Rifle Caliber Artillery: The Gardner Battery Gun

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Since man's earliest conflicts, combatants have devised ways to enhance their abilities to defeat their enemies. From the jaw bone of an ass through the inception of the Civil War era Battery Gun, many weapons were developed, improved, and utilized by fewer people to inflict greater death and destruction.

The Civil War battery gun of the Gatling design is viewed as the beginning of automated weapons. The battery gun is a device having two or more barrels, actions, and firing mechanisms connected together to produce either volley or continuous fire. Throughout the battery guns development, their design and function varied—volley fire, continuous fire, or both; few barrels to many; cranking versus pumping; mechanical ignition versus flame ignition. In short, the battery gun affords a greater power of rifle fire than is possible to obtain from a similar number of rifles in the hands of soldiers; that is " . . . the simplest and most effective means, whereby to intensify rifle fire at any point of a position, without causing the offensive or defensive power of any other part of the line to be weakened for this purpose."[1]

Battery guns that were manually actuated by turning a crank or pumping a lever were in service beginning in the 1860s to World War I. This fifty-year period saw the hand-powered battery gun go from conception to perfection to being deposed by the automatic machine gun.

With the perfection of the battery gun came the tactical question of how to best employ it in battle. In a group of their own, they were neither an individual soldier's firearm nor a piece of artillery. Early depictions show battery guns mounted on wheeled carriages resembling a piece of artillery. As they "were worked by cranks or levers, this required the guns to be mounted on resisting and heavy carriages, so that the motions of the operator should not be transmitted to the gun, and for the same reason necessitated the use of elevating screws and toggles for pointing."[2] The range of fire for the rifle caliber battery gun was between that of the individual soldier and that of an artillery piece, being between 800 to 1200 yards.

Many early tacticians believed this range to be ideal, but did not know where or how to employ the Battery

Gun for its best utilization. Few envisioned that it was a close support weapon being wheeled forward with the attacking troops; while others felt it should be with the artillery as a support weapon to defend the artillery battery from attack, freeing up the valuable infantry to fight elsewhere. In the employment with the artillery, the Battery Gun's description as "Rifle Caliber Artillery" becomes appropriate.

The most widely known Battery Gun in the United States service and in many other countries around the world is the Gatling Gun. It is to be considered the premier Battery Gun as it was produced and used in greater quantities and manufactured in more countries than any of its competitors. The Gatling was without rivals until the latter part of the 1870s, when the Nordenfeldt and the Gardner battery guns began competing against it.

The Gardner Battery Gun, second only to the Gatling, was produced in greater quantities than the Nordenfeldt or others of the period, was adopted by five countries, tested by four additional, and was manufactured in three.

The inventor of the Gardner Battery Gun, William P. Gardner, was born to Darwin E. and Elizabeth P. Gardner at Marietta, Ohio, in 1843. He moved with his father in 1852 to Toledo, Ohio. William, with his father, a promising attorney and banker, and his stepmother Sara, made their home at the corner of Madison Avenue and Superior Street where the present Gardner Building now stands.

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William Gardner, after attending Toledo High School, served with the 9th Ohio Volunteer Calvary in the Civil War. After the war the Toledo City Register lists him as a customs inspector, an architect, and in 1872 as an inventor. It is difficult to look at the picture (Figure 1) of this awkward looking, bagged clothed individual, and think of him as an inventor of a death-spewing device.[3]

Figure 1. William Gardner with 3rd prototype produced by The Pratt & Whitney Company, circa 1878. Photo credit: Western Reserve Historical Society, Cleveland, Ohio.

Working from previously conceived design sketches, he constructed the first wooden prototype in 1874 and, with the aid of Mr. Beckman, the Adams Street optician, worked out later in the year the first operational metal prototype[4] (Figure 2). In the following year, arrangements were made with the Pratt & Whitney Co. to develop and manufacture the Gardner Gun to meet military requirements. While the first examination and firing was done at the Pratt & Whitney plant for the Commanding Officer of the National Armory, the first single barrel gun (Figure 3) was carefully tested by the U.S. Navy Ordnance Board at the Washington City Navy Yard in November, 1875.[5] Present at the Navy Yard tests were Commodore Jeffers, Chief, Bureau of Ordnance, U.S. Navy and General Benet, Chief of Ordnance, U.S. Army.[6] It was suggested that Pratt & Whitney be allowed to take the weapon back to their factory to be perfected with the new feed system invented by E. G. Parkhurst.[7] The Pratt & Whitney Company obtained the manufacturing rights for the Gardner Gun by paying the inventor a royalty on each gun delivered. They also controlled the Parkhurst patents for the improved model.

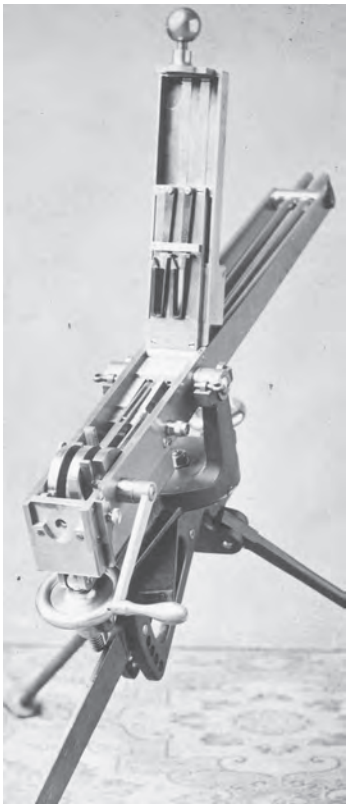

Figure 2. Gardner's 1st prototype 1874. Photo credit: Author's library.

Gardner, "the inventor," seeing no orders coming from the U.S. Government and his gun being drastically modified by The Pratt & Whitney Company, sought to form a company to manufacture his patent gun. As member of a Toledo banking family, Gardner was introduced in 1878 by the Toledo Norton family of bankers to a group of investors in Cleveland, Ohio, who were interested in incorporating such a company.[8] The investors lead by John Todd, son of Ohio's Governor Todd, and five other persons, along with William Gardner, who retained half interest, filed for incorporation in August 1879, as the Gardner Gun Company. Its purpose was to manufacture Gardner Patent guns. The capital stock amounted to three hundred thousand dollars ($300,000.00) with each share valued at $100.00. The principal office of the Gardner Gun Company was located in Cleveland, Ohio. In September 1879, the incorporation papers were refiled to grant broader terms and specify that the Gardner Gun was their main product.[9]

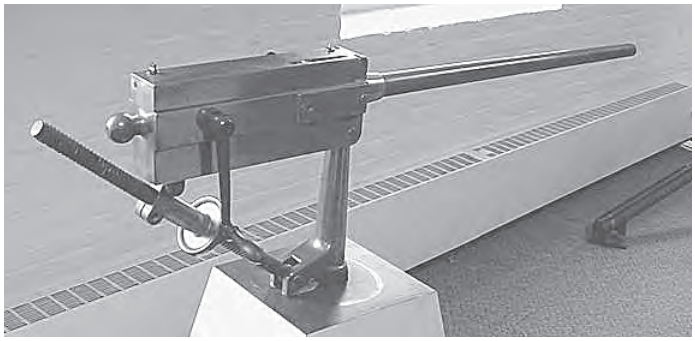

Figure 3. Gardner's 2nd prototype tested by the U.S. Navy 1875. Photo Credit: U.S. Navy, Washington Navy Yard.

In June 1878, the company sent its Director and agent, retired U.S. Navy Captain P. G. Watmough, to Europe to submit the Gardner Patent Gun to the different governments.[10] Watmough was informed in order to secure the attention of the British War Office, the weapon should be manufactured in England. Mr. Gardner, who accompanied the Captain, took his foreman and proceeded to Leeds where several Gardner Guns were manufactured under their supervision.

The Gardner Patent Gun manufactured by the Pratt & Whitney Company was exhibited at the Paris Exposition in 1878 where it was awarded the Gold Medal. The Gatling Gun finished second.

A preliminary trial of the Gardner one-barrel gun (Figure 4) was done for the British War Office in November of 1878. Three serious objections arose: exertion needed to turn the crank, wear of the parts due to one rotation of mechanisms to fire one cartridge, and the gun's weight at 53 1/2 pounds was much too heavy for one man to carry any distance.[11]

The British Admiralty first tested the Gardner Gun, chambered for the 0.45 Martini–Henry cartridge, for use

in the Tops, Boats and Land Service in February 1880.[12] After more than two years of preparatory work by Watmough, the British War Office issued an order to have the Gardner Gun tested along with the Gatling, Nordenfeldt, and Pratt & Whitney's Improved Gardner Gun at Shoeburyness.[13] The trials held in March 1881 resulted in the Gardner Patent system being judged best and the two-barrel Gardner as the most perfect form of the system. The Trials Committee recommended the 2-barrel gun (Figure 5) be introduced into service and, for special purposes, the 5-barrel Gardner Gun be adopted (Figure 6). It was suggested that for land service, the Gardner be mounted on a tripod.[14] The single-barrel Gardner Gun had been previously adopted by the British Navy.[15]

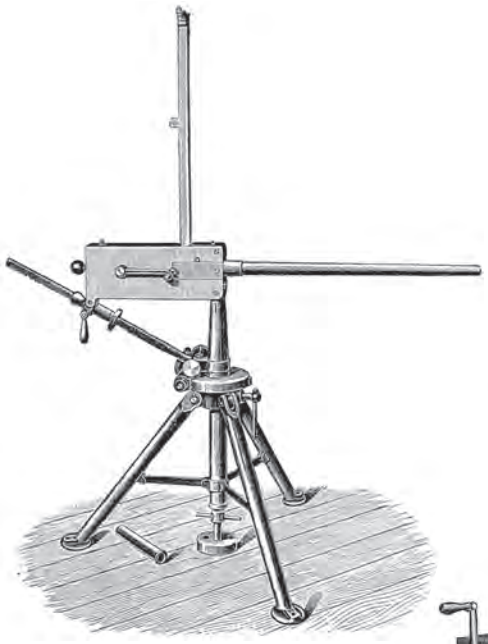

Figure 4. Gardner's patent, single-barrel gun, as used by the British Navy, 1880. Photo credit: Gardner Gun Company Catalog, 1880s.

In anticipation of receiving orders from both the British Army and the Admiralty, a factory and office were established as the Gardner Gun Company at 49–51 Curtain Road, London. The Gardner Gun Company Board sent John A. Norton in May 1881, to London to take charge of the London office as Capt. Watmough desired to return to Cleveland. Norton was to take charge of the finances of the Company and to cooperate with Capt. Gardner, who as General Manager, had the direction of the Company's affairs abroad.[16]

The Pratt and Whitney Company having obtained in 1876 the American rights to the Gardner Gun, had E. G. Parkhurst, Assistant Plant Superintendent make improvements to the gun's design over the following three years. Using the Parkhurst Patents, The Pratt and Whitney Company developed and submitted the Improved Gardner Gun for trials in the United States and abroad.

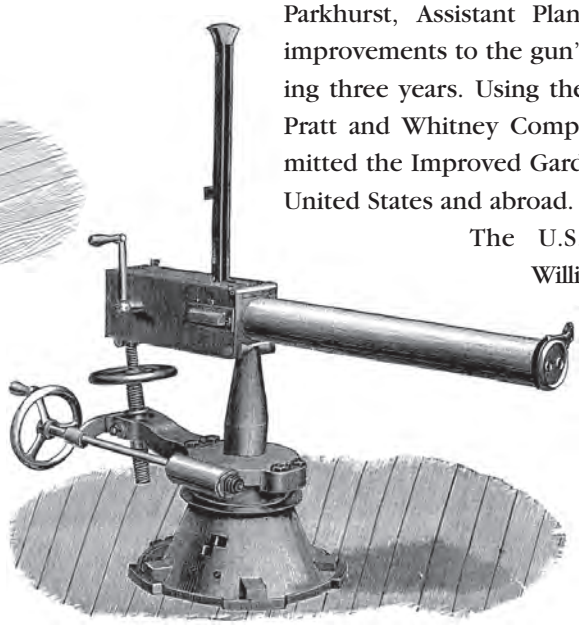

Figure 5. Gardner's Patent, two-barrel gun, as adopted by the British Navy, circa 1880s. Photo credit: Gardner Gun Company Catalog, 1880s.

The U.S. patents assigned to William Gardner for improvements in Machine Guns were issued in February 1876,[17] June 1879,[18] and August 1881.[19] His first patent (Figures 7, 8, and 9) was for multiple barrel guns with exposed frame holding the barrels, hinged top cover with feed mechanism, reciprocating feed plate and plunger, extractors and ejection, U-form reciprocating plunger, actuating crank, V-spring and hammer firing mechanism, and the operations of all the parts together to function the gun. The 1879 patent (Figure 10) applied the previously patented aspects to a single barrel weapon. Gardner's third patent covering multiple barrel guns, further defined the combination of actions of the parts upon which the previous models worked with improvements made to the feed plate, grooves, bell crank, and cams. All

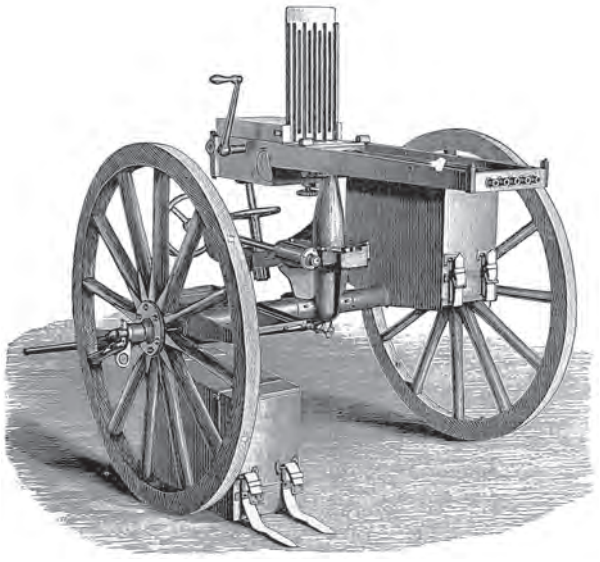

Figure 6. Gardner's Patent, five-barrel gun as adopted by the British forces. Photo credit: Gardner Gun Company Catalog, 1880s.

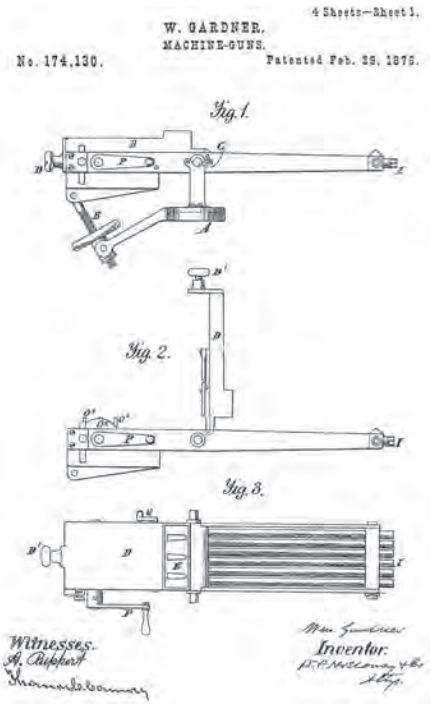

Figure 7. Gardner's 1st Patent, 1876, for multi-barrel gun. Note exposed barrels. Photo credit: U.S. Letter Patent 174, 130, Feb. 29, 1876, author's library.

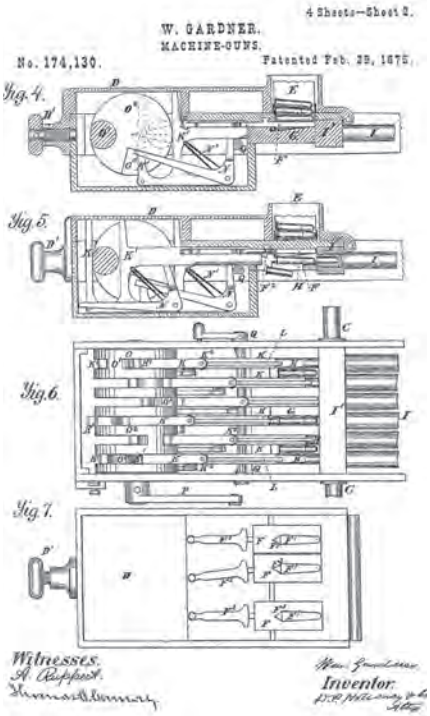

Figure 8. Gardner's 1st Patent, showing the internal mechanism for the gun's operation. Note the individual feed plate for each barrel. Photo credit: Author's library.

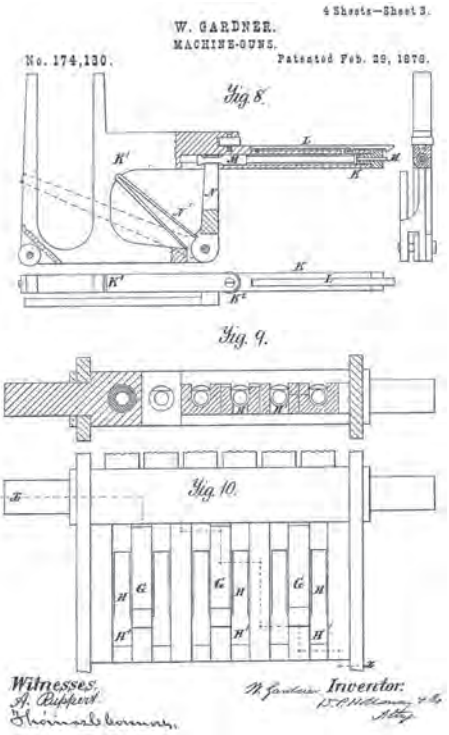

Figure 9. Gardner's 1st Patent. Note the U-shape bolt, V-spring, and hammer firing mechanism. Photo credit: Author's library.

of Gardner's U.S. patents were for battery guns with exposed barrels.

The E. G. Parkhurst Patents were assigned one-half to himself and one-half to The Pratt & Whitney Company. These patents and the Gardner patents were the basis for Pratt & Whitney's Improved Gardner Gun.

The Parkhurst patents were issued in June,[20] May,[21] and August[22] of 1880. The May patent (Figure 11) was for a Tripod-Support For Machine Guns. It covered the Tripod head with V-shape supports into which the legs and the adjustable traversing mechanism were clamped. His June patent (Figures 12, 13, and 14) is the main basis for the Pratt & Whitney Improved Gardner Gun. The specific improvements were the combination of the reciprocating feed plates, inclines, and guides providing positive feeding, the ejecting levers and its operation, feed case with plungers to stop the decent of cartridges, bolt with lever and firing mechanism, coil spring and actuating block, and the retractor (shell starter) that aids in extraction. Parkhurst's August patent (Figure 15) provided for enclosing the barrels to form a water chamber for cooling, a device for permitting steam to escape, and a drain on the bottom rear of the water chamber.

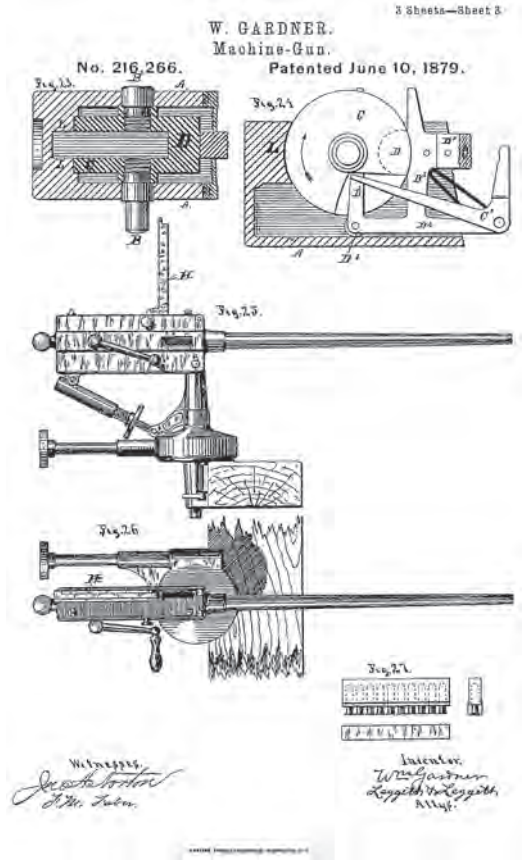

Figure 10. Gardner's 2nd Patent. Note the single-barrel gun's crankshaft and firing mechanism and similarity to the multiple-barrel guns. Photo credit: Author's library.

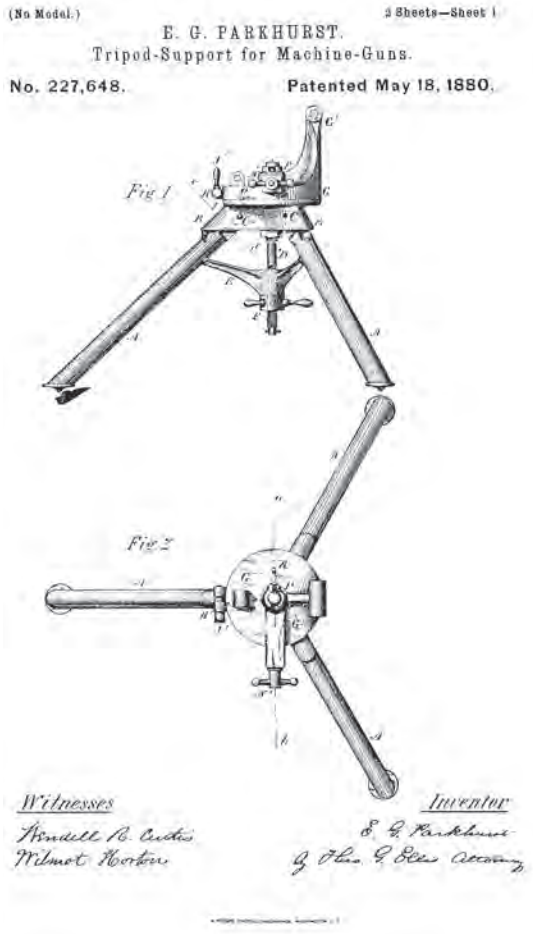

Figure 11. Parkhurst's 1st Patent for tripod support for the Pratt & Whitney Improved Gardner Gun. Photo credit: Author's library.

Except for the first few exposed barrel Gardner Guns produced for William Gardner, Pratt and Whitney's Improved Gardner Guns were two-barrel, enclosed water chamber models. The majority of the Gardner Gun Company's two-barrel models that followed also had enclosed barrels.

The significant differences between the Gardner Gun and Pratt and Whitney's Improved Gardner Gun are in the design and function of the feeding, firing, extraction/ejection, and cooling mechanisms.

The feed systems (Figure 16) appears externally similar,

but internally, the Gardner Gun Company's design has an individual cartridge feed plate and actuating arm for each barrel, while the Improved Gardner Gun has a two cartridge feed plates and arms for two barrels. The Gardner Gun firing mechanism (Figure 17) is operated for each barrel by an individual cam cut on the crankshaft and a V-spring and hammer on the plunger (bolt) assembly; the Improved Gardner Gun has a geared, coil-spring operated firing pin and geared leaver, a releasing hook actuated by the external circumference of the crankshaft lobe and is cocked by the firing pin geared lever moving forward against a fixed block, rocking back the firing pin against the coil spring and engaging the releasing hook.

The extraction and ejection (Figure 17) of the cartridge case is accomplished in the Gardner Gun by an extractor on the bolt head and gravity, while the Improved Gardner Gun employs an extractor on the bolt head, a retractor (shell starter) to help with initial extraction and pivoting levers for positive ejection.

The crankshafts (Figure 17) on both guns are circular in design, which pushes and pulls the bolt assembly into and out of the battery. The Pratt and Whitney crankshaft has cam lobes connecting together the circular portion of the crankshaft. The outside part of the cam moves the bolt assembly forward and depresses the releasing hook, releasing the firing pin to move forward. The Gardner Gun Company's crankshaft has a cam cut into the external circular portion to actuate the forward motion of the hammer and firing pin and a V-spring that moves the firing pin and hammer rearward

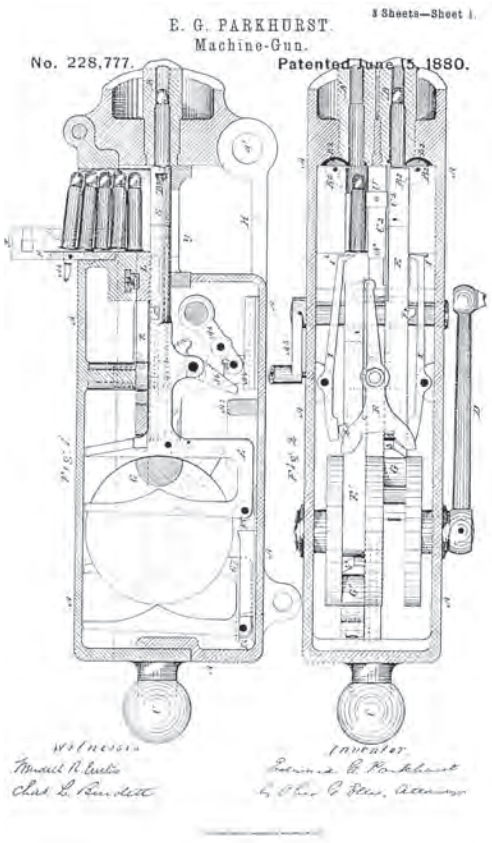

Figure 12. Parkhurst's 2nd Patent is the basis for the Pratt & Whitney Improved Gardner Gun. Note significant changes to firing mechanism from that of Gardner's Patent. Photo credit: Author's library.

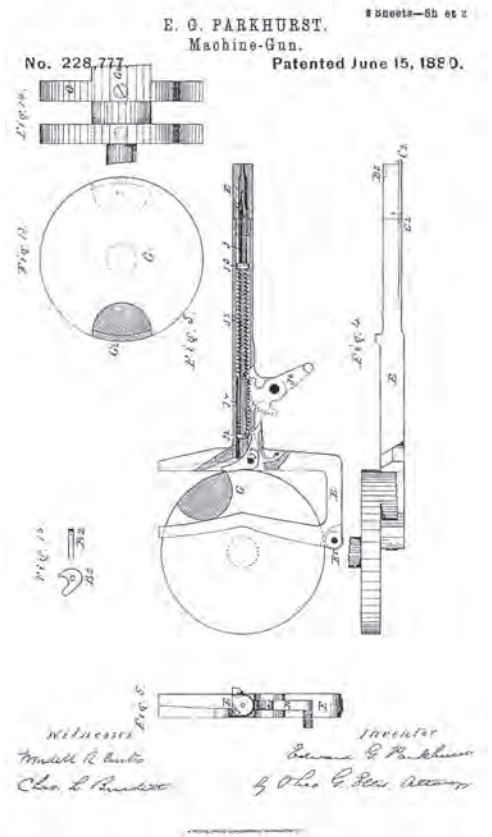

Figure 13. Crankshaft, cam bolt, and firing mechanism of the Improved Gardner Gun. Photo credit: Author's library.

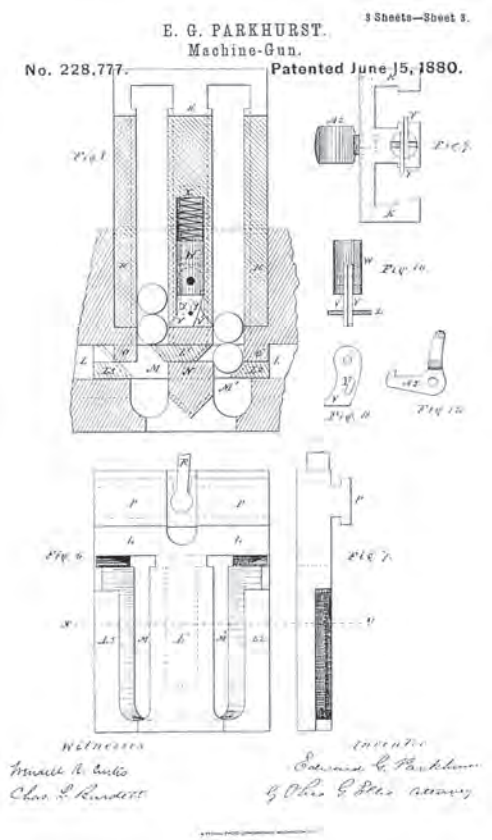

Figure 14. Feed guide and plate of Improved Gardner Gun. Photo credit: Author's library.

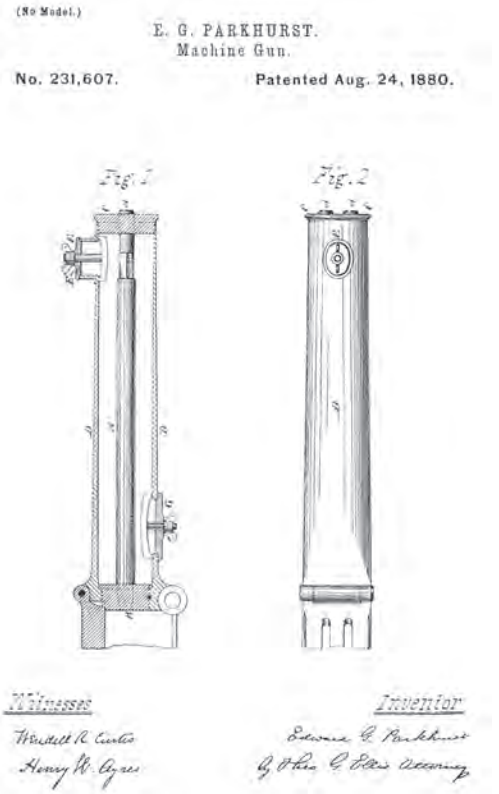

Figure 15. Parkhurst's 3rd patent for water chamber, steam release device, and drain. Photo credit: Author's library.

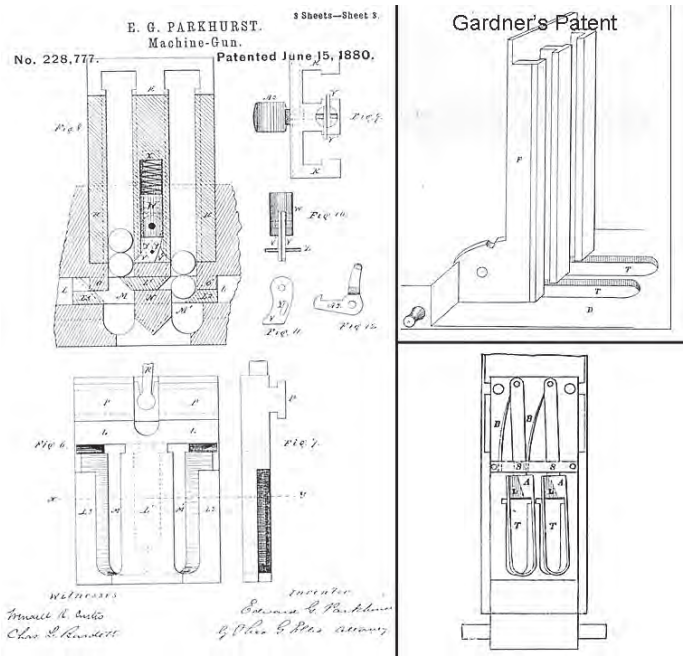

Figure 16. Compare the feed guides and feed plates between the Parkhurst Patent and Gardner Patent. Photo credit: Author's library.

and keeps the hammer lever in constant contact with the crankshaft.

The Pratt and Whitney Enclosed Two-Barrel Gardner Gun (Figure 18) was first presented for trial to the Naval Board at Washington in June 1879. The gun worked smoothly during the trials with no misfires and only six failures to extract by one lock in firing 10,000 Union Metallic Cartridge Co. caliber .50 (450 grain bullets, 70 grains of powder) cartridges.[23]

On May 22, 1880, the United States Navy tested the Improved Gardner Gun (Figure 19) in caliber .45 at the Navy Yard in Washington City. The alterations, as suggested in the previous Naval trial, were made to the crank so that

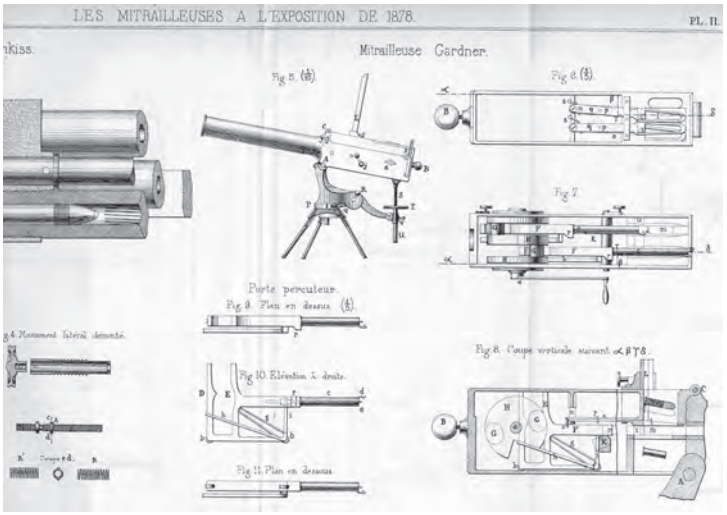

Figure 18. The 3rd Gardner Patent prototype, Caliber 45–70 made by Pratt & Whitney, displayed at the 1878 Paris Exposition and tested by the U.S. Navy in 1879. Photo credit: Author's library.

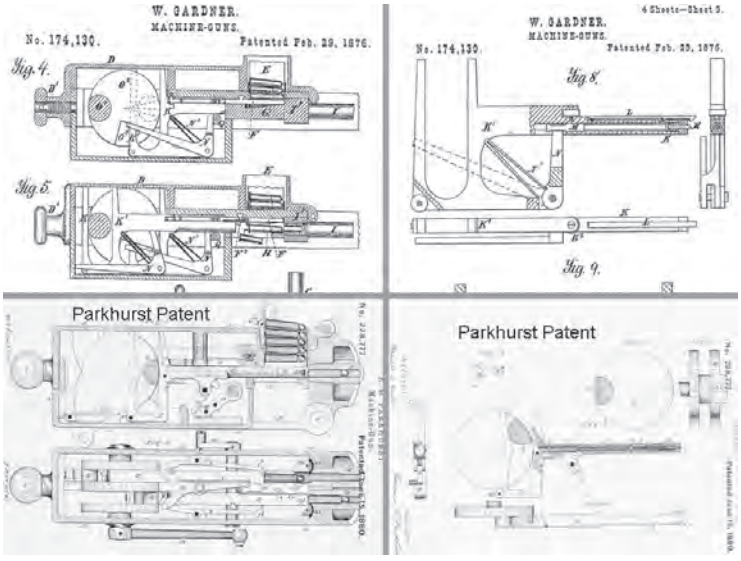

Figure 17. Compare the Parkhurst Patent mechanics to the Gardner Patent mechanics. Photo credit: Author's library.

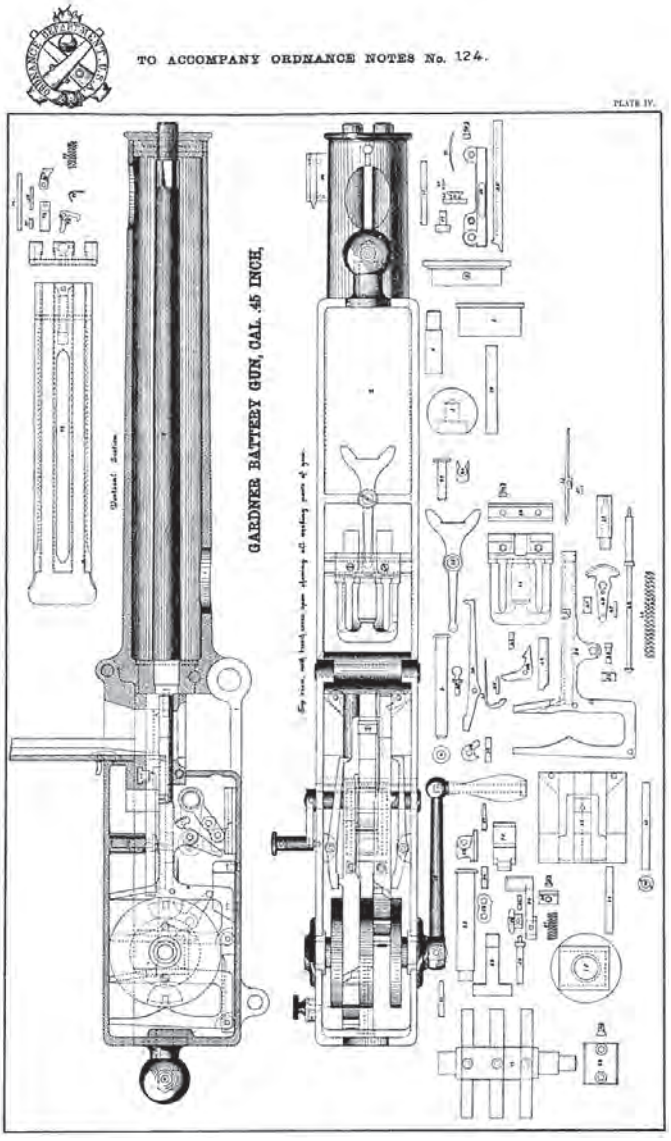

Figure 19. Pratt & Whitney Improved Gardner Gun, Caliber 45–70, (Parkhurst Patent) first tested by U.S. Navy in 1880. Photo credit: Chief of Ordnance Report 1881, author's library.

it could be revolved without compressing the main spring and barrels could be removed without interfering with the internal working parts. Improvements added were a positive shell starter and a water jacket, which proved effectual in keeping the barrels cool.[24]

The Improved Gardner Gun was submitted to the Army Ordnance board for trials conducted at Sandy Hook, New Jersey, from October 31, 1879, to January 29, 1880. It was chambered for the caliber .45 service cartridge with enclosed barrels and mechanism and was carriage mounted. The trials of this gun showed it to be one of simple construction, easy manipulation, and sure action, and in view of its cost being comparatively light, the board recommended the purchase by the Ordnance Department of a limited number for actual service trials in comparison to the other machine guns now in the hands of troops.[25]

Subsequent to the trials, the Ordnance Department ordered and received six Pratt and Whitney Improved Gardner Guns, Model 1879 (Figure 20) in caliber .45 service cartridge, field carriage mounted. Captain E. B. Williston, Second Artillery, Corpus Christi, Texas, in his Annual Target Practice Report dated January 1, 1881, related that although the Gardner Gun was recently received and fired a few times, it has proved accurate and has the advantage of simplicity, easy, and sure action. It is not as liable to get out of order as the Gatling and is cleaned more easily. Rear sights and the oscillatory arrangement of the Improved Gardner Gun should be adopted for the other caliber .45 machine guns.[26]

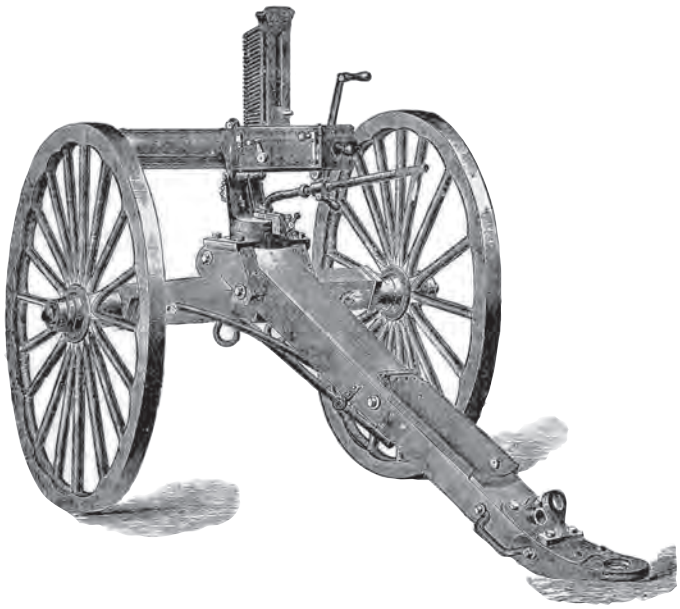

Figure 20. Model 1879 Improved Gardner Gun, U.S. Army. Photo credit: Chief of Ordnance Report 1881, author's library.

In England in July 1881, the Gardner Gun Company guns were undergoing further tests at Wimbledon. The one- and two-barreled guns worked beautifully, but the 5-barreled gun jammed once during the firing and the Gatling gun would not work at all. The British government furnished a new style of cartridge with a much thicker head than before. Fortunately, Captain Gardner found the cartridge problem the day before the test and filed 1/16" off the plunger (bolt face) of the one- and two-barrel gun, but not the 5-barrel gun.[27] Lt. General Roberts, Army in India, requested during this same month that the Gardner Gun be tested for him at Shoeburyness.[28] During July, the Gardner Gun Company commenced to obtain good mechanics and get everything in readiness for the British Navy Order for £100,000 worth of guns. The Navy Department wanted the guns immediately, even though the Navy took two years to make the decision. Parts for the model guns were being manufactured for several months prior to receiving the Navy order.[29]

By September 1881, the Gardner Gun Company had invested $80,000.00 into their foreign sales promotions, the London Office, and factory operations.[30]

The official order for £105,000 worth of guns for the British Navy was received late in September 1881, and was to be delivered by March 15, 1882.[31] The estimated profit on the British Navy order was £50,000 plus machinery and fixtures.[32]

From September 1881 to June 1882 the factory experienced increased activity with the completion of the model guns and the start of the British Navy order. The British Army was now interested in the Gardner Gun and with the large Navy order in hand, the London factory needed to be enlarged. This project would soon interfere with gun production. Captain Gardner, like so many other inventors, was very capable, but not when it came to manufacturing as noted in a letter John A. Norton wrote home: "I never saw such a slow man in my life as Gardner and never one before who was so capable in some things and so good for nothing in others. The Governments are just giving us 'fits' for being so slow."[33] This is just a glimpse of the problems yet to appear with Captain Gardner.

The first five-barreled Gardner Gun for the British Navy was delivered on July 19, 1882. Norton commented that "he does not doubt now that they can run our factory and make guns as well almost without Gardner as with him. Gardner can now take his periodic spells of illness without damage to our Company's interest."[34] Gardner, along with his wife and Messrs. Tod and Short, both Gardner Gun Company directors, went to Germany on July 19, 1882, to look into business interests. Gardner was in a nervous state and indicated he should not be gone more than a week or 10 days as the shop could not run without him.[35] On Thursday, July 27, 1882 with

additional guns about to be delivered, Norton wrote, "This very fact establishes for now, for the government, as well as our Company, that they are not dependent on the drunken whims and caprices of Mr. G- and manufacturing can go on without him."[36] Gardner and spouse were prone to take trips for their health. Norton commented in another letter home, "We are getting along at the shop splendidly—much better when Gardner is away."[37] The Gardner problem could no longer be tolerated by the Company Directors as they telegraphed Norton on September 16, 1882, that he was now in charge and Gardner had been removed.[38]

Norton, now general manager and agent for the Gardner Gun Company, London, was slow to dismiss Gardner due to the upcoming October German Machine Gun trials in Berlin. Norton felt if Gardner was dismissed before the trials, he could do great harm. During Gardner's absence, Norton was able in one week to get the new shop and machines in running order.[39]

The Company directors were emphatic that Gardner must go and, upon his return from Berlin, Norton was to take action. By November 28, 1882, Gardner still had not returned, therefore, Norton wrote telling Gardner that the Company had dismissed him. Although Gardner was no longer employed by the Company, he retained his stockholder rights. Until Gardner's death in 1887, he was a constant problem to the Gardner Gun Company and Norton.

Patent problems were found when the Italian government announced their 1883 Machine Gun trials. Upon review of the Italian Patents, it was found Pratt and Whitney had also patented the gun in Italy. The Gardner Gun Company attorneys brought suit to regain their patent rights, but found their Patent had expired as a result of not paying the required annual fee.[40] Even though the patent problem was in litigation, the Gardner Gun Company competed against Pratt & Whitney in the Italian Trials held at Camp di Cirie, Turin, Italy, during October and November, 1883. Upon completion of the trials, the Italian Ordnance Board recommended the purchase from Pratt & Whitney of one Improved Gardner Gun to be fitted for Italian ammunition. After additional exhaustive trials, the Italian Ordnance Board recommended the gun be adopted by the government, who initially ordered one-hundred guns and, later, one-hundred fifty. The Italian Government procured the manufacturing rights and produced two-hundred more guns for a total of 451 guns in their service. The Italians adopted the Improved Gardner Gun (Figure 21), tripod mounted for fortification defense, as the M.86 mitragliatrici in their M.1870 caliber 10.35 mm cartridge.[41]

Ludwig Loewe & Co. of Berlin entered the Gardner Gun Company's Gun in 11-mm caliber in the Swiss Machine Gun Tests held in late 1883.[42] The competitors were Gardner, Gatling, and Nordenfeldt.[43]

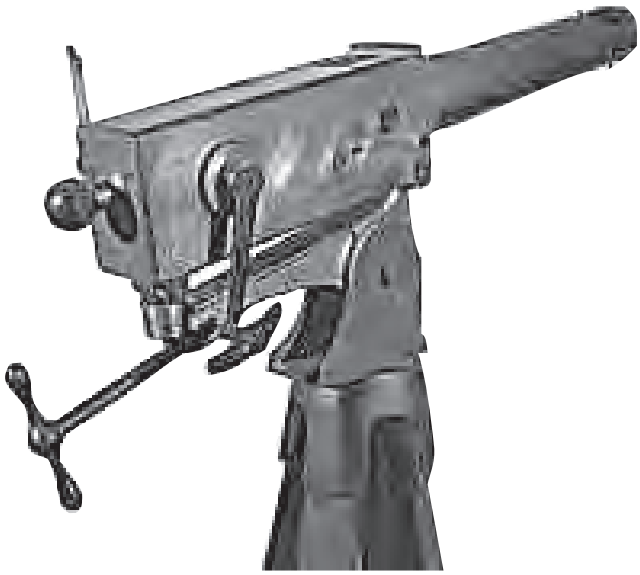

Figure 21. Italian Pratt & Whitney Improved Gardner Gun. Photo credit: Author's library.

Pratt and Whitney entered their Improved Gun in the Mexican Machine Gunnery Trials on July 14, 1883 in Mexico City. The gun was tripod mounted which provided for limited oscillation in the horizontal direction and for 360 degree traversing. The Supreme Mexican Government had previously obtained an earlier model Pratt and Whitney gun. The trial resulted in the recommendation to acquire a number of these machine guns, but no orders were forthcoming.[44]

While both companies were competing in European trials, the United States Army was field testing the Improved Gardner Guns purchased in 1881. Captain John E. Greer, U.S.A. Ordnance Department, suggested in June, 1880, that the Gardner feed guide be adopted for the Gatling and Lowell guns. He further suggested that the current pasteboard box for packing 20 Springfield rifle cartridges be modified to feed the Gardner, Gatling, and Lowell. He concluded that by adopting the cartridge box, the number of cartridges carried in the limbers would be greatly increased. His report dated June 6, 1881, detailed the results (Figure 22) of his experiments and recommended that a pasteboard box with straight dividers, holding 20 cartridges be adopted, that feed guides similar to the Gardner's be adopted for the Gatling and Lowell, and the limbers be modified to store the adopted boxes. During his experiments, Captain Greer consulted Mr. Parkhurst, who suggested the box should have a sliding cover to facilitate the ease of loading the feed guide. While the Ordnance Department declined to use the Parkhurst design, the Pratt and Whitney Company used it with their guns.[45]

The Ordnance Department published in October 1881, Ordnance Notes No. 166, "The Equipment of Field Artillery" by Captain J.R.J. Jocelyn, Royal Artillery. He put forth that the Gardner Gun would be good for mountain service due to its lightness.[46] In Ordnance Notes . . . No. 198, June 1, 1882,

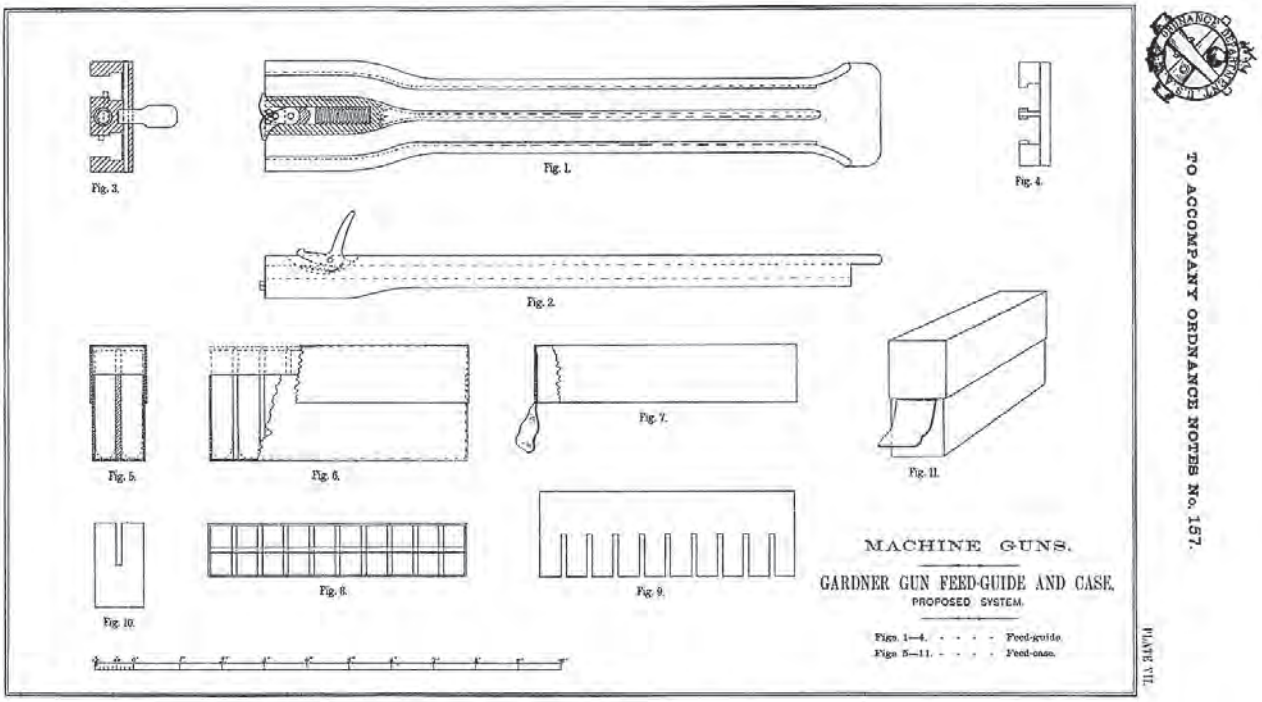

Figure 22. Cartridge box for Gardner Gun as recommended by Capt. Greer. Photo credit: Chief of Ordnance Report 1881, author's library.

Machine Guns and How to Use Them, W. Gardner (Late Captain U.S.A. and Superintendent, Gardner Gun Company) states that the machine gun should be used both defensively and offensively, not as the primary weapon, but in support of Infantry and defense of Artillery.[47] The tactical question of where machine guns should be employed was still not resolved.

Light Battery F, Second U.S. Artillery, Fort Leavenworth, Kansas, was entrusted since 1880 with the field trials of the various machine gun systems, including the Hotchkiss, Gatling, Lowell, and Improved Gardner. The Pratt and Whitney Company in December 1884, requested information regarding the trials of their Improved Gardner gun. The trials made by Battery F conformed, as nearly as possible, to all conditions of active field service in time of war. Target practice was done in all weather conditions and circumstances. Captain Williston reported that taking all things in consideration, "the accuracy of the Improved Gardner Machine Gun is remarkable. It is light, compact, simple, strong, and easily disassembled and put together. Except for one main spring breaking, the gun was not out of order since received."[48]

The final trial by the U.S.A. Ordnance Department of the Improved Gardner Gun took place on May 29 through July 30, 1884, at Sandy Hook, New Jersey. The Ordnance Department specified that the gun was to use 405 and 500 grain bullets, caliber .45, government service cartridges. The Improved Gardner Gun entered in the trials was a Model 1883 on the Model 1883 gun mount and carriage. The main difference in the Model 1879 and Model 1883 was the shape of the crankshaft: when viewed from the side, the latter is now rectangular in shape, whereas the former was circular. This improvement reduced the weight of the crankshaft and increased the rate of fire. The Model 1883 gun mount (Figure 23) was more robust. Over 5,000 car-

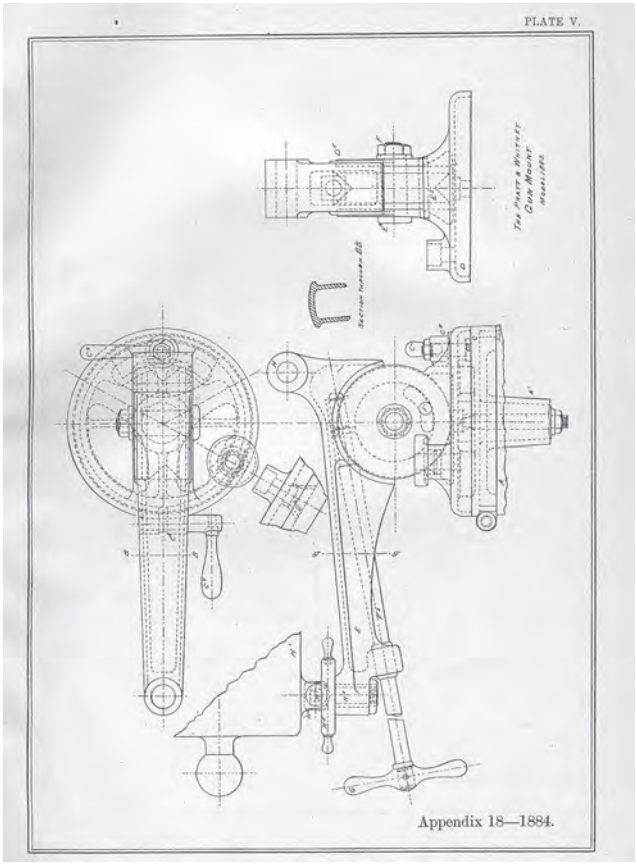

Figure 23. Pratt & Whitney Model 1883 Gun Mount for the Improved Gardner Gun. Photo credit: Chief of Ordnance Report 1883, author's library.

tridges, both 405 and 500 grain, were consumed in the trials with only 10 misfires and minor repairs to one extractor and crank retaining pin. Test results showed that the Improved Gardner compared favorably with the Gatling in everything except rapidity of fire. The feed guide was admirable and the pasteboard box containing ammunition for Infantry can be adapted easily for use with this gun. This would be a great advantage for a machine gun intended to supplement and re-enforce infantry fire. The trials board recommended that some of the Improved Gardner Guns be procured for the service.[49] By June 29, 1886, five Improved Gardners and carriages, U.S. Model 1885, had been purchased and received from The Pratt and Whitney Company.[50]

The U.S. Army Ordnance Board was far from finished testing Gardner Guns. In December, 1884, the board was directed to test one-, two-, and five-barreled guns submitted by the Gardner Gun Company of Cleveland, Ohio. In May 1885, these guns were presented for trial, but were not capable of using U.S. 500 grain bullet service cartridges. The Company was requested to modify the two- and five-barreled guns to receive the service cartridge. The one-barrel gun was not further considered as no reason existed for its adoption in the U.S. service. On July 24, 1885, the two- and five-barreled guns were tested by firing 3000 cartridges. The board concluded it was not in the best interest of the Government to continue the tests if the lock defects, length of feed guide, and vibration of mount experienced in the test were not corrected.[51]

The Gardner Gun Company was no longer producing profits as expected; therefore, the Directors requested Norton to see if a buyer could be found. A prospectus was prepared for "The Gardner Gun Company Limited," which proposed the issue of 100,000 shares at one British Pound each. The capital was to be £150,000 of which 50,000 fully paid shares were allotted to the vendors. This new company would take over January 1, 1886, the entire business, good will, plant, machinery, and manufacture of the Gardner Gun. The Prospectus stated that the gun was awarded the Gold Medal at a recent Inventors Exhibit and has been supplied to the British, Indian, Argentine, Chilean, and Peruvian governments. It further stated that it has been successfully tried in Germany, Austria, and Turkey. Patents for the gun were granted by United Kingdom, France, Germany, Austria, Italy, and Belgium. The consideration to be paid the vendors was £50,000 cash and 50,000 fully paid shares.[52] The Prospectus produced little interest and the Gardner Gun Company continued to manufacture guns. In later years, the directors would try again to sell the Company several times, but their attempts were not successful.

An agreement was made for manufacturing rights in February 1886, between the Gardner Gun Company and the manufacturing firm of Ludwig Lowe & Co. of Berlin. During February the Company tried to regain their Italian Patent rights, but found the rights had expired in 1878 instead of 1881 or 1882 as previously believed.[53]

The Gardner Gun Company's two-barreled gun production was again slow and by March 2, 1886, only six more guns were delivered for a total of 30 delivered out of 50 ordered. The Turkish government order for 150 guns was pending as of May 1886. Colonel Arbustnot, British Army, indicated to Norton, if the two-barreled gun weight could be reduced to 80 pounds, the gun would be adopted. He consented to have the barrels and casing shortened. Colonel Arbustnot directed that thirty-six, two-barreled guns and twenty, five-barreled guns be changed to the new Enfield Martini ammunition in Caliber .40. In June the French government made a request to test the Gardner gun and by September, four, two-barreled and one, five-barreled guns were ready for shipment to France.

Captain Gardner, dismissed five years previous, still received royalties from his patents, his latest, the French Patent. The Company in October submitted a quote of £25 each, to the tender previously received for 108 cone mounts, which the Government accepted in November. The Gardner guns sent to Spain in October for tests were denied entry until a £50 duty was paid. In early November officers from the British War Office discussed with Norton the need for a parapet mount (Figure 24) for the Gardner

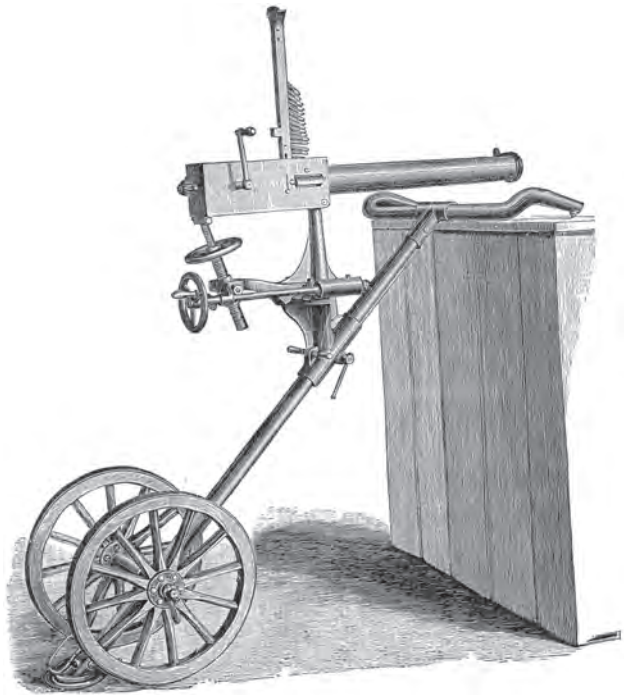

Figure 24. Gardner's Patent, Parapet Mount of Gun 1887. Photo credit: Gardner Gun Company Catalog 1880.

gun. While at the War Office in December, Norton received a verbal order for 70, two-barreled guns and 70, parapet mounts to be furnished by March 15, 1887.[54]

Notes in Norton's 1886 diary show that Pratt and Whitney's Italian Gun Patent was taken out by Mr. Parkhurst and Edward Grandville of Hartford on 23 August 1882. The Italian gun was to be made to the Italian Rifle cartridge of 1870. The contract dated April, 1885, was to deliver 12 guns in 90 days, 20 in 180 days, and 68 in 360 days.[55]

Captain Gardner died on January 20, 1887, and was buried in London. Shortly afterward Mrs. Gardner and their three daughters returned to the United States. The Gardner Gun Company settled Captain Gardner's final accounts in July, 1887.

The first parapet mount was delivered to Enfield on March 21, 1887.[56] The Spring of 1887 proved to be a most productive and prosperous time for the Gardner Gun Company. The factory completed many orders by March 31, the Government's fiscal year end. Norton's books showed on the first of April, the Company was due between £45,000 to £50,000 for guns and mounts delivered to the Government. As always, the British Government was slow at making payment.

Since the first of April, the Government payments being received were for guns delivered during the last fiscal year. The fall saw the requirement and development for the five-barrel gun of a telescope that was patented and tested by the British government. Even though in the latter half of 1887, with previous orders still being manufactured, the Gardner Gun Company, with successful trials in Spain and France, did not receive the new orders anticipated.[57]

The Danish Machine Gun Trials announcement in January 1888, to take place later in the year, started the new year off with increased hope for the Gardner Gun Company. However, on 26 January official French correspondence was received stating that the Gardner Gun would not be adopted and that arrangements were needed to return the guns.[58]

A new sales pamphlet (Figure 25) for all the Gardner Gun Company models and mounts was published March 1888 in English and French.[59] No new orders were received in February or March, although the two- and five-barrel Gardner Guns were tested with new Kynoch copper bulleted ammunition. The five-barrel gun was tested again at Hythe in March. Two-hundred fifty cartridges were received from Geo. Accles for use in the Gardner guns to be submitted to the Danish Trials.[60]

While promising reports were received in May from the Danish trials, no new orders were given by the British War Office. The Gardner Gun Company was in dire need of money as in August 1888, the banks and others refused further loans. For the remainder of the year,

Figure 25. Gardner Gun Company Catalog 1888. Photo credit: Gardner Gun Company Catalog 1880.

new orders were non-existent even though the Gardner Guns were successful in the Danish Trials. Norton traveled to Paris on October 5 and stayed until the 28th trying to get the French to give the Company an order for guns as the earlier French Trial had been permeated with scandal and payoffs.[61]

The Gardner Gun Company Directors were now selling off their holdings as the manufacture and promotion of the guns were consuming money faster than it could be made. Norton purchased much of the Directors' stock as he believed in the Company's future. January through early March 1889, was a bleak period for the Gardner Gun Company. Finally in March, the Danish Government ordered 56 two-barrel guns and mountings totaling £9,250. Upon receipt of the drawings for the Danish Cartridge and barrels from General Schreiber, production setup started. The guns from the French Trials were finally received in July; few new orders had been placed over the last three months.[62]

In September, Captain Meyer, Royal Danish Artillery, informed Norton a further order for guns was forthcoming. In September, Machine Gun Trials took place in Holland which resulted in new hope for the Gardner Gun Company as their guns performed well.[63]

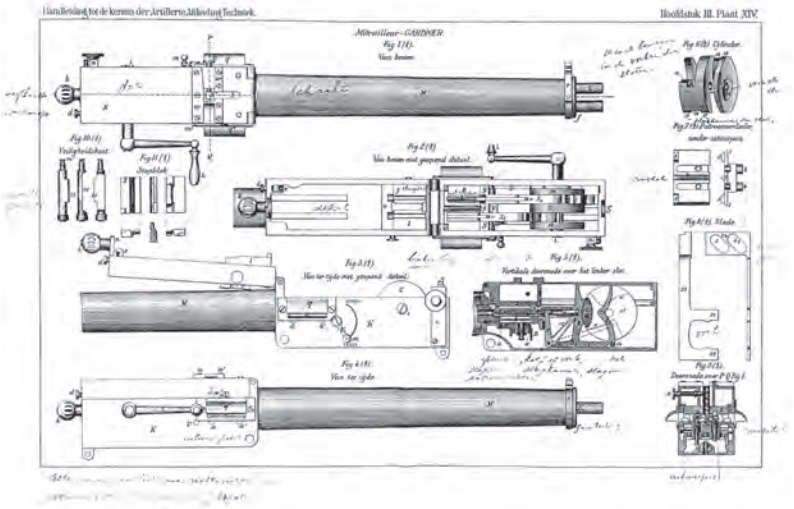

Figure 26. Dutch Mitraileurs M90, 11mm Beaumont. Photo credit: Author's library.

The Danish Royal Artillery paid £4,710 on October 21, 1889, for the 30 guns received and shortly afterward ordered eight additional guns and mounts. The remainder of the Danish order was still to be completed by the close of 1889.[64]

The Dutch Government, on December 16, 1889, made application to the Gardner Gun Company for purchase of guns. The Gardner Gun adopted (Figure 26) was the two-barrel version in 11 mm Beaumont cartridge, known in Holland as the Mitrailleurs M90.[65] By August, 1890, the first 10 guns for the Dutch Government were finished and ready for testing.[66] Even though the Dutch tests and orders were in progress over the next few years, the period from 1891 through the death of John Norton in 1895 saw very few new orders or deliveries for the Company.

The United States Navy resumed their interest in machine guns in 1894 and was determined to obtain a gun in 6mm.[67] The Gardner Gun Company Directors were eager to have the U.S. Navy test their gun and requested Norton to return to the United States with their gun. The initial test on May 8, 1894, of the Gardner had to be postponed to July, due to the defective cartridges brought with the gun.[68] The Navy trials were held at the Washington Navy Yard from July 5 to August 4, 1894. The six guns submitted and tested were in the final order of merit: Maxim-Nordenfeld, Gatling, Accles, Skoda, Robertson, and Gardner. The majority of the Officers involved with the trials concluded the efficiency of an automatic machine gun was so much greater than those worked by hand.[69] The end was apparent for manually powered machine guns.

With the failure of the Gardner Gun Company to secure orders from the U.S. Government, the directors were at the end of their options and ordered the London operations closed. In September 1894, the Company went up for sale for whatever could be obtained. The inventory of guns

Figure 27. John A. Norton, General Manager and Agent, Gardner Gun Company, London, taken shortly before his death in 1895. Photo credit: Western Reserve Historical Society, Cleveland, Ohio.

was to be sold to satisfy the Company's debts. A small order received from the Chilean Government was filled in November 1895.[70] Norton, (Figure 27) under extreme pressure to liquidate the Company and with his health failing rapidly, died in late December, 1895. Without the direction and guiding force of John A. Norton, who had managed the London operation since 1881, the Gardner Gun Company ceased to be an operating entity.[71] The Accles Company was the successor to the Gardner Gun Company.[72]

The Pratt and Whitney Company, manufacturer of the Improved Gardner Machine Gun, outlasted both William Gardner and the Gardner Gun Company. For "On May 27, 1898, an order was given by the Chief of Ordnance to the Pratt and Whitney Company for 10 two-barreled guns, caliber .45 with carriages and limbers, spare parts, tools, and appendages, complete, to be delivered within three weeks (Figure 28). They were delivered on September 30, 1898, too late for use in the Spanish-American War."[73]

The U.S. Army and Ordnance Department finally disposed by sale of all the Gardner and other machine guns in caliber .45, except for those reserved for museum purposes, by June, 1908.[74] A quantity of the Dutch and British Gardner Guns were converted to 6.5 Mannlicher and .303, respectively, and along with the Italian Gardner Guns were in service well into World War I.

ACKNOWLEDGEMENTS

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Summary of Trials, Manufacturers, Procurement
Data as of 05/10/04

Date	Trials	Model	Caliber	Manufacturer	Procurred
1874		Wooden Prototype		William Gardner	
1874		Metal Prototype		William Gardner	
1875	Demonstration for Co. National Armory at Pratt & Whitney factory	1st Prototype, 2 Barrel Gardner Patent	50–70[1]		
1875	U.S. Navy	2nd Prototype, 1 Barrel Gardner Patent	50–70[1]	Pratt & Whitney	1
1878	British Admiralty	1 Barrel Gardner Patent	.450	Manufactured at Leeds, England for Gardner Gun Co.	7[2]
1878–79	U.S. Navy	3rd Prototype Gardner Patent, Parkhurst Influence	50–70	Pratt & Whitney	
1879	U.S. Navy	Improved Gardner Gun, Model 1879	45–70	Pratt & Whitney	
1879–80	U.S. Army	Parkhurst Patent Improved Gardner Gun, Model 1879	45–70	Pratt & Whitney	6
1881	British War Office	2 & 5 Barrel Gardner Patent	.450	Gardner Gun Co.	476[2]
1881	British War Office	Improved Gardner Gun Parkhurst Patent		Pratt & Whitney	
1882	Germany	Gardner Patent		Gardner Gun Co.	
1883	Italy	Improved Gardner Gun, Model 1883 Parkhurst Patent	45–70	Pratt & Whitney	451[3]
1883	Italy	Gardner Patent		Gardner Gun Co.	
1883	Mexico	Improved Gardner Gun Parkhurst Patent		Pratt & Whitney[4]	
1883	Switzerland	Improved Gardner Gun Parkhurst Patent		Pratt & Whitney	
1883	Switzerland	Gardner Patent		Gardner Gun Co.	
1883	U.S. Army	Improved Gardner Gun, Model 1883	45–70	Pratt & Whitney	5
1884	U.S. Army	1, 2, & 5 Barrel Gardner Patent		Gardner Gun Co.	
1885	Turkey	Gardner Patent		Gardner Gun Co.	150
1886	France	2 & 5 Barrel Gardner Patent		Gardner Gun Co.	
1886	Spain	1 & 2 Barrel Gardner Patent		Gardner Gun Co.	
1888	Denmark	2 Barrel Gardner Patent		Gardner Gun Co.	64
1890	Netherlands	2 Barrel Gardner Patent	11 Beaumont	Gardner Gun Co.	10[5]
1894	U.S. Navy	Gardner Patent		Gardner Gun Co.	
1898	U.S. Army Procurement for Spanish-American War	Improved Gardner Gun Model Circa 1894	45–70	Pratt & Whitney	10

Data for Argentina, Austria, Chile, and Peru and data not shown is still to be located. [1]Probably 50–70 U.S. Government service cartridge. [2]Probably more as data from 1886 British returns of guns in service. [3]251 by Pratt & Whitney, 200 additional by Italian Government under license from Pratt & Whitney. [4]One older model procured from Pratt & Whitney. [5]10 produced by July, 1890; more ordered, quantity unknown.

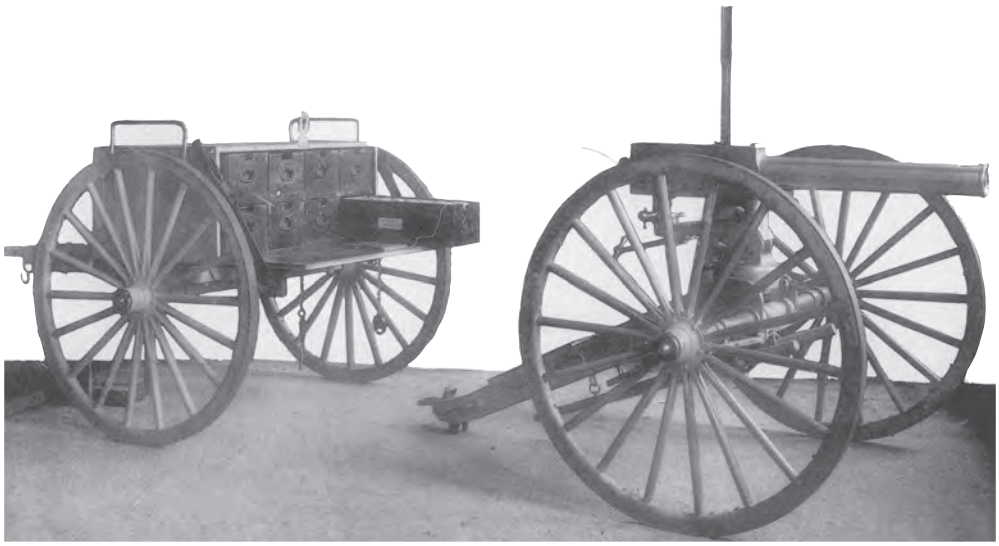

Figure 28. Improved Gardner Gun and Limber as purchased by U.S. Army in 1898. Photo credit: Sale Booklet, Pratt & Whitney Company Improved Gardner Machine Gun 1894, author's library.

and Armor, West Point Museum, West Point, New York; Joseph Lozen, Oakdale, Connecticut; John McCabe, National Park Service, Springfield Armory, Springfield, Massachusetts; Stuart Mowbray, Andrew Mowbray Publishers, Inc., Lincoln, Rhode Island; Kenneth L. Smith-Christmas, Curator, National Museum of the Marine Corps, Quantico, Virginia; and Jodie Creen Wiseman, Museum Technician, Rock Island Arsenal Museum, Rock Island, Illinois.

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