

“REVERSE TRAPDOOR” MUSKET CONVERSIONS

By Edward Hull



Figure 1. Shown here are the four “reverse trapdoor” musket conversion designs discussed in this article. From the top: Morse, Hubbell, Wilson & Flather, Van Choate. (Author’s collection and photo).

During the decade starting in 1859, the U.S. government experimented with a variety of “trapdoor” designs used in converting muzzle-loading muskets into breechloaders. This experimentation gained impetus after the Civil War as the government sought to adopt a breechloading design that could be made cheaply and quickly, leading to the Allin Patent series of Springfield Models 1865, 1866 and 1868. Foreign countries were equally interested in the up-and-forward swinging “trapdoor:” Austria with the Wänzl rifle, Belgium with the Albin-Braendlin and Terssen models, Spain with the Berdan Modelo 1867 arms, and Switzerland with the Milbank-Amsler. A variety of other inventors — most notably William Mont Storm and the Miller brothers in the U.S. — also offered similar designs but no country adopted their versions for general issue.

A few inventors had another idea: a “reverse trapdoor,” wherein the breechblock opened up-and-rearwards. Five American inventors actually made model arms for the conversion of muskets on four versions of this design: George W. Morse, William Hubbell, Silvanus Van Choate, William Wilson and Henry Flather (Figure 1). This is their story: Part I covers the pre-Civil War era and the

Morse Patent muskets, and Part II covers the post-Civil War era and three similar or derivative designs.

The terms “conversion” and “alteration” are used today somewhat arbitrarily, with alteration usually understood as some relatively minor configuration change (i.e. sights, barrel length or caliber). Conversion refers to a significant change in design - here the change is from muzzle-loader to breechloader. However, in period documents Morse’s muskets and rifles are referred to as “alterations,” so that word is used here.

PART I

Morse Patent Alterations

The Morse alteration musket (Figure 2) is most notable for being the first breechloading metallic cartridge arm manufactured by the Springfield Armory. Morse’s path to achieving that distinction took years, and the advent of the Civil War cut short it’s potential adoption as a standard infantry arm of the U.S. Army. The story of all the Morse breechloaders - carbines, sporting rifles - is much broader than just that of the musket alterations covered here (see Seigler, *The Best Gun In The World!*).



Figure 2. The Morse alteration of a Model 1866/22 .69 caliber musket retains the original length of the barrel/breech system of 42 inches, but the in-the-bore barrel length is now 38 inches. The production muskets were rifled and had long range rear sights added. The musket's metal parts are finished in-the-white, while the breech system also appears to have been identically finished (but here is tarnished). The walnut stock is oil finished. (Author's collection and photo)

George Woodward Morse was born in New Hampshire in 1813. Although a Yankee by birth, he migrated to Louisiana in 1838-9, married a Southern Belle in 1848, and settled in Baton Rouge. As a Louisiana state surveyor and later State Engineer, and being an astute businessman and plantation owner, he accumulated sufficient wealth to support his venture into designing breechloading arms and suitable cartridges. His first prototype breechloading arms were made in Baton Rouge in the mid-1850s.²

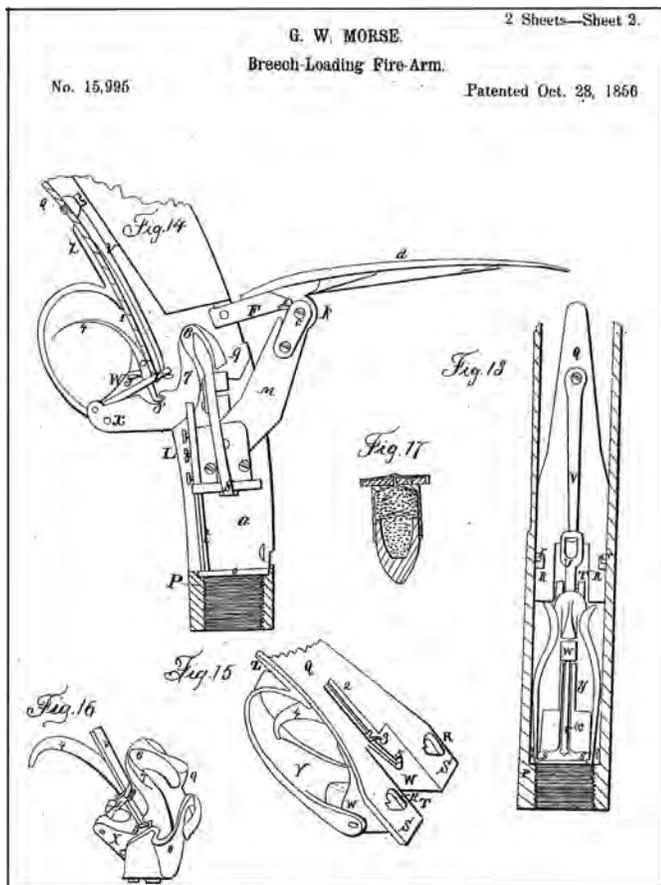


Figure 3. Drawing from Morse's patent number 15,995. Note the "pincers" that grasp both sides of the cartridge rim, acting as an extractor. (U.S. Patent and Trademark Office)

By October, 1855, Morse had fully developed his new design for a "reverse trapdoor" breechloader using a unique metallic cartridge to seal the breech; the breechloader and the cartridge were an inseparable system, though patented separately. Yet it would take him a year of negotiations with the patent office examiners before he received his first patents: numbers 15,995 for the breechloading design and 15,996 for the cartridge (both issued on October 28, 1856).³ In the design of the first patent (Figure 3), a

horizontally sliding breechblock is braced closed by a toggle link operated by a lever on top of the frame. Morse would also obtain a British patent for this design, numbered 1357 of May 13, 1857.⁴

With patents in hand, and intending to find a manufacturing company to produce his arms commercially, Morse ventured to Yankeedom in 1857. There he worked with Nathan Muzzy in Worcester, Mass., operating as "Muzzy & Co.," which company contracted to produce 100 cased sets of Morse's breechloader. (According to Morse's brother, the company completed only half that number - and those were of poor quality.⁵) In December, 1858, the "Muzzy Rifle Barrel and Gun Manufacturing Co." was formed, with Morse as a stockholder, and absorbed the assets of Muzzy & Co.⁶ This latter company would suffer financial failure in January, 1860.⁷

Simultaneously, Morse began efforts to induce the U.S. War Department to adopt his design. When John B. Floyd - a staunch supporter of the use of breechloaders - became Secretary of War in March, 1857, Morse approached the Ordnance Department with examples of his breechloader and cartridge designs. At Secretary Floyd's urging, on March 5, the Chief of Ordnance directed a test of the design at the nearby Washington Arsenal.⁸ Major William H. Bell conducted the test starting the next day - with Morse participating - by having 100 rounds fired with the following described rifle:

"This arm (Barrel about 30 inches long, Bore 54/100th in. in diameter) is [a] breech loading rifle, [with] a percussion cartridge whereof the cylinder containing charge and powder with ball...."

"In the firing, the charges of powder were 45 & 50 grains. Weight of ball expanding [sic] 377 grains."

"The arm performed exceeding well, the penetrations [through 1 inch boards] being greater than any Breech Loader of that bore..."

"The machinery of the arm during the firing sustained not the slightest injury, being as perfectly clean and serviceable at the end as at the beginning of fire."⁹

At the end of testing, Maj. Bell reported:

"This arm though complicated in its machinery is amazingly ingenious and very durable in its construction. It is worthy of the consideration of the department and were it not for its complicated machinery it would probably be as well suited to military as it certainly is to civil purposes."⁹

This positive report would set in motion Sec. Floyd's infatuation with Morse's breechloader and the cartridge that made it functional. Were it not for Morse's inability to get the arms and cartridges affordably manufactured (as well as the advent of the Civil War) this design might have

been a true competitor to the contemporary metallic cartridge breechloaders, the percussion-primed Burnside and Maynard carbines.

Morse also provided the same gun to the Navy's Bureau of Ordnance and Hydrography for testing. On March 14, Cmdr. John Dahlgren tested the sample with both rifle-length and carbine-length barrels at the Washington Navy Yard, reporting at the end, *"I am impressed favorably with Mr. Morse's invention, and consider it worthy of a trial in service for the use of picked men"* (i.e. not for general issue).¹⁰

Later in 1857, the Secretary of War convened an ordnance board at West Point, N.Y., to test the myriad new breechloader designs offered by inventors.¹¹ This board tested arms from August 17, to the end of September. Morse provided a .52 caliber carbine with a 23¾-inch barrel to this board. The board members were not as impressed with Morse's design as had been Maj. Bell; at the end the board recommended the Burnside carbine design.¹² In fact, Springfield Armory master armorer Erskine Allin give his opinion that Morse's design *"...is not suitable for military purposes, although very ingeniously made."*¹³

Nevertheless, Morse continued to lobby Secretary Floyd to obtain an order for arms. Secretary Floyd personally tested a Morse rifle at the Washington Arsenal on December 9, 1857. The Washington Union newspaper from Washington, D.C., reported, *"The Secretary of War used one with great effect, hitting a mark at eight hundred and fifty yards' distance...."*¹⁴ Finally, on March 5, 1858, Floyd directed the purchase of 100 carbines from Morse, to be manufactured by Muzzy & Co.¹⁵; these would never be delivered.

Meanwhile, in late 1857, Morse had begun developing a method of simplifying his breechloader design for use in converting muzzle-loading muskets. He once again lobbied Sec. Floyd, writing on November 12, to remind him of Maj. Bell's previous positive test report and ending with, *"Now sir, I only await your leisure, and from your known knowledge of firearms confidently expect to prove to you the truth of my assertion that mine is the best gun in the world."*¹⁶ Consequently, on December 9, Secretary Floyd issued the following direction to the Chief of Ordnance:

*"The colonel of ordnance will direct Maj. William H. Bell to have a gun made at the Washington Arsenal upon the plan of Mr. Morse's gun after either of the patents which have been exhibited, or a combination of them, the work to be executed under the supervision of Mr. Morse himself, if he chooses."*¹⁷

Note Secretary Floyd's use of the words *"...or a combination of them..."* which would turn out to be prophetic. Then five days later he countermanded this directive, changing it to order the construction of four new guns that merely used barrels provided from the U.S. armories.¹⁷ In the end, Morse was unable to make a functioning arm and he returned the barrels.

The Chief of Ordnance, Colonel H.K. Craig reported that Secretary Floyd's intent was that,

*"This application [of Morse's design] was to be made with the least possible change or expense in the arms, the object of the Secretary in the experiment being both efficiency and economy — efficiency in producing a more perfect arm than had yet been made, and economy in avoiding the contemplated sales of the old arms, necessarily at great sacrifice."*¹⁵

Thus, on February 20, and March 13, 1858, Sec. Floyd further ordered the Washington Arsenal to alter two .69 caliber muskets

and one .54 caliber rifle: a Model 1842 Rifled Musket, a Model 1816 percussion smoothbore musket and a Model 1841 Rifle.¹⁸ On May 12, Maj. Bell forwarded a detailed report of the alteration work⁹ which clearly shows the design (Figure 4) is that described in Morse's later patent 20,503, which was then in the process of being approved; the issue date would be June 8, 1858.¹⁹ The corresponding British patent number 1164 was dated May 25, 1858²⁰ (Figure 4). Maj. Bell's report described the breechloading system as being a "breech-pin and lid" and estimated the conversion would cost from \$2.50 to \$3.50 per arm. He also said a fourth .69 caliber smoothbore musket was in work, specially designed for the use of round balls or buckshot (Figures 6, 7).⁹ The Washington Arsenal spent a total of \$1,253.92 (\$39,592 today) to alter these four arms.²¹



Figure 4. Patent model for Morse's second design, U.S. patent number 20,503. The breech-pin and lid design and the under-stock extractor are clearly shown. (Wray Collection, Atlanta History Center)

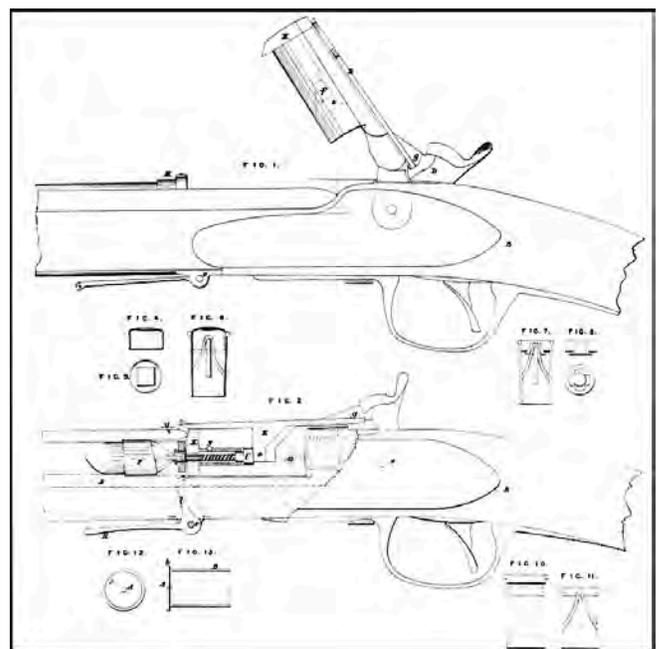


Figure 5. Drawing of Morse's second-type breechloader design, from British patent number 1164, dated May 25, 1858. (from English Patents of Inventions, Specifications: 1858)

With his directives of December, 1857 and February/March, 1858, Secretary Floyd had set in motion the production of the

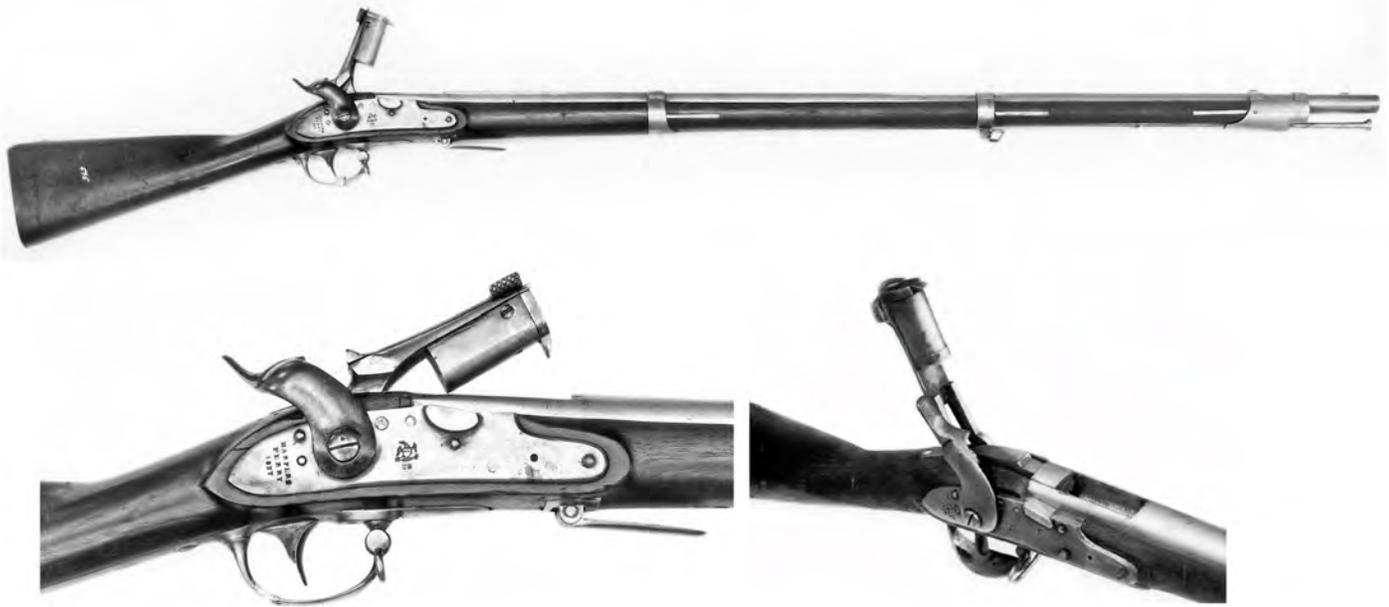


Figure 6. This Morse alteration musket is one of two Model 1816/22 muskets made at the Washington Arsenal in 1859, on the breech-pin and lid design of patent 20,503. Its smoothbore .69 caliber barrel/breech system is 42 inches long, while the in-the-bore length is 39 inches. Labeled “No. 2” on a plaque on the buttstock, it is probably the last musket made, designed for the use of round balls or buckshot cartridges. (SPAR 4706, Springfield Armory National Historic Site, photo by H.M. Madaus)



Figure 7. Another of the two Model 1816/22 muskets made on the breech-pin and lid design of patent 20,503. Its smoothbore .69 caliber barrel/breech system is 42 inches long. It is the first Model 1816/22 musket altered by the Washington Arsenal in 1859. The under-stock extractor lever is missing. The forestock shows evidence of charring from the fire at the Springfield Armory in October, 1931. (SPAR 4704, Springfield Armory National Historic Site, photo by H.M. Madaus)

Morse breechloading musket alteration design being discussed here. Secretary Floyd also began lobbying Congress to appropriate funds in the amount of \$100,000 to convert arms to breechloaders; ultimately, only \$20,000 was approved on June, 12, 1858.¹¹ The appropriation law stipulated that the funds were “*For the alteration of old arms so as to make them breech-loading arms, upon a model to be selected and approved by a board of ordnance officers.*”²² Secretary Floyd immediately convened an ordnance board to fulfill that requirement.

Secretary Floyd actually convened two ordnance boards: one to consider once again the best carbine design for cavalry and another to consider the best mode of converting muskets into breechloaders. Both boards met concurrently at West Point that summer. The carbine board first met on July 13 and completed its report on July 31. Morse submitted to this board a .54 caliber carbine of his sliding-breech design (patent 15,995) having a 22 inch barrel. It functioned well, though its accuracy of firing was mediocre. At the end the board members again preferred the Burnside as “*the least objectionable for use in the hands of mounted troops.*”²³

The second ordnance board of 1858 began its deliberations on July 22. On Morse’s behalf the Ordnance Office submitted three of the arms fabricated at the Washington Arsenal earlier in the year.

In describing his arms to the board, Morse emphasized that they used his unique primed metallic cartridge. Of the other muskets submitted (including the Joslyn, Merrill, Mont Storm and Sharps percussion arms) only the Maynard also used a metallic cartridge, and it was separately primed. While the ordnance board’s testing was inconclusive as to the “best” arm for infantry, Morse’s cartridge intrigued the members and resulted in this recommendation on August 3:

*“The Board select Morse’s model, inasmuch as it differs from the others by including the new and untried principle of a primed, metallic cartridge, which may, on actual trial, be found of advantage; and the recommend that the appropriation...be applied to the alteration of old U.S. arms to breech-loading arms upon Morse’s model, with certain modifications suggested by him.”*²⁴

Morse followed this positive report with an offer to Secretary Floyd on September 9, to contract with the government “*to alter 2,500 old arms in any Government armories on my plans for the sum of \$5 each, or for the sum of \$12,500.*”²² Secretary Floyd accepted Morse’s offer to the extent of 2,000 alterations, with the wording of the September 13, 1858, contract reading, “*In consideration of the sum of \$10,000 [nearly \$316,000 today], I hereby*

grant, sell and convey to the United States the right and privilege to alter 2,000...muskets."²⁴ This was a sweetheart deal, since most patentees were satisfied with a royalty of a dollar or less per arm. Also, Secretary Floyd omitted mention of the per arm price of \$5; consequently Morse was allowed to keep all the royalty no matter how many guns were produced - a factor that would later work against the adoption of his design.

On September 11, Secretary Floyd gave the Chief of Ordnance, Colonel H.K. Craig, the following direction:

*"Let Mr. Morse have an order for three United States flint-lock muskets of the latest model and for three United States percussion rifles seven grooves to alter after his plan for patterns. When these patterns are ready, let an order be given for the alteration according to the pattern arms of 2,000 muskets of the same model at either United States armory as he may designate... The arms so altered to be rifled and sighted at the armory, and Mr. Morse to have the privilege of superintending the process of alteration, and to be required to state that the work is done in a satisfactory manner to him before the altered arms are issued for trial."*²⁴

Morse accepted the contract on September 13.²⁵ For some reason, this direction was changed to specify the alteration of two muskets and four rifles, as the following documentation shows. But first, Morse had Muzzy & Co. fabricate a new model alteration of the same configuration as tested by the 1858 Ordnance Board - the second patent type. Morse obtained the tooling that the Washington Arsenal had used in fabricating this type and had it shipped to Worcester. By November 4, Muzzy had completed this new model arm and Morse selected the Springfield Armory as the location where he would undertake the conversion work.²⁵

The new model of musket differed slightly from that approved by the 1858 Ordnance Board by including a different ejection lever (Figure 8). Consequently, Col. Craig had two of the original board members - Captains George Ramsay and William Mayna-

dier - review the changes. Their report of November 5 approved of the changes, saying that "...the modified arm...comes within the recommendation of the Board at West Point..."²⁶

However, they went even further, recommending cart blanche be given Morse and the Springfield Armory mechanics to make almost any modifications:

*"The undersigned would further remark, that if in undertaking the work of alteration at the Springfield Armory it should be found by the experienced practical armorers there, that any changes can be made win the details hereby the economy of manufacture, or the efficiency, simplicity or durability of any of the parts may be improved, without affecting the principle of the model, such changes, made with the concurrence of the inventor and patentee, would, in their opinion, be in accordance with the views and recommendation of the West Point Board..."*²⁶

Production of Model 1822 Musket Alterations

With the model musket in hand, beginning in mid-November, 1858, the Springfield Armory was directed to undertake the alteration work with Morse providing direct oversight. By February, 1859, Superintendent J.A. Whitney at the armory reported that preparations for manufacture and tooling had progressed to the extent of \$671.56 (out of a total of \$4,200 allotted by Secretary Floyd from the congressional appropriation).²² To begin the alteration work, the armory had withdrawn 1,000 percussion Model 1822 muskets from storage.²⁷

The work did not go forward quickly; Morse would make several changes to his design along the way which delayed completion and consumed time and funds. The primary change was the combination of Morse's two patented designs into a single system: the design embodied in the model arm made by C.H. Munck described below. The sliding breechblock design of patent 15,995 was combined with the "breech-pin and lid" design of patent 20,503 to produce the design seen in Figures 2 and 10; Morse never obtained a separate patent covering the combined designs.

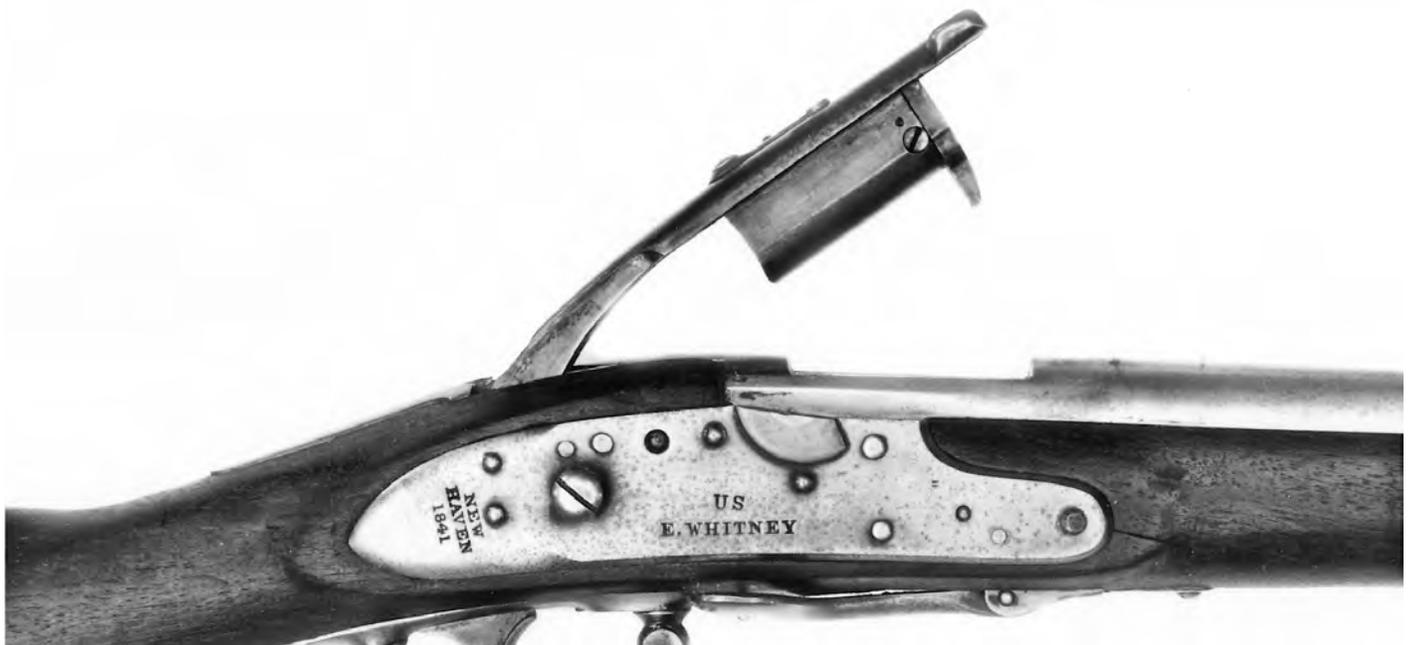


Figure 8. This is the model musket of the breech-pin and lid design that Morse had made at Muzzy & Co. and delivered to the Springfield Armory in November, 1858. This model has an extractor lever that differs from those shown in Figures 7 and 8, in that the extractor lever extends rearward. (SPAR 4703, Springfield Armory National Historic Site, photo by H.M. Madaus)



Figure 9. The .69 caliber musketoon made by C.H. Munck shows the sliding breech design which Morse finally developed, combining both of his patents. It is an E. Whitney Model 1822 musket dated 1841; its total length is 41½ inches and the barrel is 231/16 inches long in-the-bore. (SPAR 4709, Springfield Army National Historic Site, Photo by H.M. Madaus)



In later court testimony, Morse recalled that he had a gunsmith named “Munk” (i.e. probably C.H. Munck of Washington, D.C.) make a new model arm, described as having a “*head-block to be moved longitudinally in the cartridge [slot in the barrel] which should force the cartridge all the way into the chamber and retract it whole out of the chamber.*”²⁸ By this final design Morse’s two original patents were combined with an extractor unlike that shown in either patent. On February 7, Morse sent this new model (an example of which is in Figure 9) to the Springfield Armory. There is no record of Morse attempting to obtain any new patent on this final design; he likely determined that the two original patents sufficiently covered the essential features of his new design.²⁹

Two months later the Springfield Armory completed the first two Morse muskets (Figure 10), sending both of them to the Ordnance

Office on April 22.³⁰ By now it was becoming obvious that the expenditures at the armory would far exceed the budget of \$4,200. On April 26, the Col. Craig informed Secretary Floyd that the funding allotted was insufficient for altering all 2,000 muskets.²⁹ As a result, on May 6, Secretary Floyd directed that the number of arms to be altered be reduced to correspond with the means [i.e. funding], available for the alteration, thus limiting Morse to only 600 arms to be altered at Springfield.³¹ Col. Craig enlarged upon this direction to the armory: “*Care should be taken to apply the available means so as to make all the altered arms complete [sic], and leave none, or as few as possible, in an unfinished state.*”³² However, as later reported, work had already been initiated to some extent on all 600 muskets. The armory returned 400 of the original 1,000 muskets to storage.²⁷



Figure 10. This Morse alteration musket is stamped “1” on the major breech parts. It is likely one of the first two sliding breech models made, and the one returned to the Springfield Armory in May, 1859, for use as the official model. It is smoothbore and lacks a rear sight. Note the smooth contour of the finger latch “ears” on the breech latch/firing pin; production muskets had this part knurled. (Courtesy Heritage Auctions)



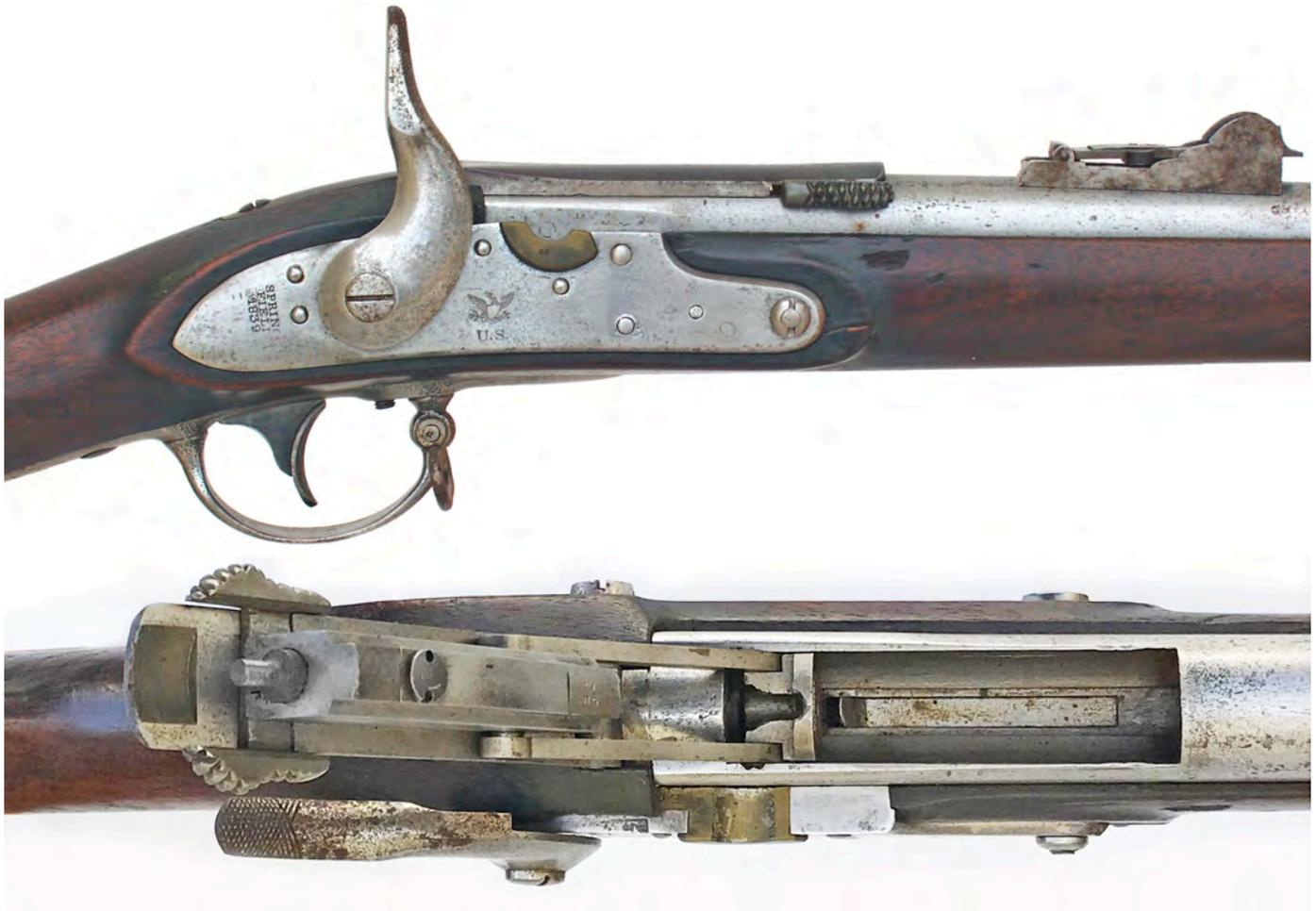


Figure 11. Close-up photographs of the open breech of the .69 caliber musket of Figure 2. The top photo shows the lockplate forward through-bolt which is held by an external nut — typical of all production muskets. The lower photograph shows the extractor lever at the base of the slot. (Author's collection and photo)

On May 17, 1859, Supt. Whitney at Springfield Armory asked to have one of the two altered muskets approved as the official model arm:

*"I have the honor to request that one of the altered muskets of the Model of 1822, which were sent to Washington for approval, be returned to the Armory, that we may use the same as a model in proceeding with the alterations of the number of muskets we are to altering conformity with such a model."*³³

By the end of June, 1859, the armory had completed only six Morse alterations (two muskets of .69 caliber and four Model 1841 Rifles); the Ordnance Office reported that by June 30, "698 Morse breech-loaders [were] in progress" (the number 698 versus the 600 authorized is unexplained).³⁴ Yet Morse was still modifying the arm's design: on June 24, he wrote to Secretary Floyd saying, "The arms which have been altered in accordance with my plans work well, but still some slight modifications are necessary for their perfection."³⁵ Then on July 6, he asked that the design be changed again.³⁵ The details of the changes are not known, but this may be when the forward lock screw was replaced by a bolt, having a thinner diameter shank, that extended through the lock plate and was held on with an external nut (Figure 11). This thin bolt likely left more clearance for the extractor mechanism under the barrel. The complexity of the final Morse design is shown in Figures 11 and 12.

Only a few Morse alterations were completed: on November 12, Supt. Whitney reported that all \$4,200 authorized had been ex-

pendent in completing 60 Morse arms (54 muskets), that 540 were in various stages of completion, and that he estimated that a further \$4 per arm was required to complete them. But there was no further funding authorized.³⁷

Nevertheless, the Ordnance Office made preparations to issue the arms. On November 29, Morse wrote to suggest that the muskets now be rifled and then sent to the Washington Arsenal, and Col. Craig concurred.³⁸ One would be sent to Muzzy & Co. as a model for the preparation of 12,000 cartridge cases (it was the plan of the Ordnance Office that the Washington Arsenal fabricate the finished cartridges). That musket was shipped to Worcester on January 10; the remaining 53 muskets were shipped to the Washington Arsenal on January 17, to be rifled and receive sights there.²⁷

Meanwhile, in February, 1860, the Ordnance Office had convened yet another ordnance board at the Washington Arsenal to evaluate new breechloading carbine designs. This board also evaluated two of Morse's altered muskets, both .69 caliber: a smoothbore (for round ball) and a rifled musket (for elongated ball). The board's report was less complimentary than those of previous boards, calling the mechanism too complicated; but the report was complimentary of the cartridge design.³⁹

Finally, by April 9, 1860, the 53 Morse muskets were ready at the Washington Arsenal, having been rifled and having had the chamber modified for Morse's latest cartridge design. But there were no cartridges: the first delivery on the original order for

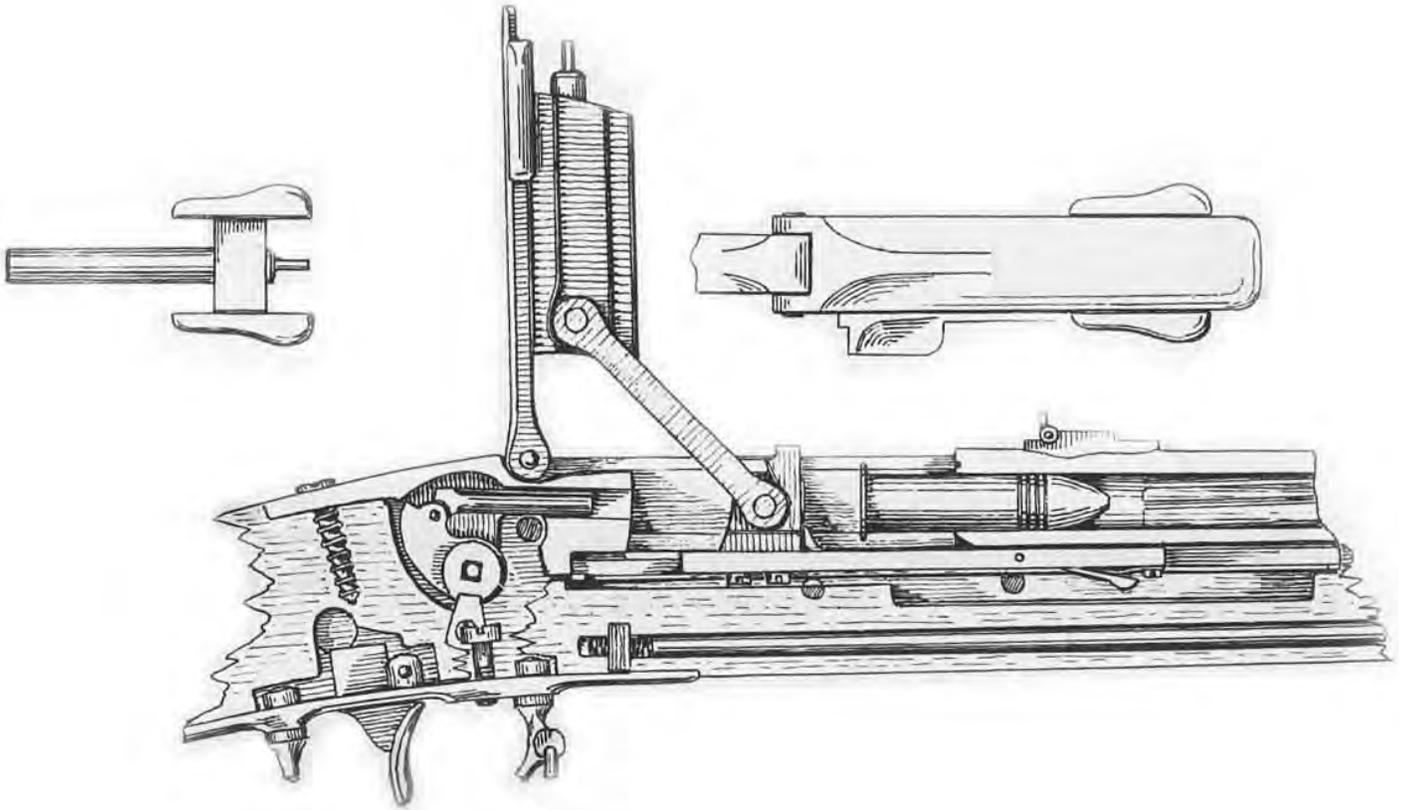


Figure 12. Drawing showing the complexity of the Morse mechanism as fully developed. Fabricating the breechblock and latch/firing pin must have been complex and costly.³⁶

12,000 cartridge cases was not ready until September.⁴⁰ So there the muskets sat, not to be issued and all but forgotten as the impending Civil War captured all attention. In an auction of surplus arms by the Ordnance Office in 1873, the Washington Arsenal listed for sale “47 muskets altered to Morse’s plan, cal. .69” for sale.⁴¹ Presumably, the remaining six muskets had been transferred to the Ordnance Office for other uses.

The entire project at the Springfield Armory produced only 60 completed arms using the Congressional appropriation for converting muskets to breechloaders: two .69 caliber models, 54 Model 1822 .69 caliber muskets and four Model 1841 Rifles. (As noted below, an additional four M1841 Rifles were altered using other funds.) To achieve this effort, a total of \$4,200 (over \$131,000 today) was expended from the Congressional appropriation. With the royalty paid Morse per the contract noted previously, the total expenditure was \$14,200 (over \$443,000 today or nearly \$7300 per musket).²² There were 540 muskets left in the process of alteration and, as noted previously, the cost to complete them was estimated at a further \$4.00 per arm (\$2,160 or \$67,429 today). Had the contract with Morse been written as he originally suggested - giving a royalty of \$5 per arm - the armory could have completed at least 600 alterations: Morse would have received only \$3000, leaving a budget of \$11,200 for the alteration work instead of only \$4,200.

But the foregoing story only tells the tale of the musket alterations. Secretary Floyd, ever optimistic about the utility of Morse’s inventions, found another source of funding for continuing the alteration work.

Morse Model 1841 Rifle Alterations

The Model 1841 Rifles made into Morse Patent breechloaders are far more rare than the scarce Model 1822 version: only nine

were made. However, both Morse and Secretary Floyd started the effort with much higher hopes.

As previously noted, the Washington Arsenal had altered one .54 caliber Model 1841 Rifle to Morse breechloader under Sec. Floyd’s order of March 13, 1858. This rifle certainly matched the design of the other .69 caliber musket alterations done at the Washington Arsenal: the breech-pin and lid design of the second patent (Figure 5). This rifle was not located during the course of this study.

When Secretary Floyd ordered the start of Morse alteration work at the Springfield Armory he originally directed that three .54 caliber Model 1841 Rifles be included in the work.²⁴ That order was at some point changed: when armory Supt. Whitney requested on May 17, 1859, that the Ordnance Office return an altered .69 caliber musket as the official model arm, his letter also noted, “... the remaining four Harpers Ferry rifles, altered to Morse Patent breech loader, are nearly complete...”⁴² On May 25, these four rifles were shipped to the Harpers Ferry Armory. The report of the Chief of Ordnance for the year ending June 30, 1859, shows the armory had completed only “6 arms altered to Morse breechloader,” two muskets of .69 caliber and four Model 1841 Rifles.³⁴

These four rifles were of an early pattern side-breech alteration that did not exactly match the design of the Morse alteration muskets put into production a few weeks later; most notable is the use of the original front lock screw rather than the later through-bolt (Figure 13).

Nov. 28, 1859, Morse requested that sword bayonets be added to the rifles, at Washington Arsenal and Secretary Floyd concurred.³⁸ The rifle in Figure 13 exhibits this bayonet stud. Then on December 7, Secretary Floyd directed Col. Craig:

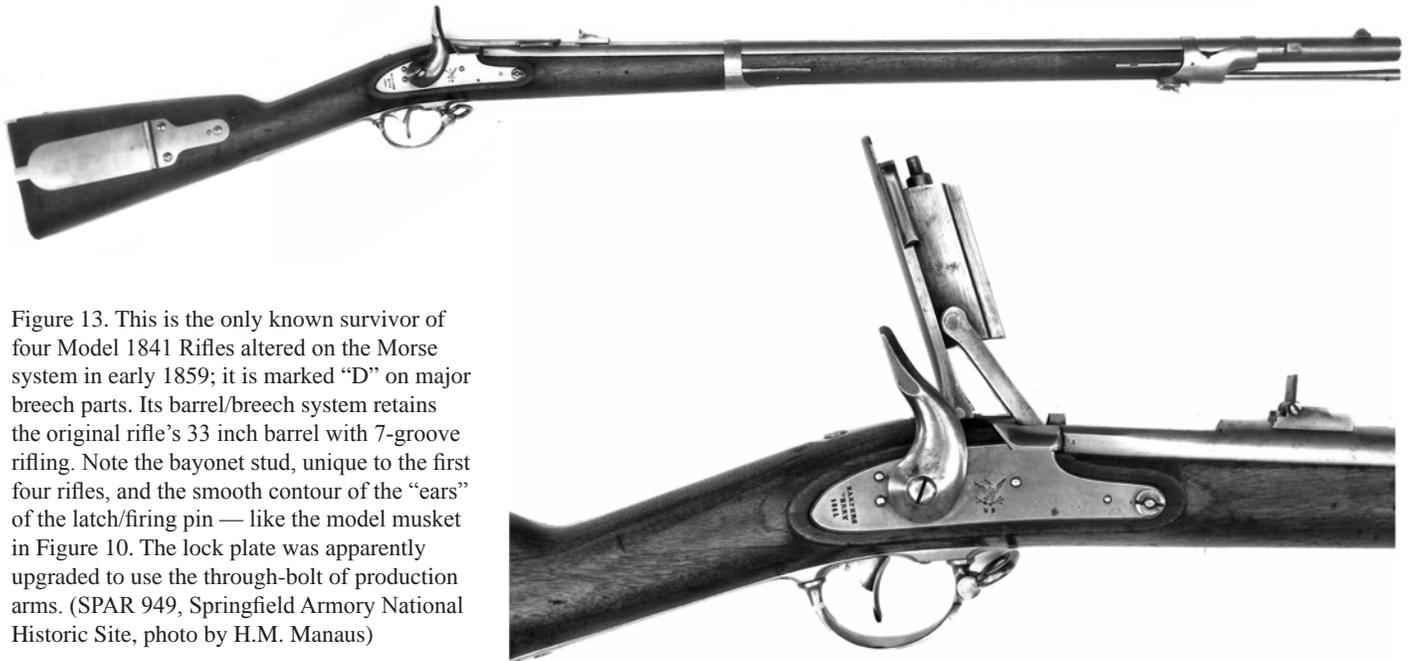


Figure 13. This is the only known survivor of four Model 1841 Rifles altered on the Morse system in early 1859; it is marked “D” on major breech parts. Its barrel/breech system retains the original rifle’s 33 inch barrel with 7-groove rifling. Note the bayonet stud, unique to the first four rifles, and the smooth contour of the “ears” of the latch/firing pin — like the model musket in Figure 10. The lock plate was apparently upgraded to use the through-bolt of production arms. (SPAR 949, Springfield Armory National Historic Site, photo by H.M. Manaus)

“You will please cause...the four rifles with sword bayonets which were altered at Springfield Armory to Morse’s plan and are now at the Washington Arsenal, to be properly boxed and sent to Mr. Morse, together with the wad cutters, wads, moulds, and cartridge cases belonging to the guns. These guns are to be delivered for experimental purposes to Mr. Morse who will be permitted to obtain from the Arsenal on payment for therefore, the necessary powder and balls for filling the cartridge cases. The arms and appendages are to be returned to the Arsenal when called for.”⁴³

It is clear from this letter that Secretary Floyd intended to enable Morse to continue developing his rifles. Only one of these four rifles was ever “called for” by the Springfield Armory (Figure 13). This rifle is marked “D” on its major parts (a remaining example of subsequent production is lettered “E”). What Morse did with the other three original Model 1841 Rifle alterations is unknown.

By the end of 1859, the Congressional appropriation funding the Morse musket alteration work had been expended. Secretary Floyd was unable to get an increase in the appropriation because Senator Jefferson Davis (the former Secretary of War) was blocking the purchase of expensive breechloaders for general infantry issue. Using a different approach, Secretary Floyd turned to the appropriation for the War Department for “Arming and Equipping the Militia” — he would get one of the states to requisition Morse conversion arms.

To start this new effort Secretary Floyd directed the Ordnance Office to fabricate more Morse alteration Model 1841 rifles; likely he recognized that the previous four rifles were of an earlier pattern and thus, not suitable for use as models to show to the various states’ ordnance officers. On February 28, 1860, Secretary Floyd wrote to the Chief of Ordnance directing the manufacture of four .54 caliber Harper’s Ferry rifles on Morse’s alteration plan, along with 200 cartridges per arm for testing the altered rifles.⁴⁴

On March 1, Col. Craig gave the fabrication order to the Springfield Armory. However, the Armory had no such rifles on hand, with Master Armorer E.S. Allin writing on March 5:

“I have also to reply to your letter of the 1st inst. relative to the manufacture and alteration of arms, according to the ‘Morse’ plan. This order designated four Harpers Ferry Rifles of .54 inch caliber, to be altered, of which we have none on hand. I have to request that you will give the Superintendent of Harpers Ferry Armory an order to forward the above number to this Armory for that purpose.”²⁷

Col. Craig then ordered the needed rifles sent from Harpers Ferry and the work at Springfield commenced. Allin also wrote to Morse on March 6, requesting the return of one of the original four rifles made in early 1859 for use as a model.⁴⁵ This rifle (Figure 13) with its saber stud intact remains at the Springfield Armory Museum (catalog number SPAR 949).

Springfield completed three of the four rifles ordered by June 30, 1860; an official 1878 synopsis of Morse alteration work lists only three rifles made in the fiscal year ending June 30, 1860.²⁷ The report of the Chief of Ordnance for the fiscal year ending June 30, 1860, merely mentions the completion of “8 sample arms” in addition to the Morse alteration muskets.⁴⁶ The fourth rifle was completed by September, in the next fiscal year and was subsequently sent to Harpers Ferry; two remained at the Springfield Armory (along with the earlier 1859 model rifle) until 1877, according to the 1878 inventory.²⁷ Today, one of these rifles is in private hands; a second is at the Atlanta History Center (Figure 14).

After the first of the new rifles had been completed, on July 5, Secretary Floyd directed Col. Craig:

“With a view to altering rifles to Morse’s plan at the Harpers Ferry Armory, you are requested to have sent to that armory from Springfield one of the last models of altered rifles, with its appendages, together with all of the tools which have been made at Springfield...also the drawings, or copies of them, by which the work has been done....”⁴⁷

All the above items were shipped on July 16, and received at Harpers Ferry on July 19.⁴⁸



Figure 14. This is one of the four Model 1841 Rifles altered on the Morse system in 1860, and is one of two known survivors. Its .54 caliber barrel/breech system retains the original rifle's 33 inch barrel with 7-groove rifling. The barrel lacks a bayonet stud and has a long range rear sight. Note the through-bolt — the same configuration as on the production model musket in Figure 12. A Morse cartridge, made from a copper tube with a base plug of various materials, is shown in the chamber. (courtesy Atlanta History Center, George Wray collection)

Meanwhile, on July 13, Secretary Floyd separately directed the Harpers Ferry Armory "...to alter Harper's Ferry rifles of the .54-inch caliber to Morse's plan, and to go on with the alteration according to the Springfield model to the extent for which the right has been obtained."⁴⁷ On July 25, Col. Craig clarified that direction to say the number was limited to 2,000 - the number agreed to in the original 1858 contract with Morse.⁴⁹ Completing that many required more rifles than the 99 rifles Harpers Ferry had on hand, so an additional 300 were sent there from the New York Arsenal on August 9.⁴⁹ Thus, the initial number of alterations was to be limited to 399 rifles.

Concurrently, Secretary Floyd offered Morse Model 1841 rifles to the State of Texas. By a July 13, letter to Texas' Senator L.T. Wigfall, Secretary Floyd offered to provide either 237 Morse alteration rifles for free as the state's quota of arms for the militia for the years 1860 and 1861, or 341 rifles for the year 1860 quota but pay \$4.00 per rifle for their alteration.⁵⁰ Texas Governor Sam Houston replied on July 28, that the state would prefer to have their Whitney Model 1841 rifles altered. Col. Craig endorsed that letter on August 24, with an estimate of the costs:

"...we estimate that the most of altering rifles of Whitney's manufacture at \$4.14 per piece. The State of Texas will be entitled to 268 rifles, including the quota of 1861.

"In addition to the cost of the work included in the above estimate there will be an expenditure of about \$2000 for new tools, etc., for this particular purpose, which if not used in work on more than the guns now in hand, will prove a dead loss to the Armory."⁵¹

Thus, Col. Craig was informing Secretary Floyd of the cost of tooling for the alteration of the 399 rifles then in work.

Texas' interest was lukewarm, with a further inquiry not coming from the state until October 23.⁵⁰ In the end, no arrangement was ever completed. No other state showed an interest in such rifles. Nevertheless, on September 18, the Harpers Ferry Armory master armourer, A.M. Ball, reported that *"The tools are advancing steadily, and I feel that we will be able to turn out a very superior lot of arms during the winter."⁴⁹*

In a final act of support for Morse's invention, on December 27, 1860, Secretary Floyd directed *"the alteration of the rifles at Harper's Ferry Armory to Morse's plan...be carried on with all possible dispatch, and 1,000 of them be finished as soon as possible...and sent [with cartridges] to the United States Arsenal at San Antonio, Texas."⁵²*

Secretary Floyd resigned from office on Dec. 29, as his loyalty was with the southern states, not with the new president, Abraham Lincoln. In May, 1861, he was appointed a brigadier general in the Confederate States Army. Morse followed Secretary Floyd south, leaving Washington on April 11, 1861, to return to Louisiana.

Any completed rifles at Harpers Ferry were likely destroyed when, on April 18, 1861, the armory's storage buildings were burned to prevent their capture at the start of the Civil War. Any in-process examples in the Rifle Factory were probably scavenged for parts as the Confederate forces removed all of the inventory and machinery after that raid.

After the Civil War, Morse would make claims against the Ordnance Department and pursue lawsuits through the Federal courts claiming his breechloading design and his centerfire cartridge patents were the predecessors of all subsequent designs. His various lawsuits dragged on until the 1890s - all to no avail.

PART II

Derivative Designs

In Part II of this story we discuss three other American "reverse trapdoor" designs of the post-Civil War era, all seemingly derivatives of Morse's design.

In the aftermath of the Civil War, the U.S. Ordnance Department held in its arsenals hundreds of thousands of muzzle-loading muskets that the war had proven were now obsolete. As with the end of most wars, there was little enthusiasm to spend more money on arms. To provide American soldiers — both federal and state — with modern weapons on-the-cheap, the course of action followed was to adopt designs for converting these existing arms into

breechloaders. Three "reverse trapdoor" designs resulted from inventors' efforts to fabricate the perfect conversion system.

Wilson & Flather Conversion

The first of these post-war breechloader conversions was the brainchild of William Wilson and Henry Flather. They took advantage of George Morse's failure to patent the details of his final "sliding breech" design; they developed a more compact system especially adapted to rimfire cartridges.

William F. Wilson was very experienced in the arms-making business. Born in Birmingham, England on October 4, 1815, he immigrated to the U.S.A. Here he is recorded as working on gunlocks at Harpers Ferry Armory as early as 1835. By 1852, he had risen in his expertise to arms inspector. By 1859, he was employed as a foreman in the rifle factory. A Union man, his efforts to secure the factory at the outbreak of the Civil War earned him the enmity of the local Virginians and he fled to Washington. There he was briefly employed at the Washington Navy Yard, but then moved to Philadelphia, Pa. In late 1861, he was one of the two inspectors detailed to the factory of P.S. Justice to inspect the quality of his muskets after complaints from the field of faulty arms. Wilson then found employment as the superintendent of the new armory of Alfred Jenks & Son at Bridesburg, on the Delaware River northeast of Philadelphia. It was while at Jenks' armory that he met fellow Englishman Henry Flather. He returned to Harpers Ferry, now in West Virginia, in late 1865, serving there as postmaster from January, 1866, until late 1868. In the 1870s he moved to nearby Martinsburg, where the 1880 census finds him listed as a "machinist." He died on April 27, 1899.^{53, 54}

Little is known about Henry Flather. He was born February 14, 1835, in Bradford, England. In 1860, he was living in New York

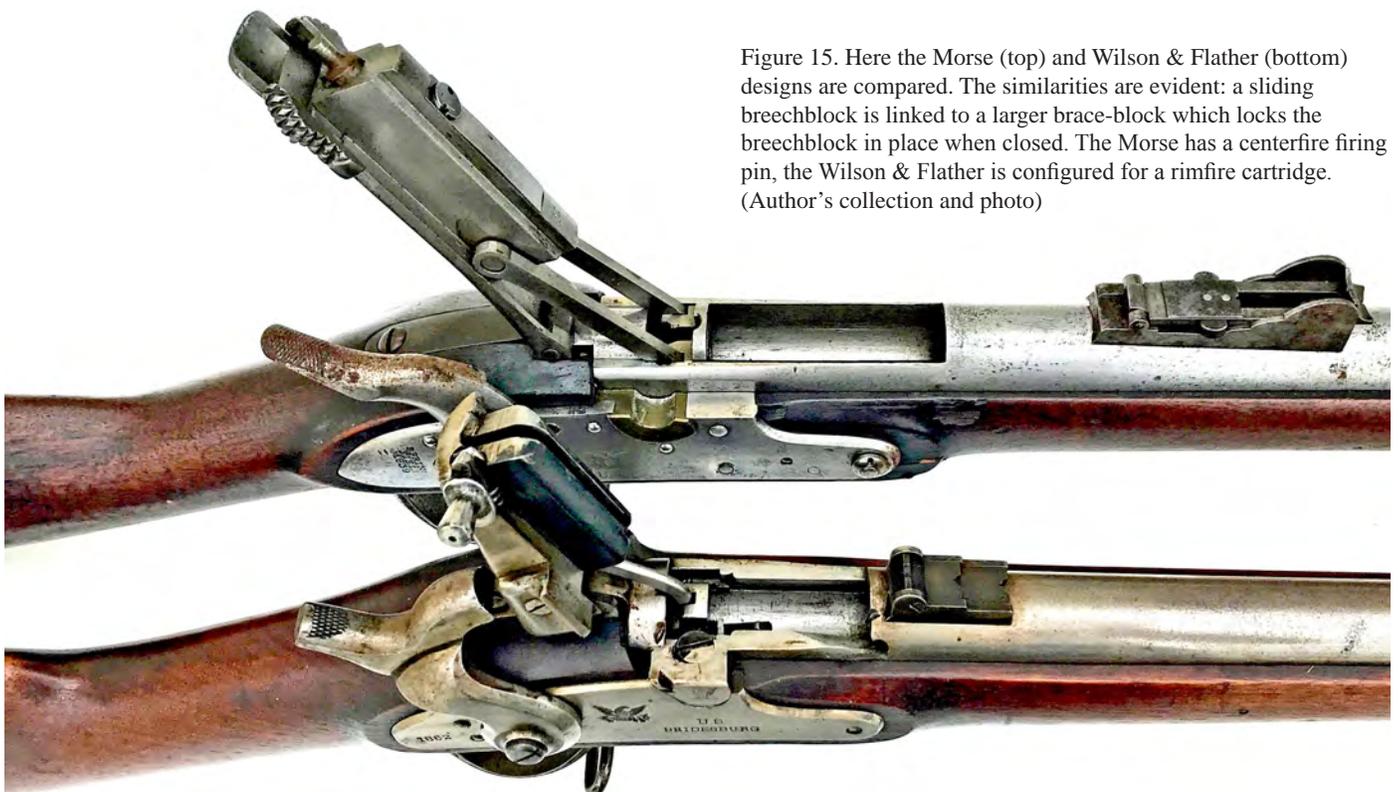


Figure 15. Here the Morse (top) and Wilson & Flather (bottom) designs are compared. The similarities are evident: a sliding breechblock is linked to a larger brace-block which locks the breechblock in place when closed. The Morse has a centerfire firing pin, the Wilson & Flather is configured for a rimfire cartridge. (Author's collection and photo)

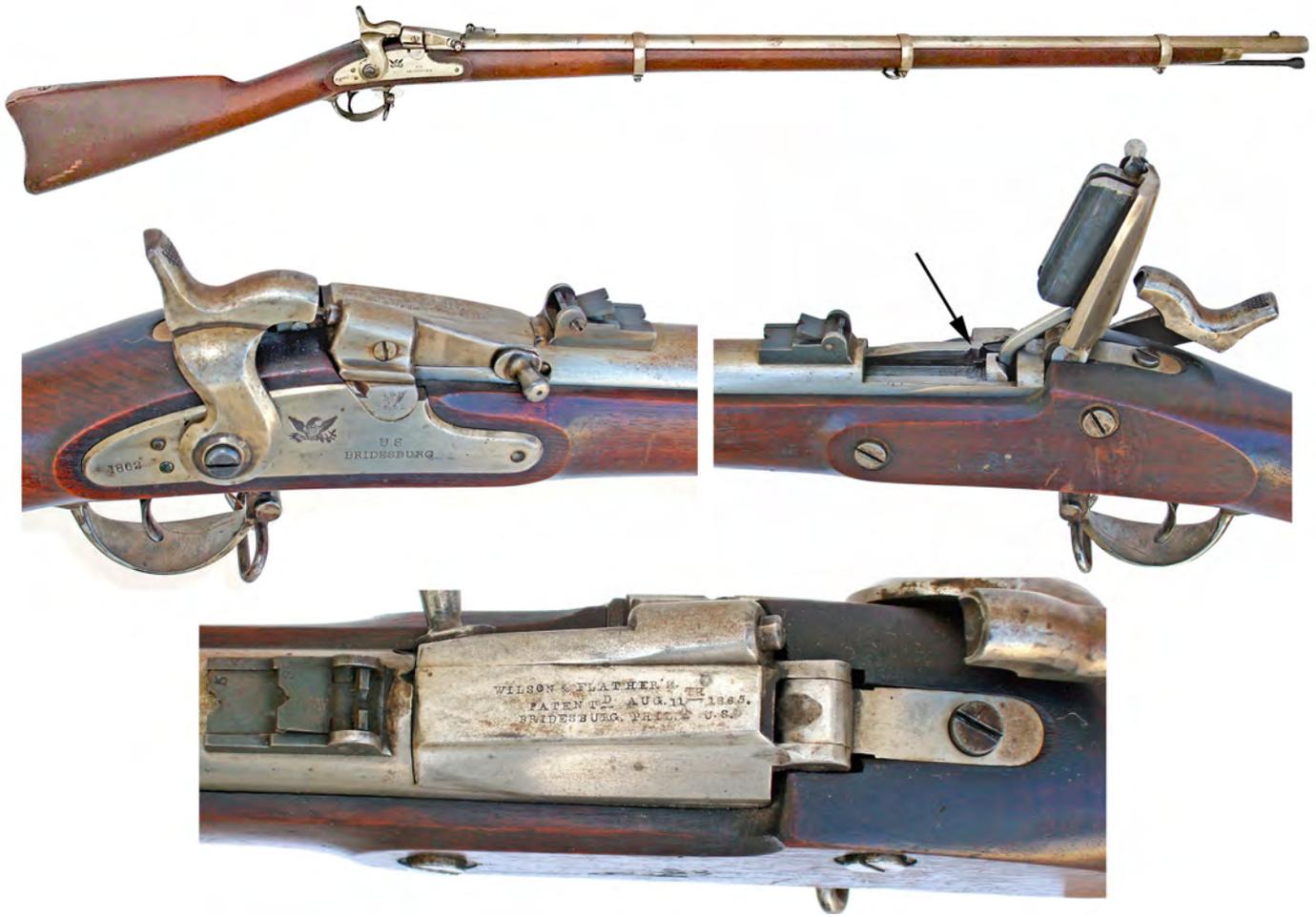


Figure 17. This example of the Wilson & Flather conversion, one of two known, has a barrel/breech system in the original musket's length of 40 inches; the in-the-bore length is 37½ inches. The channel cut into the barrel top to receive the cartridge is only 0.60 inch wide, necessitating a cutout for the wider rim of a cartridge (arrow). The .58 rimfire cartridge that was used has not been identified, but it is shorter than the .58 Allin. That this example is made from a Jenks' Armory "BRIDESBURG" Model 1863 rifle musket that lacks any inspectors' markings is evidence of its fabrication there. The letters of the three-line patent marking on the breechblock are individually stamped. (Author's collection and photos)

block. As the cartridge was extracted fully, a nub at the bottom of the chamber (not shown in the patent drawing) rose to nudge the cartridge upwards. The shooter either plucked the case from the open breech or turned the musket over to allow the case to fall free.

The Ordnance Board likely offered Wilson the opportunity to fix the problem with the cartridges, as several other competitors were allowed to do, but he did not avail himself of that option. Thus, on April 20, the board's report the gun was "by vote of the board set aside."⁶¹

With this failure to interest the Ordnance Department in their design, and perhaps seeing that other inventors had more efficient systems, Wilson and Flather discontinued their marketing efforts. Most notably, no such musket was presented to an 1867 ordnance board of the State of New York, which held extensive trials of conversion systems, essentially duplicating the work of the Hancock Board. Both inventors went on their separate ways for their future careers.

One other example of the Wilson & Flather conversion musket was made. The breech parts are nearly, but not exactly, the same configuration as the musket of Figure 17. The fact that the original musket was made by "Parker's Snow & Co." of Meriden, Conn., may indicate the Wilson & Flather considered pursuing their design in Meriden, after leaving the Jenks Armory. This musket ended up in the collections of the War Department (Figure 18) and was exhib-

ited at the 1876 Centennial Exhibition in Philadelphia. The exhibit's catalog described the musket as follows:

"Wilson & Flather, Bridesburg, alteration of muzzle loading rifle musket; caliber .58. Essentially the same in principle as the Morse. The cartridge is rim-fire, fired by side lock; the parts not so well proportioned as in the Morse, and the breech not so securely locked as in that arm. This arm is provided with an automatic ejector, rising from the bottom of the receiver, to throw out the cartridge after it has been withdrawn by the extractor."⁶²

This same musket was displayed at the Centennial Exhibition of 1888, in Cincinnati; the exhibit catalog lists the musket as "Morse's System, 1858; Wilson and Flather's Alteration."⁶³ The catalog description of the design was the same as in 1876. The description does not give us any further history on this unusual "reverse trapdoor" conversion design.

Hubbell 1867 Conversion Musket

A second post-war conversion system came from a famous ordnance designer, but the story of his conversion musket is as brief as that of the Wilson and Flather design. His name is William W. Hubbell.

Figure 18. This image, from photographs of the collection of arms displayed at the Centennial Exhibition held in Cincinnati, Ohio, was made in 1883. Note the several minor differences in the contours of the breechblock compared to Figure 17. This example now resides in the Springfield Armory Museum collection. (courtesy the Smithsonian Institution)



William Wheeler Hubbell (Figure 19) was as distinguished a man of letters as was his contemporary, Dr. Edward Maynard. While Maynard was a firearms inventor and renowned dentist, Hubbell was an ordnance inventor and renowned attorney. He was born March 4, 1821, in a suburb of Philadelphia, was educated at academies in that city and studied law with his uncle. He was admitted to the bar in 1845, and had great success as a patent attorney in the U.S. Circuit Courts. In 1850, he was admitted as an attorney to practice before the U.S. Supreme Court. His successful handling of

several momentous cases earned him both renown and remuneration. Hubbell was also an innovator, inventing fuses for detonating explosive cannon shells, which also earned him financial rewards. After a long and illustrious career, he died November 6, 1902.⁶⁴

Of interest to this story, he also designed two breechloading firearms. The first featured a side-swinging breechblock much like a later design of Maynard's and, much later, that of Jacob Snider (Figure 20). He obtained a patent on this design, number 3,649 of July 1, 1844 (Figure 21).⁶⁵ While the design was tested by military authorities in 1844, and was extensively marketed, only a few examples were made. In 1866, he updated this design to work with metallic cartridges and had one Springfield Model 1863 Rifle Musket converted to breechloader on this system. It was tested by the 1866 Hancock Board.⁶⁶ It did not find favor and — as with the Wilson and Flather — on April 20, it was “by vote of the board set aside” and considered no further.⁶¹

This did not dissuade Hubbell from further design work. On October 22, 1866, he wrote a letter to Secretary of War Edwin Stanton, stating:

“I have invented & perfected an entirely new Breech Loading Gun, much superior in every respect to any of those either I, or anyone else had [presented] before the late Board of Officers.

The papers are now being prepared for both foreign & American patents, so as to make the right secure.

I will shortly present a gun to your Department.

The Springfield guns can be altered & the principle is so simple & quick in its action, that it can readily be loaded & fired from 15 to 20 times a minute....”⁶⁷

However, the War Department was uninterested in a new design, having already invested in preparations to manufacture the “trap-door” Springfield Model 1866 Rifle Musket.



Wm Wheeler Hubbell

Figure 19. Image of William Wheeler Hubbell from History of the Hubbell Family



Figure 20. This is an example of Hubbell's first design for a breechloader, with its leftward rotating chamber. It is engraved on the top of the chamber "Wm.W.Hubbell's / Patent July 1.1844 " in two lines. (courtesy Cowan's Auctions)

The only known example of Hubbell's new design is shown in Figure 22.

Hubbell continued to seek a military buyer for his design, moving on to present his design to the New York State ordnance board of 1867. This board was chartered to examine breechloaders for the use of the New York militia. This board convened on January 10, 1867, at the State Arsenal in New York City but moved to the Springfield Armory to conduct the testing. Hubbell's sample musket of this new design, a "reverse trapdoor," was entered by James H. Orne, who was apparently a sponsor or investor in Hubbell's arm. The musket is described in the report of the ordnance board as follows:

"The gun presented was an altered Springfield rifle, Calibre 50, and adapted to central-fire cartridges. The barrel of original gun is cut off in front of the breech-pin and screwed into a new breech receiver [later corrected to say "cut-out in barrel"]. The breech-block consists of two parts, one of them is hinged to back part of receiver and opens upward, moving in a vertical plane. The other works back and forth in grooves in the

receiver and is attached to the former part by two slotted links. The first part being raised (working upon the hinges in its rear) draws back the second part which leaves sufficient space in the receiver for the cartridge which is dropped in and the hinged block being depressed, drives the front block forward, forcing the cartridge into the chamber, when the two blocks occupy the receiver and transmit the recoil in the line of axis of the barrel to the square recoil seat. The cartridge is retracted by a small steel hook attached to the front block and working in a slot in the receiver. It is flipped by suddenly opening the breech, which gives a rapid movement to the case when it strikes a projection in the bottom of receiver which tilts it and throws it out. The lock of original gun is retained, the percussion being transmitted to the cartridge by means of a firing pin composed of three parts — two parts in the back block, which change the line of motion, and the other part in the front block."⁶⁸

The musket was put through a series of tests for rapidity of fire, achieving a rate-of-fire of only 8 shots per minute. It was fired for endurance, but the bore quickly became excessively fouled and

one bullet became lodged in the bore. The problem was attributed to lack of lubricant on the bullets.⁶⁸

Nevertheless, the board was impressed with the strength of the design:

“The strength of the breech, and especially of the barrel, were well attested by this unpremeditated result. Upon an examination of the cartridges, it was evident that the fouling was occasioned by inadequate lubrication of the cartridges, although manufactured at an United States arsenal. The gun was not submitted to the test of two balls, the test being considered unnecessary after the above-described endurance of the parts.”⁶⁹

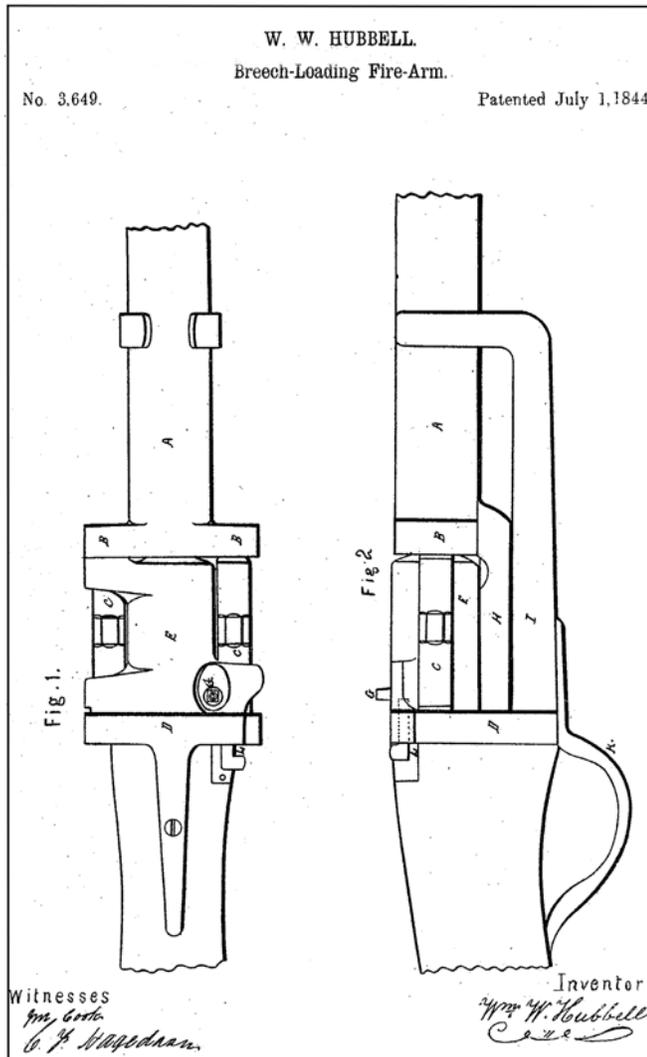


Figure 21. Hubbell's patent number 3649 of 1844. (U.S. Patent and Trademark Office)

At this point the musket was withdrawn from the remainder of the tests.

The ordnance board was unable to select the best breechloader during its first session, so in June it reconvened; for this session it was focused solely on breechloader designs that could be used for converting muzzle-loading muskets.

Hubbell's musket was again subjected to testing, and after 100 rounds, once again the bore was found to be excessively fouled. As a test of the breech's strength, four cartridges with the cases weakened by filing the rim were fired; the board reported *“the breech*

[was] not affected nor gun in any manner deranged.”⁷⁰

In the end the board was not impressed with Hubbell's design, the final report stating:

“The special advantage claimed for this gun is its automatic loading, i.e., the cartridge is simply dropped into the receiver and pushed into the chamber by the act of closing the breech. The Board does not appreciate highly this point, which this gun possesses in common with several others.”⁷⁰

Consequently Hubbell's design was dismissed, and the *“tipping block”* design of General Benjamin Roberts was chosen for converting the state's muskets.

Hubbell had earlier applied for a patent on this *“reverse trapdoor”* design, which patent was issued on June 18, 1867 (number 65,812; Figure 23).⁷¹ The patent was assigned to himself and James Orne, further indicating Orne's investment or sponsorship.

Hubbell's patent covered six claims for unique features. The most significant were, paraphrased:⁷¹

1. The design of the brace block wherein the convex rear end nested in a corresponding concave receptacle in the breechpin.
2. The design of the three piece firing pin.
3. The combination of all the moving parts in this unique configuration.

Thus, Hubbell did what Morse had not done: protected his complete design as a working whole, as well as the individual elements unique to his design. Hubbell went so far as to obtain a patent in Great Britain, number 1449 of May 16, 1867,⁷² but no evidence has been found that he attempted to market this design in Europe.

With this final failure before the New York ordnance board, Hubbell discontinued his interest in firearms. He continued his more successful career as a litigator; he won lawsuits against the U. S. government for the use of his patent fuses.⁷³

Van Choate Conversion Musket

Silvanus Van Choate is a firearms inventor most recognized by today's collectors for his *“2-trigger”* bolt action rifle design. But history better remembers him as a prolific inventor of electrical devices, most pertaining to telegraphy and undersea cables. His patent applications show that at first he resided in Yreka, Calif. in 1860, afterwards moving to Boston, Mass., in 1867; he resided that vicinity through the end of the century. While there he developed other electrical devices, many pertaining to electric lighting.⁷⁴

More to our interest, while in Boston he also invented a breech-loading rifle design applicable to the conversion of muzzle-loading muskets. This earliest firearms design of Van Choate's is a *“reverse trapdoor”* that is very like Morse's second patent of 1858. When he began work on it is unknown, but he was granted a British patent (number 3,345) on this design in late 1867 (Figure 24).⁷⁵ He obtained no American patent; it seems obvious that his design infringed on the mechanical principle that Morse patented a decade earlier. The British patent describes the design as follows:

“The action...can be applied to the conversion of muzzle-loaders into breech-loaders. The breech-block D [see the drawing in Figure 24] is hinged at its rear end on a horizontal pin b, and a curved inclined firing-pin is fitted in the block so that it can be struck by the ordinary hammer. The lower portion of the block is formed with a shoulder F to take the recoil, and



Figure 22. This Hubbell 1867 musket conversion is the only known example of his design; the iron barrel and furniture was originally finished bright but now have an overall deep patina. The barrel/breech system retains the musket's original 40 inch length; the in-the-bore barrel length is 35½ inches. The barrel is chambered for the .50 Government (.50-70) cartridge. It is a conversion of a "SPRINGFIELD" marked Model 1864 Rifle Musket that has the standard inspectors' cartouches on the stock, which indicates the use of a surplus military arm. The top of the breech lever is marked across the front end "W.W.HUBBELL / PATENT / JUNE 18,1867 / PHILADA PA" in four lines. (Author's collection and photos)

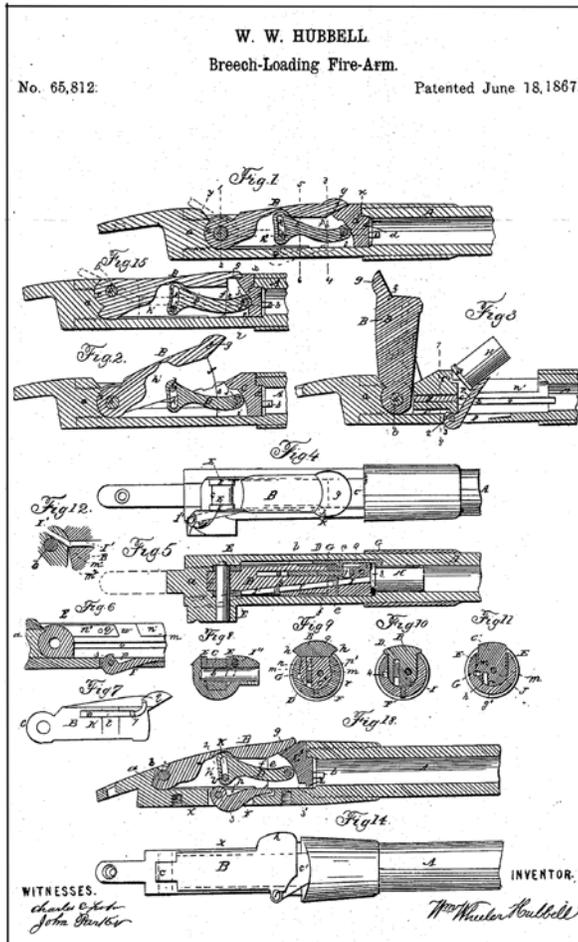


Figure 23. Patent drawing from Hubbell's 1867 patent. Note that the design differs from those of Morse and Wilson & Flather by having the brace-block B pivot in a concave receptacle in the breech-pin rather than on a hinge at the top rear of the breech. Hubbell's design uses a three-piece firing pin: a vertical firing pin link at the location of the original percussion bolster works through a wedging action to drive a horizontal central pin in the brace-block that strikes the actual central firing pin in the breechblock. (U.S. Patent and Trademark Office)

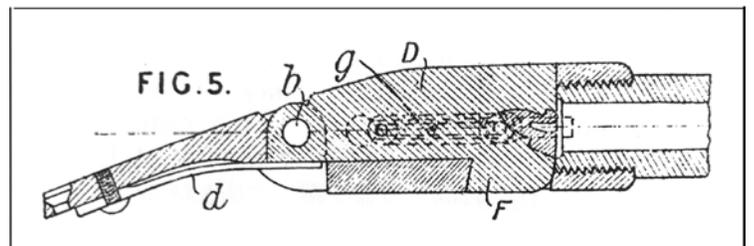


Figure 24. This illustration is from Van Choate's British 1867 patent, number 3345. The "reverse-trapdoor" design is evident, as is the use of a separate receiver that contains the breech system. The stiff spring "d" retains the block in the closed or open position. (from Patents for Inventions Class 119 Small Arms⁷⁵)



Figure 25. This is a Van Choate prototype rifle of his "reverse-trapdoor" type, the design of which is illustrated in Figure 24. The .58 caliber barrel is 30½ inches long in the bore. The rifle is assembled from a shortened Springfield Model 1863 rifle musket. On this prototype rifle the firing pin angles downward from the hammer to the center of the face of the breechblock. When the breechblock is opened upward a link draws the extractor rearward; there is no ejector and the rifle must be inverted for the case to fall out. Note the unique contour of the undated lockplate. The short breech opening limits the length of the cartridge; the chamber accepts the short .58 Gatling centerfire cartridge. The breech system is finished in-the-white. The breechblock is stamped lightly "S.F. VAN CHOATE / INVENTOR" in two lines. (Institute of Military Technology collection, photos by author)

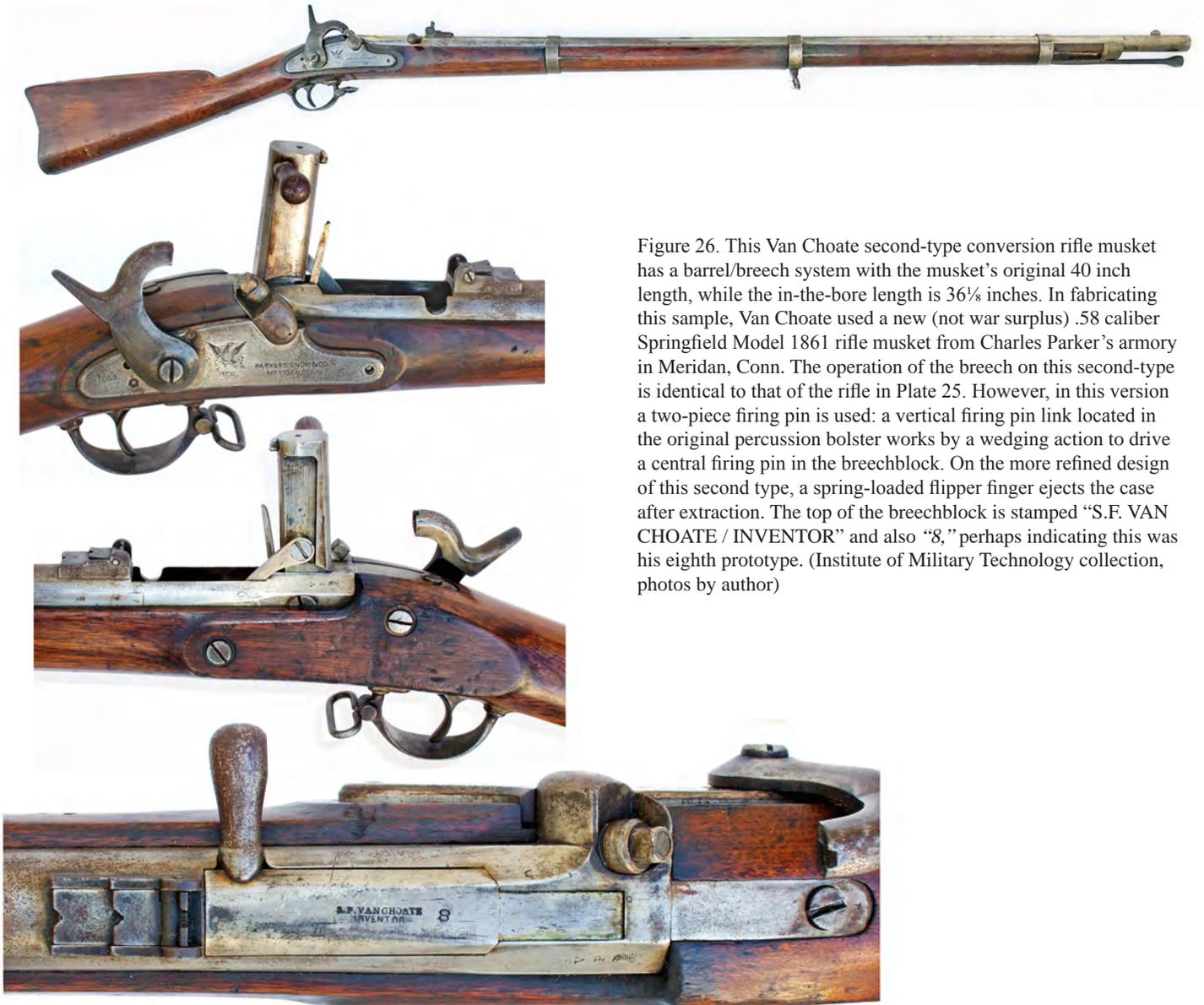


Figure 26. This Van Choate second-type conversion rifle musket has a barrel/breech system with the musket's original 40 inch length, while the in-the-bore length is 36¼ inches. In fabricating this sample, Van Choate used a new (not war surplus) .58 caliber Springfield Model 1861 rifle musket from Charles Parker's army in Meridan, Conn. The operation of the breech on this second-type is identical to that of the rifle in Plate 25. However, in this version a two-piece firing pin is used: a vertical firing pin link located in the original percussion bolster works by a wedging action to drive a central firing pin in the breechblock. On the more refined design of this second type, a spring-loaded flipper finger ejects the case after extraction. The top of the breechblock is stamped "S.F. VAN CHOATE / INVENTOR" and also "8," perhaps indicating this was his eighth prototype. (Institute of Military Technology collection, photos by author)



Figure 27. This example of Van Choate's second-type conversion is made on a standard British Pattern 1853 rifle musket. The lockplate is stamped "1857 / TOWER" in two lines; the crown over "VR" and the small crown-over-broad-arrow marks denote original British army ownership. The lock parts are casehardened in color, the barrel and rear sight are blued. (Courtesy Chickamauga & Chattanooga National Park museum)

Van Choate had two versions of this single shot breechloading design produced, both shown here and both marked with Van Choate's name. In the earliest version of this design (Figure 25) a receiver, or "shoe" in the parlance of the time, into which the barrel was screwed was used. It had a one piece firing pin which angled downward from the hammer to the center of the face of the breech block. It had a sliding extractor along the left side of the cavity which was connected by a link to the breechblock, but the rifle had to be turned over for the extracted case to fall out. Two examples of this first version are known: the musket conversion shown here (Figure 25) and a new-made .50 caliber rimfire carbine having a center-hung hammer (see Sawyer, *Our Rifles*⁷⁶).⁷⁴

In a more refined second version, used specifically for the conversion of rifle muskets into breechloaders, the breechblock was set into into a long slot cut into the top of the barrel at the breech. It has an unique, two piece firing pin design: a vertical plunger (replacing the percussion nipple in the barrel's bolster) drives a sliding pin in the breechblock to strike the centerfire primer. As with the first version, opening the breechblock causes a slide along side of the chamber to extract the cartridge case, but Van Choate also added a spring-loaded finger in the bottom of the cavity to flip the shell clear of the breech. Two examples of this more advanced Van Choate design have been located for study: the one shown here on a Springfield Model 1861 rifle musket (Figure 26) and another on an Enfield Pattern 1853 rifle musket (Figure 27).

The maker of the existing samples has not been identified. These examples would seem to have been made in the late 1860s because all use a centerfire cartridge, a type which did not become readily available until 1867. Both of the rifles in Figures 25 and 26 will chamber the .58 Gatling centerfire cartridge. An early Union Metallic Cartridge Co. cartridge board labels this cartridge the ".58 Gatlin [sic] Rifle" indicating its use beyond just the Gatling gun. Van Choate likely adopted this cartridge for his prototypes because of its ready availability.

In summary, Van Choate never was able to obtain a U.S. patent on his "reverse trapdoor" idea. Nor is there record of any military trials of this design. Likely because no interest was shown in this design, he moved on to bolt action rifle systems, where he was able to obtain several patents. Failing to find success with those, he then returned to his career as an electrical engineer.

With thanks to Gordon Jones, Atlanta History Center, for photographs of their Morse alteration M1841 Rifle.

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- 10 U.S. Navy, *Records of the Bureau of Ordnance*, Record Group 74, Entry 145. In the National Archives, Washington, DC.
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- 13 Seigler, Robert S., 2017. p 44.
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