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FIG. 1. Nineteenth-century engraving of Carthage Jail by Frederick H. Piercy, 1853. Courtesy Church History Library.

Physical Evidence at Carthage Jail and What It Reveals about the Assassination of Joseph and Hyrum Smith

Joseph L. Lyon and David W. Lyon

Thursday, June 27, 1844, was a hot summer day in Carthage, Illinois. Joseph Smith, his brother Hyrum Smith, John Taylor, and Willard Richards sat in a bedroom in Carthage Jail (fig. 1). Illinois Governor Thomas Ford (fig. 2) had promised them protection while they voluntarily awaited trial on charges of civil disturbance. About ten miles south of Nauvoo was another river town named Warsaw. The editor of the *Warsaw Signal*, Thomas Sharp, had been advocating extrajudicial violence against the Mormons and the destruction of Nauvoo for some time. The Nauvoo City Council's decision to interfere with the opposition newspaper, the *Nauvoo Expositor*, in early June 1844 was the impetus that Sharp and other anti-Mormons used to have key Church leaders arrested.¹

The neighboring town of Warsaw had a local militia that was created and armed by the state of Illinois. In late June 1844, during the crisis caused by the destruction of the *Expositor*, the Warsaw Militia was called to active duty by Governor Ford and marched to Carthage, the county seat of Hancock County. On the morning of June 27, before he left Carthage for Nauvoo, Governor Ford discharged the Warsaw Militia from service.²

1. Glen M. Leonard, *Nauvoo: A Place of Peace, a People of Promise* (Salt Lake City: Deseret Book; Provo, Utah: Brigham Young University Press, 2002), 362–68, 380–98.

2. Joseph Smith Jr., *History of The Church of Jesus Christ of Latter-day Saints*, ed. B. H. Roberts, 2d ed., rev., 7 vols. (Salt Lake City: Deseret Book, 1971), 6:565, 605–7 (hereafter cited as *History of the Church*).

Joseph L. Lyon and David W. Lyon

The Lyon brothers first gained an interest in Nauvoo's history from their father, the late T. Edgar Lyon. Joseph recalls, "When I was eight or nine years old my father read Mark Twain's *The Innocents Abroad, or The New Pilgrim's Progress* to my twin brother, Ted, and me. In it, Twain makes fun of the various religious relics he saw on his journey to Europe and the Holy Land. I can still remember Twain's comment that he had seen enough wood from the 'true cross' to build a large church, and that in one church he had seen two skulls of Adam, the first his skull as a child and the second his skull when he reached adulthood. When we queried Dad about how such absurdities could happen, he told us well-meaning people may embellish historical facts to increase the faith of others, but such embellishment ultimately discredits the religion.

"When I visited Carthage for the first time in 1965, I was awe-struck by seeing the holes through the jailer's bedroom door, but I also wondered whether the door was actually from 1844 and if the holes might have been made later. When I learned in my medical training of the effects of damage to the base of the brain on speech, I realized that if Willard Richards's and John Taylor's accounts of Hyrum Smith's facial wound were true, it was not consistent with his being able to speak any last words. Both of these thoughts troubled me.

"During a 1995 visit to Carthage, I measured the diameter of the holes in the bedroom door and then set out to determine what type of firearm could have made such holes. My brother David and his wife MarGene served a mission to Nauvoo in 1996 and 1997, and he came up with the idea of inserting a laser pointer into the hole in the bedroom door to determine the pathway of the musket ball. He also measured the jailer's bedroom and the hallway in front of it, and he made the schematic included in this article. Later, I spoke with Glen Leonard, the former director of the Museum of Church History and Art, to obtain the diameter of the musket ball that stuck John Taylor's watch. In that conversation, I discovered there was no evidence that a musket ball struck the back of the watch. At this point I realized a much more detailed and thorough account was needed."

The discharged militia members marched out of Carthage but returned later in the day. At least sixty men³ stormed the jail, killing the Smith brothers and wounding John Taylor and Willard Richards.⁴ Even though LDS witnesses described the attackers as a group of Missourians and a mob,⁵ the murderers belonged to a military organization, and evidence suggests they retained their government-issued weapons when they returned to Carthage.

Much has been written of the assassination of Joseph and Hyrum Smith,⁶ but little attention has been paid to the crime scene in Carthage Jail. In this article, we examine eyewitness accounts of the assault, the layout of the crime scene, the physical evidence left in the jail, and the types of weapons used and the wounds they inflicted. We hope to shed new light on this tragic event and address previous misconceptions about what happened on that fateful day.

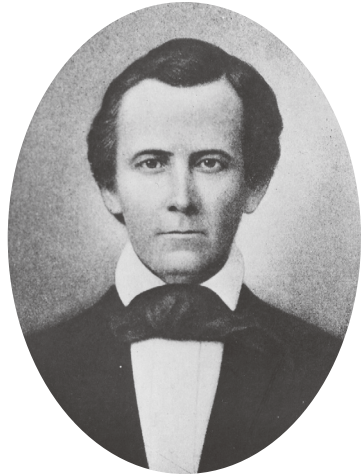


FIG. 2. Thomas Ford. Courtesy Church History Library.

The Eyewitness Accounts

John Taylor and Willard Richards (figs. 3 and 4) both left written accounts of the events of the martyrdom. Although there are many similarities, each account differs slightly in the details (see table of similarities and differences on pages 46 and 47).

3. *History of the Church*, 7:143–45.

4. E. Cecil McGavin, *Nauvoo the Beautiful* (Salt Lake City: Stevens and Wallis, 1946), 138–42.

5. Both John Taylor and Willard Richards refer to the attackers as a mob and as Missourians. Those who drove the Mormons from Far West, Missouri, in 1838 were state militia acting under the direction of their officers and the governor. In the twenty-first century, the word *mob* is viewed as a leaderless group acting on negative emotions.

6. For an examination of early accounts, see Dean C. Jessee, “Return to Carthage: Writing the History of Joseph Smith’s Martyrdom,” *Journal of Mormon History* 8 (1981): 3–19; Davis Bitton, “The Martyrdom of Joseph Smith in Early Mormon Writings,” *John Whitmer Historical Association Journal* 3 (1983): 29–39; and Davis Bitton, *The Martyrdom Remembered: A One-Hundred-Fifty-Year Perspective on the Assassination of Joseph Smith* (Salt Lake City: Aspen Books, 1994).



FIGS. 3 & 4. Engraving of John Taylor and daguerreotype of Willard Richards. Both men were in Carthage Jail with Joseph and Hyrum Smith on June 27, 1844. Taylor, pictured here in an 1852 engraving, recorded his account in the late 1850s. Pictured here from a detail of a photograph by Charles R. Savage on October 9, 1868, Richards wrote and published his eyewitness account seven weeks after the Martyrdom. Courtesy Church History Library.

Willard Richards. Written soon after the event, Willard Richards's account was published in the *Times and Seasons* on August 1, 1844. "Generals Joseph and Hyrum Smith, Mr. Taylor, and myself, who were in the front chamber, closed the door of our room against the entry at the head of the stairs, and placed ourselves against it, there being no lock on the door, and no catch that was usable.

"The door is a common panel, and as soon as we heard the feet at the stairs head, a ball was sent through the door, which passed between us, and showed that our enemies were desperadoes, and we must change our position.

"General Joseph Smith, Mr. Taylor and myself sprang back to the front part of the room, and General Hyrum Smith retreated two-thirds across the chamber directly in front of and facing the door [figs. 5 & 6].

"A ball was sent through the door which hit Hyrum on the side of his nose, when he fell backwards, extended at length, without moving his feet.

"From the holes in his vest (the day was warm, and no one had his coat on but myself), pantaloons, drawers, and shirt, it appears evident that a ball must have been thrown from without, through the window, which entered

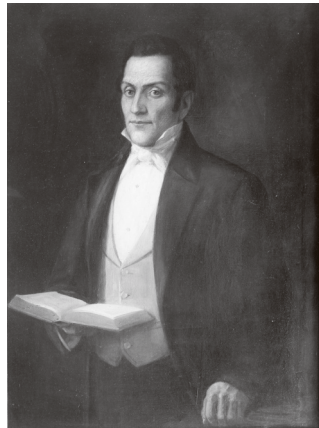
his back on the right side, and passing through, lodged against his watch, which was in his right vest pocket, completely pulverizing the crystal and face, tearing off the hands and mashing the whole body of the watch. At the same instant the ball from the door entered his nose.

“As he struck the floor he exclaimed emphatically, ‘I am a dead man.’ Joseph looked towards him and responded, ‘Oh, dear brother Hyrum!’ and opening the door two or three inches with his left hand, discharged one barrel of a six shooter (pistol) at random in the entry, from whence a ball grazed Hyrum’s breast, and entering his throat passed into his head, while other muskets were aimed at him and some balls hit him.

“Joseph continued snapping his revolver round the casing of the door into the space as before, three barrels of which missed fire, while Mr. Taylor with a walking stick stood by his side and knocked down the bayonets and muskets which were constantly discharging through the doorway, while I stood by him, ready to lend any assistance, with another stick, but could not come within striking distance without going directly before the muzzle of the guns.

“When the revolver failed, we had no more firearms, and expected an immediate rush of the mob, and the doorway full of muskets, half way in the room, and no hope but instant death from within.

“Mr. Taylor rushed into the window, which is some fifteen or twenty feet from the ground. When his body was nearly on a balance, a ball from the door within entered his leg, and a ball from without struck his watch, a patent lever, in his vest pocket near the left breast, and smashed it into ‘pie,’ leaving the hands standing at 5 o’clock, 16 minutes, and 26 seconds, the force of which ball threw him back on the floor, and he rolled under the bed which stood by his side, where he lay motionless, the mob from



FIGS. 5 & 6. Joseph and Hyrum Smith. Courtesy Church History Library.

the door continuing to fire upon him, cutting away a piece of flesh from his left hip as large as a man's hand, and were hindered only by my knocking down their muzzles with a stick; while they continued to reach their guns into the room, probably left handed, and aimed their discharge so far round as almost to reach us in the corner of the room to where we retreated and dodged, and then I recommenced the attack with my stick.

"Joseph attempted, as the last resort, to leap the same window from whence Mr. Taylor fell, when two balls pierced him from the door, and one entered his right breast from without, and he fell outward, exclaiming, 'Oh Lord, my God!' As his feet went out of the window my head went in, the balls whistling all around. He fell on his left side a dead man.

"At this instant the cry was raised, 'He's leaped the window!' and the mob on the stairs and in the entry ran out.

"I withdrew from the window, thinking it of no use to leap out on a hundred bayonets, then around General Joseph Smith's body.

"Not satisfied with this I again reached my head out of the window, and watched some seconds to see if there were any signs of life, regardless of my own, determined to see the end of him I loved. Being fully satisfied that he was dead, with a hundred men near the body and more coming round the corner of the jail, and expecting a return to our room, I rushed towards the prison door, at the head of the stairs, and through the entry from whence the firing had proceeded, to learn if the doors into the prison were open.

"When near the entry, Mr. Taylor called out, 'Take me.' I pressed my way until I found all doors unbarred, returning instantly, caught Mr. Taylor under my arm and rushed by the stairs into the dungeon, or inner prison, stretched him on the floor and covered him with a bed in such a manner as not likely to be perceived, expecting an immediate return of the mob.

"I said to Mr. Taylor, 'This is a hard case to lay you on the floor, but if your wounds are not fatal, I want you to live to tell the story.' I expected to be shot the next moment, and stood before the door awaiting the onset."⁷

John Taylor. John Taylor's account was written in the late 1850s, over a decade after the martyrdom. He began, "I was sitting at one of the front windows of the jail, when I saw a number of men, with painted faces, coming around the corner of the jail, and aiming towards the stairs. The other

7. *History of the Church*, 6:616–22. This source contains two accounts, one written by the editor and the other by Willard Richards titled "Two Minutes in Jail," taken from *Times and Seasons* 5 (August 1, 1844): 598–99, a reprint from the *Nauvoo Neighbor*.

brethren had seen the same, for, as I went to the door, I found Brother Hyrum Smith and Dr. [Willard] Richards already leaning against it. They both pressed against the door with their shoulders to prevent its being opened, as the lock and latch were comparatively useless. While in this position, the mob, who had come upstairs, and tried to open the door, probably thought it was locked, and fired a ball through the keyhole; at this Dr. Richards and Brother Hyrum leaped back from the door, with their faces towards it; almost instantly another ball passed through the panel of the door, and struck Brother Hyrum on the left side of the nose, entering his face and head. At the same instant, another ball from the outside entered his back, passing through his body and striking his watch. The ball came from the back, through the jail window, opposite the door, and must, from its range, have been fired from the Carthage Greys, who were placed there ostensibly for our protection, as the balls from the firearms, shot close by the jail, would have entered the ceiling, we being in the second story, and there never was a time after that when Hyrum could have received the latter wound. Immediately, when the ball struck him, he fell flat on his back, crying as he fell, 'I am a dead man!' He never moved afterwards.

"I shall never forget the deep feeling of sympathy and regard manifested in the countenance of Brother Joseph as he drew nigh to Hyrum,

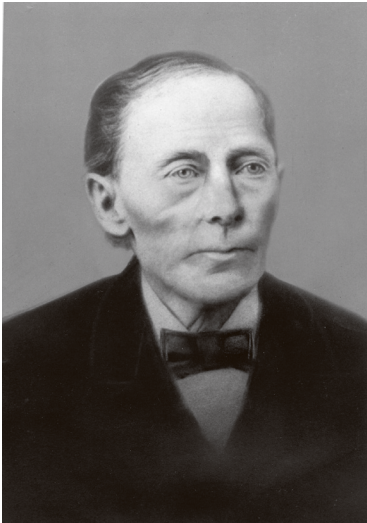


FIG. 7. Cyrus Wheelock. Brother Wheelock loaned his pistol to Joseph Smith during a visit in Carthage Jail. Courtesy Church History Library.

and, leaning over him, exclaimed, 'Oh! my poor, dear brother Hyrum!' [Joseph], however, instantly arose, and with a firm, quick step, and a determined expression of countenance, approached the door, and pulling the six-shooter left by Brother [Cyrus H.] Wheelock [fig. 7] from his pocket, opened the door slightly, and snapped the pistol six successive times; only three of the barrels, however, were discharged. I afterwards understood that two or three were wounded by these discharges, two of whom, I am informed, died. I had in my hands a large, strong hickory stick, brought there by Brother [Stephen] Markham, and left by him, which I had seized as soon as I saw the mob approach; and while Brother Joseph was firing the pistol, I stood close behind him. As

soon as he had discharged it he stepped back, and I immediately took his place next to the door, while he occupied the one I had done while he was shooting. Brother Richards, at this time, had a knotty walking-stick in his hands belonging to me, and stood next to Brother Joseph, a little farther from the door, in an oblique direction, apparently to avoid the rake of the fire from the door. The firing of Brother Joseph made our assailants pause for a moment; very soon after, however, they pushed the door some distance open, and protruded and discharged their guns into the room, when I parried them off with my stick, giving another direction to the balls. . . .

“Every moment the crowd at the door became more dense, as they were unquestionably pressed on by those in the rear ascending the stairs, until the whole entrance at the door was literally crowded with muskets and rifles. . . .

“After parrying the guns for some time, which now protruded thicker and farther into the room, and seeing no hope of escape or protection there, as we were now unarmed, it occurred to me that we might have some friends outside, and that there might be some chance of escape in that direction, but here there seemed to be none. As I expected them every moment to rush into the room—nothing but extreme cowardice having thus far kept them out—as the tumult and pressure increased, without any other hope, I made a spring for the window which was right in front of the jail door, where the mob was standing, and also exposed to the fire of the Carthage Greys, who were stationed some ten or twelve rods off. The weather was hot, we all of us had our coats off, and the window was raised to admit air. As I reached the window, and was on the point of leaping out, I was struck by a ball from the door about midway of my thigh, which struck the bone, and flattened out almost to the size of a quarter of a dollar, and then passed on through the fleshy part to within about half an inch of the outside. I think some prominent nerve must have been severed or injured for, as soon as the ball struck me, I fell like a bird when shot, or an ox when struck by a butcher, and lost entirely and instantaneously all power of action or locomotion. I fell upon the window-sill, and cried out, ‘I am shot!’ Not possessing any power to move, I felt myself falling outside of the window, but immediately I fell inside, from some, at that time, unknown cause. When I struck the floor my animation seemed restored, as I have seen it sometimes in squirrels and birds after being shot. As soon as I felt the power of motion I crawled under the bed, which was in a corner of the room, not far from the window where I received my wound. While on my way and under the bed I was wounded in three other places; one ball entered a little below the left knee, and never was extracted; another entered the forepart of my left arm, a little above the wrist, and,

passing down by the joint, lodged in the fleshy part of my hand, about midway, a little above the upper joint of my little finger; another struck me on the fleshy part of my left hip, and tore away the flesh as large as my hand, dashing the mangled fragments of flesh and blood against the wall. . . .

“It would seem that immediately after my attempt to leap out of the window, Joseph also did the same thing, of which circumstance I have no knowledge only from information. The first thing that I noticed was a cry that he had leaped out the window. A cessation of firing followed, the mob rushed downstairs, and Dr. Richards went to the window. Immediately afterward I saw the doctor going towards the jail door, and as there was an iron door at the head of the stairs adjoining our door which led into the cells for criminals, it struck me that the doctor was going in there, and I said to him, ‘Stop, Doctor, and take me along.’ He proceeded to the door and opened it, and then returned and dragged me along to a small cell prepared for criminals. . . .

“Soon afterwards I was taken to the head of the stairs and laid there, where I had a full view of our beloved and now murdered brother, Hyrum. There he lay as I had left him; he had not moved a limb.”⁸

Physical Features of the Crime Scene

Carthage Jail is a two-story stone building that faces south. On the afternoon of June 27, 1844, Joseph and Hyrum Smith, John Taylor, and Willard Richards had been allowed to move from the jail cells that occupy the north end of the second floor to the jailer’s bedroom, which is on the southeast side of the second floor of the building.

Access to the second floor is obtained through the jail’s front door on the west end of the south wall, then up a steep, narrow staircase (fig. 8) built against the west wall. At the head of the stairs, a platform begins and forms a hallway that provides access to the bedroom on the right. We refer to this as a hallway, although it has no wall on the north and



FIG. 8. Narrow stairway in the Carthage Jail. Photograph by Joseph Lynn Lyon.

8. *History of the Church*, 7:102–7.

west sides, but is bounded by a railing on the west over the stairwell. We measured the distance from the jail's west wall to the wall that forms the west wall of the jailer's bedroom as 97 inches. There is a 3-inch space from the jail's west wall to the stairs. The stairs are 35 inches wide, and there is a 15-inch space between the east edge of the stairs and west edge of the platform that provides access to the bedroom. The platform then runs along the east edge of the stairs to provide access to both the bedroom and the attic. The bedroom door opening begins 26.25 inches from the inner north wall formed by the south wall of the dungeon. The doorway opening is 33.5 inches wide. The hallway in front of the bedroom door is 44 inches wide and is bounded on the east side by the bedroom wall and on the west by a railing. The hall continues about 54 inches past the bedroom door to a door that provides access to the attic. This door opening is 25.5 inches wide. A narrowed platform about 16 inches wide continues past this door to the south wall, ending in a 70-inch-wide platform that looks down over the stairwell.⁹

The jailer's bedroom is 15 feet 8.25 inches wide measured east to west by 15 feet 3.5 inches long measured north to south. There are three windows, one facing east and two facing south. The east window opening starts 74 inches from the north wall, and this window, including its casing, is 45 inches wide. The windowsill is 24 inches wide. The wall that forms the west wall of the bedroom is made of hand-split oak lath covered with plaster.¹⁰

Physical Evidence of the Assassination

The only physical evidence of the shooting of Joseph and Hyrum Smith that still remains at Carthage Jail are two bullet holes through the door of the jailer's bedroom (fig. 9).¹¹ There were additional bullet holes in

9. When standing on the platform looking north you will see the jailer's bedroom door to your right, the stairwell directly beneath you, the north wall of the cells directly ahead, and the door that provides access to the jail cells in front of you and to your left. Unless otherwise noted, all measurements in this article were taken by the authors.

10. Joseph A. McRae and Eunice H. McRae, *Historical Facts regarding the Liberty and Carthage Jails* (Salt Lake City: privately published by the McRaes, 1954), 116. Page 119 has a picture of one of the interior walls of the jail (unidentified as to which room) with the plaster stripped off to show the laths.

11. We considered the possibility that the bedroom door may have been a replacement for the original door and possibly the bullet hole and bullet nicks were made at a later time; however, ample evidence negated this. Seven of the eight doors in the jail (the exception being the front door) are of the same wood, and all are handmade. The section of the door around the latch with the partial

FIG. 9. Bullet holes in bedroom door. These holes are the only extant physical evidence of the shooting of Joseph and Hyrum Smith that still remains at Carthage Jail. Notice that the second hole on the side is in a piece of wood that was cut from the door by a souvenir hunter but later returned by one of his descendants. Photograph by John W. Welch.



the walls, window casing, and ceilings of the bedroom, but these are no longer present and must have been repaired by the mid-1860s. In 1866, the *Carthage Republican* reported that in 1857 bullet holes were still visible in the window casing of the east window, the walls, and the bedroom door, but that by 1866 the damage, excepting the bullet holes in the door, had been repaired.

When the plaster was stripped from the walls during remodeling in the late 1930s or 1940s, no musket balls were found in the plaster and oak lath. Writing in 1885, James W. Woods, one of Joseph Smith's attorneys, claims to have counted thirty-five bullet holes in the walls of the room.¹²

bullet holes was removed sometime after the martyrdom as a souvenir by a resident of Carthage. A Church missionary couple sent to be caretakers of the jail in the 1930s, the McRaes, heard of its existence and prevailed on the resident's descendants to return it. The piece of wood was restored to the door, and its grain matched that of the surrounding door. McRae and McRae, *Historical Facts*, 99. Another item of interest related to the bedroom door was not mentioned in other accounts we found. On inspecting this door in June 1999, we found that a wedge of wood had been crudely cut, probably with a knife blade from the inside top edge of the door, a long time ago. The wedge was about twelve inches long and an inch at the top then tapering downward. Perhaps a souvenir hunter from many years ago thought the door historic enough to cut a good-sized piece off it.

12. McRae and McRae, *Historical Facts*, 116; James W. Woods, "The Mormon Prophet: A True Version of the Story of His Martyrdom; Reminiscences of an Old Timer, Who Was Joe Smith's Attorney," *Ottumwa Democrat*, May 13, 1885, reprinted in *Journal History of the Church*, June 27, 1844, Church History Library, The Church of Jesus Christ of Latter-day Saints, Salt Lake City, microfilm copy

A drawing made by Frederick Piercy in 1853 of the west wall of the bedroom has five discrete holes, four above the line of the window sills, and what appear to be two clusters of about three to four holes.¹³ The holes below the level of the windowsill could not have been fired into the room from outside. Only the four balls higher up could have come from outside the room. The two clusters low down had to have been made by someone standing in the room and firing into the west wall. The accounts by Willard Richards and John Taylor do not mention musket balls hitting the west wall of the bedroom.

The door to the jailer's bedroom is a handmade panel whose style is known as the Christian door, about 0.5-inch-thick panels that are flat on the hall side but raised on the bedroom side. The door is hinged on the north side to swing into the room as one enters from the platform. The door is made of hardwood, likely black walnut. One of the two bullet holes is on the south edge of the door, 46.5 inches above the floor. This is a partial hole, occupying about 0.5 inches of space, where a musket ball grazed the edge of the door.¹⁴ Even though it is partial, the hole we measured is approximately 0.75 inches in diameter and is angled downward and to the south. This bullet hole is in a piece of wood that was cut out of the door by a souvenir hunter and returned by one of his descendants.¹⁵ The cutout in the door starts 42.25 inches above the floor and extends to 48 inches above the floor. The cutout is several inches above the current doorknob. The grain and color of the wood in the cutout match that of the door.

The current door latch is an external, metal-box-type latch mounted on the bedroom side of the door with a doorknob mounted on the hall side of the door below the cutout piece of wood. In 1844, the door likely

in Harold B. Lee Library, Brigham Young University. James Woods claimed to have counted thirty-five bullet holes in the walls of the room. However, his testimony of the actual martyrdom was unreliable in several details. For example, Woods confused the two brothers, saying that Joseph was wounded in the face and abdomen, but actually those were Hyrum's wounds. Woods did go to the bedroom and spend some time looking at it and making a count of holes in the walls and ceilings.

13. Frederick Hawkins Piercy, *Route from Liverpool to Great Salt Lake Valley*, reprint, ed. Fawn M. Brodie (Cambridge, Mass: Belknap Press of Harvard University Press, 1962), illustration xvi.

14. John Taylor describes one ball shot through the keyhole and another through the panel, striking Hyrum Smith in the face. *History of the Church*, 7:102.

15. McRae and McRae, *Historical Facts*, 98, 99.

was held shut by a simple metal latch near the location of this bullet hole.¹⁶ There is no evidence of bullet holes in the doorjamb, nor is there evidence of a latch plate being mounted there. The McRaes, a missionary couple sent by the Church in the 1930s to be caretakers of the jail, noted that while the doors were made of walnut, the door casings were made of oak. The couple also reported that all the interior doors were original to the jail, but the front door was a replacement.¹⁷

The second hole in the door is in an upper panel, 10 inches from the south edge of the door and 51.75 inches above the floor. This hole is circular on the corridor side of the door and approximately 0.69 inches in diameter. There is a circular hole on the bedroom side of the door of the same diameter, and pieces of wood have been blown out of the wood panel above and below the exit hole. The type of damage to the wood is compatible with that done when a high-velocity ball exits from a hard substance such as dry wood and is called spalling. Both holes are approximately 0.05 inches larger than the 0.64-inch diameter of the ball fired by the U.S. Model 1795 and Model 1816 69-caliber musket (the weapons most likely used in the attack). The soft lead balls likely flattened slightly when hitting dried hardwood, or perhaps the fingers and knives of many visitors over the years have expanded the holes slightly.

The pathway of the musket ball that made the hole in the door panel was reconstructed using a laser pointer wedged into the bullet hole in the door (figs. 10a and 10b). The ball was traveling in a downward direction and was aimed slightly to the right (or toward the south side of the room when the door was closed). If the door was closed when the musket was fired, the ball would have struck the east wall just below the east window, between 17 and 23 inches above the room's floor. Considering the bullet path and the length of the Model 1816 musket, the butt of the musket would have been about 65.5 inches above the floor if the muzzle was pressed against the door when fired.

16. The accounts by Willard Richards and John Taylor both mention a door latch, not a doorknob. Frederick Piercy's drawing, done in 1853, shows a door latch mounted several inches higher than the current doorknob.

17. McRae and McRae, *Historical Facts*, 113, 120.

Lyon and Lyon: Physical Evidence at Carthage Jail and What It Reveals about the

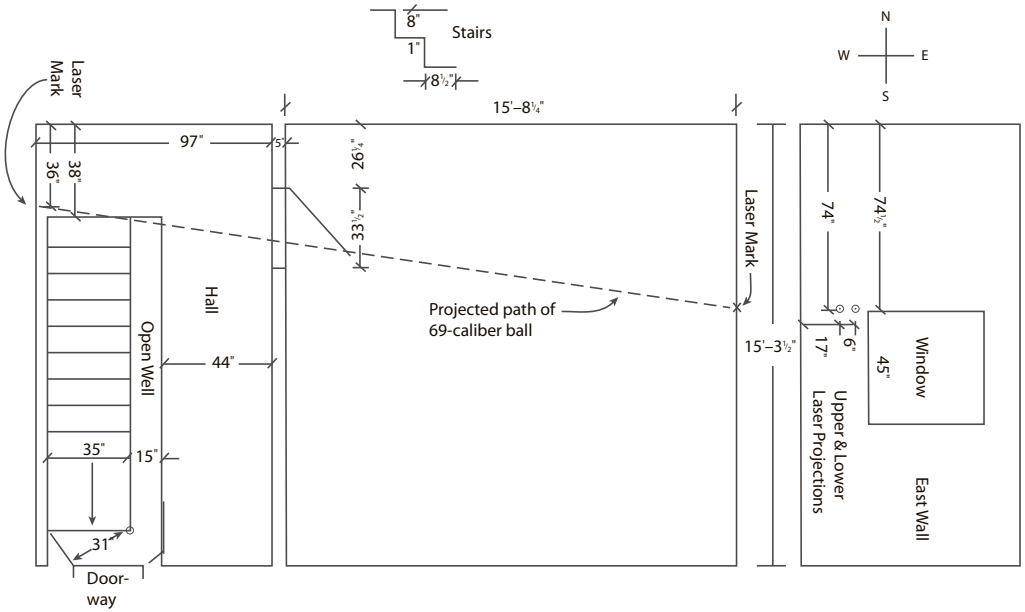


FIG. 10a. Pathway of the musket ball that made the hole in the door panel was reconstructed using a laser pointer wedged into the bullet hole in the door. Based on diagram by David W. Lyon.

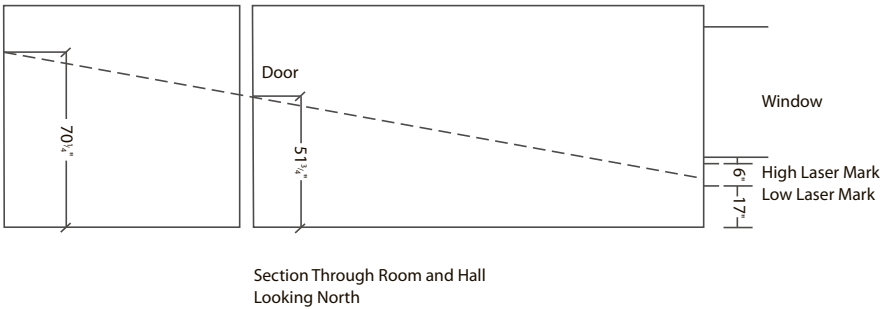
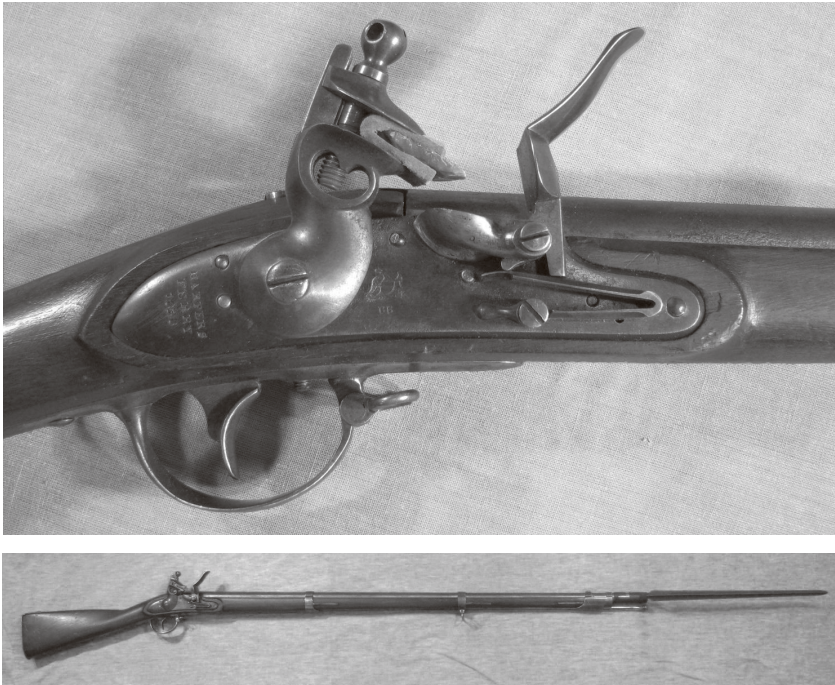


FIG. 10b. If the door was closed when the ball was fired, it would have struck the east wall just below the east window, between 17 and 23 inches above the room's floor. Based on diagram by David W. Lyon.



FIGS. 11 & 12. A U.S. Model 1816 flintlock-ignited musket and a detail of the firing mechanism (*top*). Photographs by Joseph Lynn Lyon.

The Firearms

The reports of John Taylor and Willard Richards, both present in the room with Joseph and Hyrum Smith, state that the attackers (members of the Warsaw Militia) were armed with muskets, though John Taylor mentions that muskets and rifles were fired through the door of the bedroom.¹⁸ In the early and mid-nineteenth century, the federal government provided each state with U.S. military firearms for use by local militias. The U.S. Model 1816 flintlock-ignited musket (figs. 11 & 12) was the firearm most likely issued to the militias of Hancock County, including those of Carthage, Warsaw, and Nauvoo,¹⁹ though it was possible that some U.S.

18. *History of the Church*, 6:616–22; 7:102–7. John Taylor's comment appears in 7:103. Unfortunately, he did not further amplify this statement.

19. When Governor Ford came to Nauvoo the day Joseph and Hyrum Smith were martyred, Ford told the assembled citizens that the large number of privately owned firearms held by the Saints was a cause of prejudice among their neighbors against them (see *History of the Church*, 6:623). We believe the presence of these privately owned muskets was a decisive factor in keeping the men in surrounding

Model 1795 muskets were also issued.²⁰ The 1816 musket was made in much larger numbers than the 1795 musket, and most 1795 muskets did not survive the War of 1812.²¹

The U.S. Model 1795 and 1816 muskets were flintlock-ignited, smooth-bore weapons with a bore diameter of 0.69 inches or 69 caliber.²² Willard Richards says that during the attack the Carthage Greys, the Carthage militia unit that was supposed to defend the prisoners, “elevated their firelocks.”²³ A “firelock” was another name for a flintlock musket. The Model 1795 musket had an overall length of 59.5 inches, and the Model 1816 musket was 57.5 inches long. The bayonet issued with both muskets added an additional 16 inches to the overall length. As unlikely as it seems, given the limited space within the jail, Willard Richards mentions muskets with attached bayonets being thrust through the doorway into the bedroom where the murders occurred. After Joseph Smith leaped from the jail’s east

communities from attacking Nauvoo at the time of the Smiths’ murders and in the weeks thereafter. See Leonard, *Nauvoo*, 114–15, 377.

20. An alternate explanation was that a 69-caliber pistol was used to shoot through the door. This was also a possibility, but it was highly unlikely. The United States made only a thousand Model 1816 flintlock pistols in 69 caliber, then changed to 54-caliber pistols, and by 1830 had produced about thirty thousand pistols in this caliber. The thousand 69-caliber pistols were sold as surplus with the adoption of the 54-caliber pistol, since musket ammunition was not suitable for use in a pistol. Norm Flayderman, *Flayderman’s Guide to Antique American Firearms and Their Values*, 9th ed. (Iola, Wis: Gun Digest Books, 2007), 328–29. Neither Willard Richards nor John Taylor mentions the mob being armed with or discharging pistols.

21. The U.S. Model 1795 and 1816 muskets were made at the two U.S. armories at Springfield, Massachusetts, and Harpers Ferry, Virginia, as well as by a number of independent gunmakers who received government contracts. About 150,000 Model 1795 muskets and 675,000 Model 1816 muskets were manufactured between 1795 and 1840 at the two federal arsenals; an additional 100,000 Model 1816 muskets were made by government contractors. Flayderman, *Flayderman’s Guide*, 538–40, 553–54. Midwest militia units were using the percussion-converted, smoothbore Model 1816 muskets as late as 1863. General Ulysses S. Grant reported exchanging about 60,000 smoothbore militia muskets for new, rifled, British-manufactured muskets imported by the Confederacy after the fall of Vicksburg in July 1863. Most of General Grant’s troops at Vicksburg were raised in the Midwest, including Illinois, and were armed with muskets supplied to the militia units of each state. Ulysses S. Grant, *Personal Memoirs*, ed. Caleb Carr (New York: The Modern Library, 1999), 306.

22. Caliber is a measurement of the diameter of the bore of a firearm measured in hundredths of an inch; for example, a 69-caliber musket has a barrel with an internal diameter of 0.69 inches.

23. *History of the Church*, 6:617.

window, this eyewitness “withdrew from the window, thinking it of no use to leap out on a hundred bayonets, then around General Joseph Smith’s body.”²⁴ Because commercial firearms did not provide an attachment for a bayonet, Willard Richards’s account establishes that the men who killed Joseph Smith were armed with military muskets and that some of the Warsaw Militia had mounted their bayonets on their muskets preparatory to attacking the jail.

The bore of the Model 1795 and 1816 muskets had a metal tube with a smooth, 0.69-inch inside diameter similar to that found on modern shot-guns. A smoothbore musket was faster to load than a musket with a rifled barrel because the bullet did not have to be hammered down the barrel so the ball engaged the riflings when exiting the barrel. The ball used with the 1795 and 1816 muskets had a diameter 0.05 inches smaller than 0.69 inches. Both muskets were loaded from a rolled paper container called a cartridge. The cartridge held the correct amount of gunpowder and a 0.64-inch-diameter lead ball weighing 397.5 grains (or about nine-tenths of an ounce). The paper of the cartridge also covered the ball and was designed to make up the 0.05-inch difference in diameter between the barrel and the ball as it was rammed down the barrel. Ammunition may have been supplied by the federal government or manufactured locally from lead and gunpowder.

To load the firearm, the soldier leveled the musket and pulled the cock (a device on the right side directly above the trigger that held a piece of flint in its jaws) to the half-cocked position. He next removed a paper cartridge from a leather-covered box on his belt, tore the bottom off with his teeth, poured part of the powder into a pan on the right side of the musket, and closed a spring-loaded lid called a frizzen over it. He raised the musket vertically, poured the remainder of the powder (about 100 grains or about a quarter of an ounce) down the barrel, and placed the musket ball that was still wrapped and tied in the end of the cartridge paper in the musket’s muzzle (probably giving the paper a little push to keep it from falling off the end of the barrel). The soldier then withdrew the ramrod stored under the barrel and rammed down the cartridge-paper-covered lead ball until it rested on top of the powder charge. The musket was leveled again, and the cock was pulled all the way back. Next, the musket was brought to the shoulder and the trigger pulled. This released the cock, which swung forward driven by spring tension, striking the flint on an upright, curved metal projection on the frizzen, pushing the frizzen up, and showering sparks into the gunpowder. The gunpowder in the pan was ignited by the sparks, and the flame traveled via a hole on the side of the barrel to the

24. *History of the Church*, 6:620–21.

main charge of gunpowder. The powder then ignited, and the gas generated from its ignition propelled the lead ball down the barrel.

Due to the smoothbore barrel and the use of a round ball, the effective range of such muskets was about 100 yards. Both the 1795 and 1816 muskets had a sight on the front barrel band only, and, typical of all smoothbore muskets of the day, they were not very accurate. (To achieve accurate fire from any handheld firearm, a sight at the front and rear of the weapon is necessary to guarantee proper alignment of the barrel when the weapon is discharged. With only a front sight, the barrel is only pointed in the general direction of the target.) The military accepted this limitation, viewing musket fire as covering an area occupied by enemy troops with deadly lead balls, and so did not bother with the expense of adding a rear sight. A smoothbore musket can best be compared to a modern 12-gauge hunting shotgun (bore diameter 0.73 inches), but the musket fired a large lead ball rather than many tiny balls (birdshot).²⁵

The Initial Assault

With an understanding of the firearms, we can now analyze the events of the assassination. The members of the Warsaw Militia rushed the jail shortly after 5:00 p.m. on the afternoon of Thursday, June 27, 1844. An eight-man squad from the Carthage Greys had been charged with the defense of the jail. They were to provide the initial protection for the prisoners against an attack, and, if one occurred, the squad would be joined by the remainder of their company who were camped in the town square, about 600 yards away. The Carthage militiamen who were guarding the jail were reported to have been aware of the assassination plot and to have

25. In 1843 and 1844, experiments were conducted to test the gunpowder being produced at the Washington Arsenal using an 1816 musket loaded with 80 grains of black powder. Using a ballistic pendulum, the velocity of a 0.64-inch lead ball at the musket's muzzle was estimated at 1,500 feet per second and the energy at the muzzle of 2,060 foot-pounds. Captain Alfred Mordecai, "Experiments on Gunpowder Made at the Washington Arsenal in 1843 and 1844." Copy in possession of John Spangler, Salt Lake City. Modern black-powder loading manuals could not confirm this and suggested muzzle velocities on the order of 1,000 to 1,200 feet per second with an 80-grain powder charge. C. Kenneth Ramage, ed., *Lyman Black Powder Handbook*, 12th ed. (Middletown, Conn: Lyman Publications, 1997), 142. Since there were no values given for a 69-caliber ball, we have interpolated between the 58-caliber and the 75-caliber data. Cartridges were also issued that contained a 0.64-inch ball and three 0.33-inch balls. These cartridges were used primarily for guard duty and referred to as "buck and ball." There is no evidence that such were used by those who killed the Smith brothers.

agreed to fire blanks (muskets loaded with powder held in place with cartridge paper but without a lead ball) at the Warsaw Militia to make it appear as if they had put up resistance.²⁶

The accounts of John Taylor and Willard Richards state that the guards did fire at the attackers, but without any effect. Besides attempting to drive off the attackers, the shots from the guards at the jail were to alert the remainder of the Greys to an attack so they could come to the jail. John Taylor states that the Carthage Militia stood off 10 to 12 rods (55 to 66 yards) and fired at the jail windows, suggesting the Greys were trying to kill him and the other men in the room.²⁷ Once the main body of the Carthage Militia became aware of the attack, the attackers would have had only a few minutes to murder Joseph Smith and make their escape.

The Warsaw militiamen charged through the front door of the jail, ran up the stairs, and fired into the door leading to the prison cells at the immediate head of the stairs.²⁸ The staircase was narrow (35 inches) and steep (the stairs rise 8 inches), so the attackers likely had to mount it single file.

The attackers then confronted an unanticipated problem. The prisoners were not in the cells with metal bars, where the men would have been easy targets, but in a bedroom, which was accessible through a single wooden door.

Realizing that Joseph Smith was not in the prison cell at the head of the stairs, the attackers turned to their right. Joseph and his companions had closed the door to the jailer's bedroom when they first heard shouts and shots.²⁹ Both Hyrum Smith and Willard Richards held the door shut. John Taylor said the latch on the door was worthless and that he and others had tried to repair it before the assassination.³⁰

In the hands of inexperienced troops, or under the pressure of a conflict, the muskets of the day could take up to a minute to load. The men at the top of the stairs, having fired into the prison cell at the head of the stairs, now had empty muskets, so it was not possible to immediately fire through the bedroom door. This pause gave the men in the bedroom time to better position themselves against the door.

26. Woods, "Mormon Prophet"; B. H. Roberts, *A Comprehensive History of The Church of Jesus Christ of Latter-day Saints* (Provo, Utah: Brigham Young University Press, 1965), 2:279–81 (hereafter cited as *Comprehensive History*).

27. *History of the Church*, 7:104.

28. *History of the Church*, 6:619. The front door to the jail had been replaced sometime in the past. McRae and McRae, *Historical Facts*, 120.

29. *History of the Church*, 6:616; 7:102.

30. *Comprehensive History*, 2:284.

The two bullet holes through the bedroom door were evidence that two muskets were fired into the door by the attackers. Willard Richards and John Taylor both mention two shots being fired through the door. The first shot was fired through the keyhole³¹ and the second through the upper door panel on the south side. Based on the holes, the musket muzzles were pointing at a downward angle and to the right (or south) when both holes were made. The angle toward the south suggests the shots were fired by men standing slightly to the north of the door opening. The buttstocks of the muskets when making these holes would have been higher than the shoulder height of the average man of that day (about 5 feet 6 inches) and the butt being about 5 feet 5 inches above the floor.

To reconstruct how this might have happened, we measured a 44-inch space horizontally from a 33-inch-wide door and used a bench to simulate the railing of the jail hallway. Because of the length of the 1795 and 1816 muskets and the narrowness of the hallway, a man could not have shouldered his musket in the normal way (with the barrel parallel to the floor) and fired into the closed door when he was standing in the hallway at the head of the stairs. However, as will be discussed herein, lack of space was not an insurmountable obstacle.

Two or three attackers probably began pushing on the bedroom door; the narrow space in front of the door and the width of the door (33.5 inches) made it unlikely that more than three men could have stood and pushed. Inside the room, two or three of the four men were holding the door,³² knowing their lives depended on keeping it shut. There would have been a contest of strength between the attackers and their intended victims.

Some of the men lower down on the stairs likely began passing up loaded muskets in exchange for those already discharged. One of the militiamen probably decided to drive the prisoners away from the door by firing his musket at the door latch. The door was slightly open because the hole goes through the hallway part of the door and cannot be seen from the bedroom side of the door, nor is there evidence of damage to the oak doorjamb. To fire in the space at the top of the stairs, a militiaman had to hold the musket above his shoulder and absorb the recoil with his hand and arms. The recoil from a musket held in this fashion would have been uncomfortable, but a shot at such a position was possible.

A second musket was probably passed up the stairs and a second shot fired through the door panel. Because of the height of the bullet hole and its downward angle, the firer of this shot must also have stood in the

31. *History of the Church*, 7:102.

32. *History of the Church*, 7:102.

hallway, holding the musket with the trigger guard above his shoulder, and absorbed the recoil with his hands and wrists.

Two factors help determine the number of men who could push on the door and fire into the bedroom. First is the muzzle blast, and second is the side blast from the muskets. The 69-caliber musket ball is 0.05 inches smaller than the 0.69-inch bore diameter so it can be rammed down the barrel of the musket and still be surrounded with a thin sheet of paper to act as a block and better capture the force of the expanding gases. When a smoothbore flintlock musket is fired, a cloud of burning powder particles is thrown out in a circular pattern around the musket ball. These particles move at over 1,000 feet per second and can penetrate clothing or skin.

During our tests, we fired into a piece of dried walnut wood with a 69-caliber musket from point-blank range (fig. 13). We also fired at pocket watches held in hand-sewn pockets, and the flame from the hot gas generated by the burning powder set the cotton fabric on fire with every shot (fig. 14). If one man were pushing on the door and a second man next to him fired his musket with the muzzle near the door, the first man would be sprayed with burning powder particles thrown out by the discharge of the musket.

The second factor is the risk of damaging a neighbor's eyes or setting his clothing on fire from the burning powder in the musket's side pan and the discharge from the musket's touchhole when the main powder charge is fired.³³ When the powder in the pan is ignited, burning powder particles are thrown out from the pan several inches. When the powder in the pan ignites the powder charge in the barrel, there is a lateral discharge over the pan, to a distance of five feet or more, of a tiny, high-pressure jet of hot gas equivalent to the pressure driving the ball down the barrel. This jet of hot gas can damage skin and eyes. The burning powder and gas jet from the side of the musket meant the attackers could not have stood too close to each other without risking burned clothes or eye damage.

One point that has not been addressed in previous studies of the martyrdom is the amount of white smoke generated when black powder is fired. The amount of white smoke is substantial and this was a major factor in all battles fought with black-powder weapons; it probably was the reason for the phrase "the fog of war." The top of the stairs and the bedroom would have become extremely smoky once repeated firing started. This

33. While shooting one day Joseph Lyon was hit on left side of his face with burning powder particles from a 54-caliber flintlock pistol that was fired from about five feet to his left. It was quite painful even though the grains of powder did not break the skin.

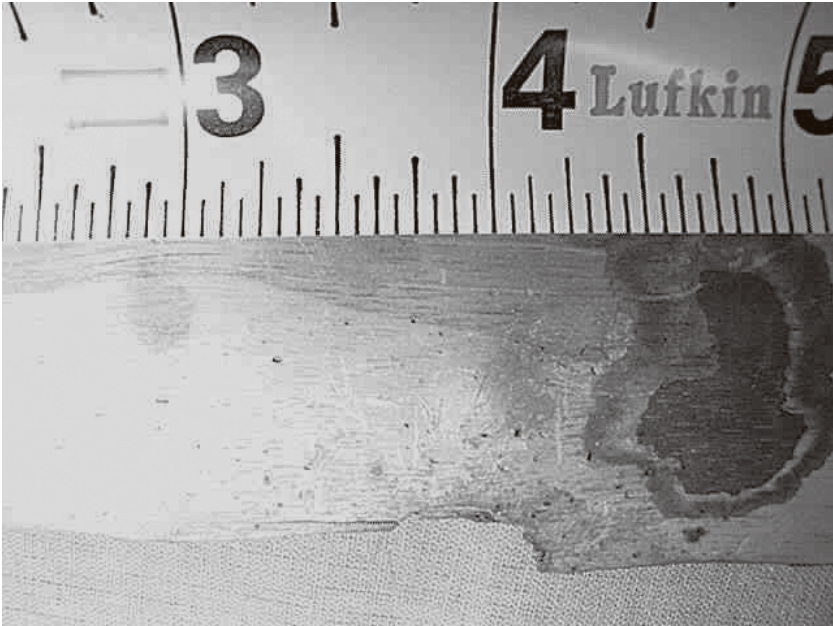


FIG. 13. A piece of dried walnut with a 69-caliber musket fired from point blank range. Notice the tiny holes in the wood surface caused by unburned particles of black powder being driven into the wood. Photograph by Joseph Lynn Lyon.

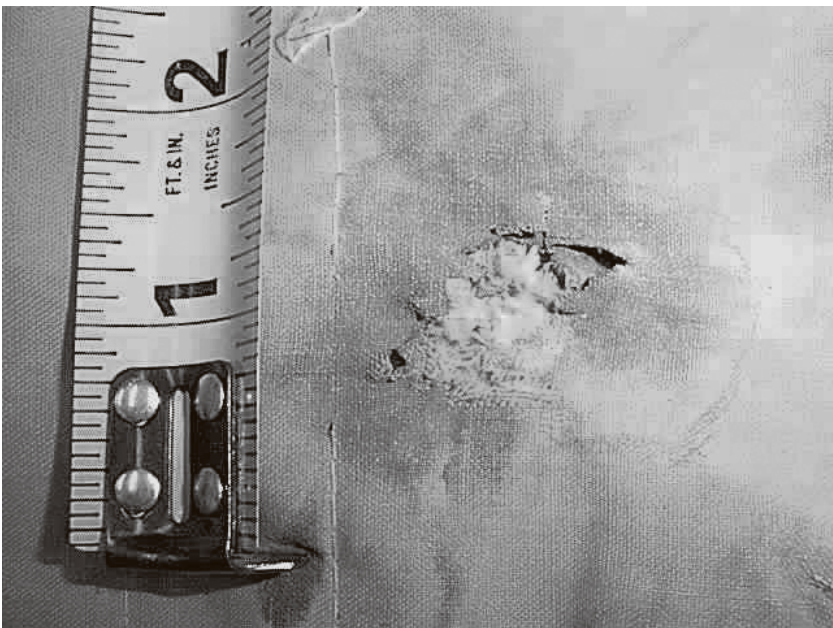


FIG. 14. Pocket watches held in hand-sewn pockets. The flames from the powder burned the cotton fabric with every shot. Photograph by Joseph Lynn Lyon.

smoke undoubtedly made it difficult to see clearly into the room for several seconds after each musket discharge.

Shots through the Door

Of the first two shots fired into the room, Willard Richards's account states, "As soon as we heard the feet at the stairs head, a ball was sent through the door, which passed between us," causing the men to spring back from the door. He says a second "ball was sent through the door which hit Hyrum on the side of his nose."³⁴ John Taylor believes the first ball actually came through the keyhole of the door, while the second entered through the door panel itself.³⁵

The accounts of Willard Richards and John Taylor declare that the second ball struck Hyrum Smith. Both eyewitnesses say that Hyrum Smith had stepped away from the door after the first musket ball was fired and was then shot through the door by the second ball. John Taylor explains, "Dr. Richards and Brother Hyrum leaped back from the door, with their faces towards it; almost instantly another ball passed through the panel of the door, and struck Brother Hyrum on the left side of the nose, entering his face and head."³⁶

If Hyrum Smith were standing fully erect to his 74-inch height³⁷ as people tend to be when they leap backward, the ball through the door at 51.75 inches height would have struck him in the upper abdomen, not the face. Since the ball was traveling downward, the farther he stepped back from the door, the lower on his torso would have been the entrance wound.

We believe the second musket ball, shot through the upper panel of the door, was the ball that struck Hyrum Smith on the left side of his face, but we believe this occurred while he was still braced against the door, and his leap backward was a reaction to being shot. Discrepancies between the eyewitness accounts and the physical evidence necessitate additional commentary.

Hyrum Smith's left shoulder likely was braced against the door when the second ball was fired through the panel.³⁸ That means his head must have been bent forward, with his left cheek turned toward the door and his face parallel to the floor. The musket ball struck the left side of his face, just

34. *History of the Church*, 6:619.

35. *History of the Church*, 7:102.

36. *History of the Church*, 6:617, 619; 7:102.

37. Pearson H. Corbett, *Hyrum Smith: Patriarch* (Salt Lake City: Deseret Book, 1963), 86.

38. *History of the Church*, 7:102.

medial to the left eye, then exited from underneath his jaw to the right of the midline. Others have misidentified the wound to the floor of his mouth as an entrance wound rather than an exit wound.³⁹ Had the wound in his neck or in the floor of his mouth been an entrance wound, the ball would have done extensive damage to the top of the skull. The photographs of Hyrum Smith's and Joseph Smith's skulls made in 1928 show no damage to the top of either skull.⁴⁰

Also, identifying this wound as an exit wound would explain the bloodstains on the right side of Hyrum Smith's clothes. A review by Richard Neil Ord and Gayle G. Ord of the clothing Hyrum Smith was wearing at the time of the assassination found the majority of bloodstains on the right front of the shirt, with a small amount of blood on the shirtfront and a blood splatter on the left shoulder.⁴¹

The current owner of the vest, Eldred G. Smith, said Hyrum Smith's vest was so blood soaked on the upper right side, that a triangular shaped piece of fabric from the top and bottom of the right armhole extending to the right lapel was cut out. It is our assumption that this fabric was also cut out to remove the clothes from the body because rigor mortis had set in, and the fabric was likely blood soaked, as was the shirt underneath it.⁴² The right lapel of his vest was about 2 inches shorter than the left lapel because of the removal of this wedge (fig. 15). Hyrum Smith's shirt (a pullover) was split up the front and down



FIG. 15. Hyrum Smith's vest. Notice that a wedge of the material was cut out, making the right lapel about 2 inches shorter. Eldred G. Smith Family Collection. Photograph by Joseph Lynn Lyon.

39. *History of the Church*, 6:617; Shannon M. Tracy, *In Search of Joseph* (Orem, Utah: Kenninghouse, 1995), 57. See also, "Findings of the Coroner's Jury on the Carthage Tragedy," *Deseret Evening News*, September 12, 1890.

40. Richard Neil Ord and Gayle G. Ord, "Artifacts of the Martyrdom," unpublished draft manuscript in authors' possession; Tracy, *In Search of Joseph*, 41-43, 52-53.

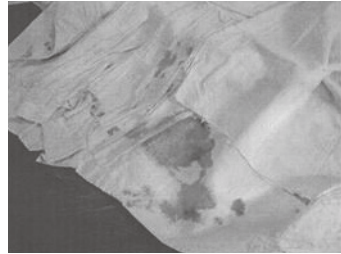
41. Ord and Ord, "Artifacts of the Martyrdom." Photographs of the clothing are printed in Tracy, *In Search of Joseph*, 75-77.

42. We had not noticed that the vest had a large piece of fabric removed from the right side until Eldred Smith pointed it out and told us he had stitched the fabric together to hide the defect.

the right arm to remove it from his body. This cut in the fabric was sewn together when we inspected the shirt. The bloodstains on the right front of the shirt were likely made by blood from the exit wound on the floor of his mouth soaking through the front of the vest and onto the shirt (see figs. 16 & 17).



After Hyrum Smith was shot in the face, he was also shot in his lower back and in both legs. His clothing shows no evidence of bloodstains around these wounds, but the clothing may have been washed, removing or reducing some of the stains.⁴³ Since Hyrum Smith fell on his back and did not move after he was shot,⁴⁴ the extensive bloodstains on his right sleeve could only have come from a wound on the right side of his neck or the floor of his mouth. Wounds in either of these places likely would have severed major blood vessels, causing massive blood loss and resulting in less bleeding from the other wounds.



FIGS. 16 & 17. The shirt and trousers Hyrum Smith wore the day he was murdered. Eldred G. Smith Family Collection. Photograph by Joseph Lynn Lyon.

In further support of a downward-angled gunshot traversing Hyrum Smith's face and exiting from the right side of his neck we offer the following evidence. The men who reburied Hyrum Smith's body in fall 1844 reported, "It was found at this time that two of Hyrum Smith's teeth had fallen into the inside of his mouth, supposed to have been done by a ball at the time of the martyrdom, but which was not discovered at the time he was laid out, in consequence of his jaws being tied up."⁴⁵ A musket ball that struck the left side of his face and traveled downward would have knocked

43. Joseph L. Lyon, "Hyrum Smith's Clothes and Pocket Watch," notes on a visit with Eldred G. Smith, Salt Lake City, April 26, 1999, in authors' possession.

44. *History of the Church*, 6:619; 7:102, 107.

45. *History of the Church*, 6:629. A musket ball shot through the floor of the mouth would have passed upward through the hard palate, through the bottom of the skull, and into the brain. The short distance between the hallway and Hyrum Smith's body means the ball would have passed through the top of the skull, shattering it. In the pictures of the Smith brothers' skulls taken in January 1928 at the time of their reburial, there was no evidence of fractures to the top or back of either skull. Compare with Tracy, *In Search of Joseph*, 52, 53.



FIG. 18. Deathmasks of Hyrum Smith (*left*) and Joseph Smith (*right*). Courtesy Museum of Church History and Art.

out two or more of the left upper molars. These molars were undoubtedly being held in place by the mucous membrane lining of his mouth and attached at one end to the fragment of his upper jaw when he was first buried. By the time his body was viewed again three months after his death, the mucous membrane would have decomposed, and the two left upper molars would have dropped into his mouth.

We inspected a copy of Hyrum Smith's death mask at the Museum of Church History and Art in Salt Lake City (fig. 18). The mask showed that Hyrum Smith's left cheekbone was depressed about 2 millimeters compared to the right cheekbone. This depression appeared only on the left side of his face and extended over that area from the left side of his nose to the left side of the mask. The most likely cause of such a depression is a fracture of the left maxillary bone. We also obtained access to a copy of Hyrum Smith's death mask owned by Grant Fairbanks, a Salt Lake City plastic surgeon.⁴⁶ The wound to the left side of Hyrum Smith's face was 1 inch to the left of the midline of his face and was plugged with cotton when the mask was made, thus stretching the skin around the wound. The cotton had been pushed toward Hyrum Smith's nose when the mask was

46. Joseph L. Lyon, "Cast of Hyrum Smith's Death Mask," notes of a meeting with Grant Fairbanks, M.D., April 25, 1999, copy in authors' possession.

Effect of an 1816 Musket Ball on a Simulated Human Skull

John Spangler, a collector of historic military firearms, and Joseph L. Lyon, one of the authors, performed an experiment to estimate the damage done to a skull by a 69-caliber musket ball when fired through a piece of hardwood similar to the door at Carthage Jail.¹ We obtained an artificial skull made of a synthetic material and used in training neurosurgery residents to cut out sections of bone from the human skull.²

We used a rectangular box made of 0.75-inch pine boards to hold a hardwood board and the skull. The skull sat on a wadded newspaper at the back of the box behind a piece of well-dried, 0.8-inch-thick black walnut board, held in place by half-inch wood cleats at the bottom and the middle. The black walnut wood was likely similar to the wood used in the door of the jailer's bedroom. Our goal was to replicate the amount of resistance to a musket ball that the bedroom door would have offered. The skull was positioned on its side with the back lifted up so the ball would pass through the walnut, strike the skull over the left maxilla just under the left eye, and exit without striking the bones forming the floor of the cranium.

We used a 397-grain, 0.64-inch musket ball. We propelled the ball with 75 grains of commercially available rifle grade black powder, the same type used in Model 1795 and 1816 military muskets. This load was less than the 80- to 100-grain load typically used in U.S. muskets because the age of the firearm made us reluctant to use the full powder charge. But our purpose was to determine if a musket ball fired through a piece of hardwood had sufficient energy to fracture the maxillary bones of the human skull. The ball was fired in a 69-caliber Model 1816 musket, converted to percussion-cap ignition for use in the Civil War.³ (*continued*)

1. Notes describing test of firepower of a Model 1816 musket, conducted by John Spangler and authors, May 12, 2001, copy in authors' possession.

2. Even though it duplicated the hardness of the human skull, including the thickness and resistance to breaking, this imitation did not replicate some of the finer details of a human skull.

3. A flintlock-ignited musket was not available to the authors for this experiment. A percussion-cap-ignited musket, the next

The musket was discharged about 2 inches from the walnut board. The force of the ball striking the skull knocked the left maxilla and the base of the right maxilla off the skull and threw them about 15 feet from the box. Had this been the skull of a living person, the overlying soft tissue (skin, muscles, fascia) would have prevented the maxillae from being blown off the skull. However, we concluded that after being fired through a piece of dried walnut a musket ball still had sufficient force to fracture the maxillary bones.

We also wanted to determine what the effect would be if the musket ball had been moving parallel to the floor and struck the back of Hyrum Smith's skull as the eyewitness accounts suggest. We repositioned the skull so it faced another walnut panel and was parallel to the bottom of the box. Using the same powder charge, we fired another ball through the walnut board into the right maxilla, medial and slightly below the right eye socket. The musket barrel was parallel to the floor of the box when discharged and was about 1 inch from the walnut board.

The musket ball created a fracture of the skull that extended from the point of entry diagonally across the bridge of the nose and then upward 7 inches into the left frontal bone. Much of the right side of the face, including the right eye socket, maxilla, temporal bone, half the right parietal bone, and the entire occipital bone were fractured, pulverized, or blown off the skull. The entire occipital bone, which forms the back of the skull, about 4 inches long by 3.5 inches wide, was blown to small fragments, leaving a massive exit wound.

We concluded that if Hyrum Smith had been struck by a ball from a 69-caliber musket fired through the door that then traversed his skull parallel to the floor, it would have left a massive exit wound at the back of his skull. However, neither eyewitness account mentions such a wound nor was such a wound evident when his skull was exhumed and photographed in 1928.

best alternative, was used instead. The difference in muzzle energy between a flintlock-ignited musket and a percussion-cap-ignited musket was negligible, so the results of the experiment would have been similar regardless of which weapon was used.

made, exposing the outer edge of the bullet hole. The diameter of the hole was 0.7 inches, consistent with a wound inflicted by a 69-caliber musket ball. We also confirmed this dimension with the mask at the museum.

The pictures of Hyrum Smith's skull taken in January 1928, just before his final interment, showed that the left and right upper jawbones and nasal bones were missing from his skull and that the bone edges were rounded, suggesting they had been exposed to the elements for a long time.⁴⁷ These missing bones from Hyrum Smith's skull undoubtedly were fractured by the force of the musket ball that struck him just below his left eye. As the overlying tissue decayed, the bones fell away and were lost when the skeletal remains were exhumed. The photographs of his skull also showed no evidence of damage to the occipital (back) area of the skull.⁴⁸ This was the area where a musket ball traveling parallel (or almost parallel) to the long axis of his body would have struck if he were shot while standing erect.

A downward-angled wound through the skull also resolved one physically impossible aspect of the eyewitness accounts of Hyrum Smith's death. Both report Hyrum Smith as saying immediately after he was shot in the face, "I am a dead man!" and then falling backward on the floor.⁴⁹ If he were standing erect (6 feet 2 inches) with his face vertical to the floor when struck by the musket ball, as the accounts of Willard Richards and John Taylor suggest, the ball would have struck his brain stem (medulla oblongata) at the base of his brain. The brain stem controls speech, respiration, and all muscular movements. Any damage to this vital part would have rendered him instantly speechless and paralyzed all muscles, making a verbal statement impossible. But if his face were tilted forward, parallel to the floor, the musket ball would have severed the arteries in the floor of his mouth and exited on the right side of the neck, under the jawbone. He would have had difficulty speaking from the injury to his

47. Tracy, *In Search of Joseph*, 41–43.

48. The skull we have identified as Hyrum Smith's was originally identified as Joseph Smith's. Shannon Tracy asserted that the skulls of the Smith brothers were misidentified when they were reburied in 1928 by the Reorganized Church of Jesus Christ of Latter Day Saints (now Community of Christ). We concur with this assertion. The skull identified by the excavators as Hyrum Smith's had no hole in the left maxilla, but a small defect to the right maxilla. The skull identified as Joseph Smith's was missing the bones of the nose, the floor of the mouth, the frontal sinuses and upper jaws. This would be consistent with a traumatic fracture to these structures such as that caused by a 69-caliber musket ball striking the left maxilla. Tracy, *In Search of Joseph*, 48–60.

49. *History of the Church*, 7:102; 6:620.

tongue, but it would have been possible before blood loss led to unconsciousness and death.

To test whether a 6-foot-2-inch man bracing against a door would have been hit in the face by a shot fired 51.75 inches above the floor, we enlisted the aid of a man of that height and had him brace himself against a door opening to his right. If he braced with his left shoulder and turned his head to the right, his face was between 49 and 54 inches above the floor.

Retaliation

When Hyrum Smith fell to the floor, the attackers pushed the door partly open. After seeing his brother mortally wounded, Joseph Smith responded to the murderers. Because of the continual death threats he had received by the various militia units in Carthage and overheard by many Mormons present, he had been given a six-barreled, percussion-cap-ignited, Allen “pepper box” revolver earlier in the day by Cyrus H. Wheelock for protection.⁵⁰ Designed to be carried in a pocket, these pistols were produced in three calibers: 28, 31, and 36.⁵¹

Common sense dictates that Joseph Smith probably waited until the attackers had fired a volley into the room. Then standing on the right side of the partly open door to protect himself and holding the revolver around the door, he would have pulled the trigger six times.⁵² Three of the six barrels were fired. The balls from the pistol struck three men, two in the upper arm and a third in the face. None of these wounds was immediately fatal, though one of the men was said to have died later from the injuries.⁵³ The wounded men would have had to walk or have been carried down the stairs. Because of the narrow hallway and stairs, this likely caused a lull in the firing. During this short lull, the men in the room probably tried to rectify the problem that caused three barrels to misfire, but no evidence suggests they were successful.

50. *History of the Church*, 6:617, 620; 7:102–3. Writing about Joseph Smith’s assassination for *Atlantic Monthly* in 1869, John Hay, who knew many of the attackers personally, reflected their anger that the victims were armed and blamed the “Jack Mormon” sheriff of Hancock County, Miner Deming, for allowing the prisoners to have firearms. John Hay, “The Mormon Prophet’s Tragedy,” *Atlantic Monthly* 24 (December 1869): 676.

51. Flayderman, *Flayderman’s Guide*, 56–57.

52. *History of the Church*, 6:620; 7:103.

53. *History of the Church*, 7:103. B. H. Roberts quoted John Hay, who said that four men were wounded and that three of the wounds were in the upper arms and one in the face. One man was said to have died at a later time from an arm wound. See *Comprehensive History*, 2:285 n. 19.



FIG. 19. Pistols given to Joseph and Hyrum Smith while they were in Carthage Jail. Courtesy Richard Neitzel Holzapfel.

However, this firing by Joseph Smith produced enough fear to restrain the attackers from immediately rushing through the door and killing everyone in the room. Records show that Hyrum Smith was also armed with a single-shot pistol given to the prisoners for their defense by John S. Fullmer.⁵⁴ This pistol was not fired during the attack, but it is now in the possession of the Church Museum of History and Art along with the one Joseph Smith fired (see fig. 19).

When Joseph Smith's pistol was empty, the only defense left to the men in the room was their walking sticks. Undoubtedly, both John Taylor and Willard Richards put pressure on the door to prevent it from being pushed open completely, and both report striking at the musket barrels with their canes to deflect the bullets downward.⁵⁵

Since Willard Richards, John Taylor, and Joseph Smith were still trying to push the door shut after it was partially forced open, at least one of the attackers would have had to continue pushing on the door, while others fired around him. That man might have resisted the prisoners' efforts by holding a musket butt in the space between the doorjamb and the door.

54. *History of the Church*, 6:607–8.

55. *History of the Church*, 7:103–4.

The attackers did not hit anyone in the northwest corner of the room. This suggests that the door and the narrow hallway blocked those trying to shoot into this corner of the room.

As the frequency of musket fire increased, John Taylor left the temporary safety of the door and ran to a window; he says he did this to look for friends and to escape.⁵⁶ Perhaps he also hoped to draw the attackers away from Joseph Smith and be mistaken for him. John Taylor undoubtedly waited until immediately after a volley was fired, which would have given him a few precious seconds before musket fire resumed—otherwise he never would have reached the window without being shot. This action required considerable courage because the door had been forced partly open and the south and east windows were visible to the men firing from the hallway. John Taylor reached the window, then turned the left side of his body to the bedroom door before mounting the windowsill. While in this position, he was shot from the doorway in the left thigh and fell to the floor. He lost all control over his muscles and fell limp for a brief period.⁵⁷

Although John Taylor believed he started to pitch headfirst out the window and was saved only when a musket ball struck his watch (fig. 20), Neil and Gayle Ord have established—based on the linear dents in the back of the watch—that his watch was not hit by a musket ball, rather the watch broke as he fell across the edge of the windowsill before falling to the floor.⁵⁸ John Taylor then regained muscle control and crawled or rolled under the bed in the southeast corner of the room.⁵⁹ While making his way toward the bed, he was shot from the door three more times. The fact that he was shot once in the thigh, fell to the floor, lay still for a few seconds without being shot again immediately, and then started crawling toward the bed before being



FIG. 20. John Taylor's pocket watch, which probably broke as he fell on the window sill. Courtesy Museum of Church History and Art.

56. *History of the Church*, 7:104.

57. *History of the Church*, 7:104–5.

58. Leonard, *Nauvoo*, 397 n. 47; Ord and Ord, "Artifacts of the Martyrdom."

59. *History of the Church*, 6:620.

shot three more times suggest that the attackers were firing volleys of two to three muskets every twenty to thirty seconds.⁶⁰

The men at the door probably knew what Joseph Smith looked like and that the man they had just wounded was not the man they sought. Joseph Smith must have realized that the attackers' fear of another firearm in the room would soon diminish, and they would shortly burst into the room and kill him and Willard Richards.

Joseph Smith probably then decided he might be able to save Willard Richards's life by moving into the line of fire and attempting to jump from the east window, which was the nearest window to Joseph Smith's haven in the northwest corner of the room. This action would draw the attackers outside. He would have timed his run to the east window immediately after a discharge of muskets from the door, knowing it took several seconds to replace the fired muskets. This pause would have given him a few seconds free from musket fire. He reached the east window and must have had his legs part way out when, as reported by Willard Richards, he was shot two times from the door and once by someone outside the jail.

60. In our minds, John Taylor's account is subject to two interpretations concerning the window to which he ran. His 1856 account said, "I made a spring for the window which was right in front of the jail door, where the mob was standing." *History of the Church*, 7:104. The south window in the bedroom looks down on the front door of the jail, and there were people standing in front of that door. John Taylor's use of the words "jail door" could also refer to the door to the jailer's bedroom, but he refers to the bedroom door simply as "the door" adding no modifier in the other parts of his account. He does use the words "jail door" once again in his account: "Immediately afterwards I saw the doctor going toward the jail door, and as there was an iron door at the head of the stairs adjoining our door which led into the cells for criminals, it struck me that the doctor was going in there, and I said to him, 'Stop, Doctor, and take me along.' He proceeded to the door and opened it, and then returned and dragged me along to a small cell prepared for criminals." Here, John Taylor uses "jail door" to mean the entrance into the iron-barred cells on the north end of the second floor. B. H. Roberts wrote, "[John Taylor] rolled under the bed, which was at the right of the window in the south-east corner of the room." *History of the Church*, 6:618. Willard Richards adds, "Joseph attempted, as the last resort, to leap the same window from whence Mr. Taylor fell." Willard Richards's account was written closer to the event, so the east window is most likely, but it presents a problem. To reach the relative safety under the bed, John Taylor would have had to crawl backward, facing the door and dragging his already wounded left leg. This would have been much more difficult than crawling forward if he was wounded by the south window. We know this because he was again wounded in his left arm, hip, and leg before reaching the bed, so his left side had to be facing the bedroom door.

The men who prepared Joseph Smith's body for burial reported a wound to the lower abdomen and another wound to the right hip. (This wound may have been an exit wound from the abdominal wound, but it is impossible to tell from their description.) The men also reported a wound to the right breast, a wound under the heart, and a wound in the right shoulder near the neck. The coroner's jury mentions two wounds, one to the right side of the chest and one in the right neck near the shoulder, but the jury mentioned only some of the wounds to both bodies.⁶¹ Willard Richards's account says Joseph Smith was shot twice from the door and once from below.

We think it most likely that Joseph Smith had turned the right side of his body toward the door and was trying to get his left leg out the window when he was first shot and that these shots came from the doorway. When John Taylor was shot, he fell back into the room, but Joseph Smith's upper body must have been very near the window opening, and the shots from the door likely caused him to fall out the window rather than back into the room. We think the wound on his left side under his heart came from someone standing below the east window. The shot would have been fired at an upward angle. The ball would have been traveling upward and likely traversed his chest cavity, exiting in the area above the right collarbone near the right shoulder. The pathway of a musket ball fired at this angle would have struck his heart and/or the great vessels associated with it. Such a shot would have been immediately fatal. He then fell through the open window to the ground below.

It could not have taken Joseph Smith more than twenty seconds to cross the room, mount the wide windowsill, and get his left leg part way out the window. This again gives us an estimate of the time it took the attackers to pass loaded muskets to those firing through the door. Joseph Smith's final act of self-sacrifice ensured that there were two friendly eyewitnesses to the murders.

Situation in the Hallway

Reloading their weapons would have been a difficult task for the men in the hallway. To reload a flintlock musket required about 62 to 64 inches of space. The leveled musket occupied 42 to 44 inches of space in front of the loader, while the person occupied the remaining 20 inches. Soldiers performed drills to load and fire their muskets rapidly with the claim that

61. "Findings of the Coroner's Jury." For example, only two of Hyrum Smith's six wounds are mentioned.

well-drilled troops could fire three shots per minute,⁶² but the narrow hallway in front of the bedroom door would have restricted movement and slowed down this process. The length of the floor in front of the door was 3 feet 8 inches wide in front of the door; the distance from the cellblock south wall to the door was 2 feet 2.5 inches, with the door adding another 2 feet 9.5 inches and the width to the stair railing 3 feet 8 inches.

John Taylor reported more and more muskets being pressed into the room and attributed this to men on the stairs pushing those in front of them into the room.⁶³ Given the space limitations of the hallway and the danger of standing close to the side of a flintlock musket, we think a more likely explanation was that the men standing on the stairs and outside the front door of the jail passed their loaded muskets up the stairs to the small number of men closest to the bedroom door, who then fired into the room. Afterward, the fired muskets were passed down the stairs in exchange for loaded muskets. This type of reloading was common when muskets were muzzle loaded on battlefields. The process would have shortened the time interval between the musket volleys and given the impression that more men were standing in front of the door.

A 69-caliber musket ball fired through the door would have had sufficient energy to severely wound or kill anyone on the other side of the door; yet only two shots were fired through the door. Since the door was being held firmly shut, the simplest course of action for the attackers would have been to fire multiple times through the door, killing or wounding anyone attempting to hold it closed. The fact that only two balls were fired through the solid part of the door confirm the eyewitness accounts that the attackers were able to force the door partly open quickly and then begin firing into the room.⁶⁴ The southeast corner where the bed was located would have been the one first exposed, then the area on the south wall over the

62. Richard Bruce Winders, *Mr. Polk's Army* (College Station: Texas A&M University Press, 1997), 92–94; Ernest F. Fisher Jr., “Weapons and Equipment Evolution and Its Influence upon the Organization and Tactics in the American Army, 1775–1963,” unpublished manuscript, Office of the Chief of Military History, 1963, File 2-3.7, AB.Z, U.S. Army Center of Military History (CMH), Washington, D.C. A summary can be found at http://www.history.army.mil/StaffRide/Antietam/Small_Arms.htm.

63. *History of the Church*, 7:103. John Taylor states, “Every moment the crowd at the door became more dense, as they were unquestionably pressed on by those in the rear ascending the stairs, until the whole entrance at the door was literally crowded with muskets and rifles.” He did not further define the use of the word rifle.

64. *History of the Church*, 6:619–20; 7:102–4.

front door to the jail. As the door was forced further open, the east wall would have been exposed.

Once committed to this course of action, the attackers continued firing into the room, pushing the door farther and farther open, trying to reach the northwest corner where they knew Joseph Smith was. The unpleasant surprise of finding the prisoners armed undoubtedly caused the attackers to remain in the hallway and try to kill those in the room without exposing themselves.

We believe three men were the maximum that could have fired into the room with any degree of personal safety. This assertion is based on the space at the head of the stairs and the hazards to those standing nearby when a flintlock was fired. Our belief is supported by the number of men Joseph Smith is said to have wounded and by the wounds to John Taylor and Joseph Smith. John Taylor received a wound in the thigh, fell to the floor and lay there briefly, then crawled toward the bed in the southeast corner of the room, where he received three more wounds. Joseph Smith's wounds suggest that he was shot two or three times from men at the bedroom door, while one shot was believed to have been fired by someone standing under the window. This suggests that shots were coming from the door in twos and threes with a pause of several seconds between them.

Some of the attackers may have positioned themselves in the short space to the south of the door. These men would have had the best angle to shoot toward the northwest corner of the room, but the width of the platform would have made it impossible to aim their muskets into the room without thrusting the muzzles partway through the doorway and running the risk of having the barrels knocked down. Willard Richards comments that as the door was pushed farther open, musket barrels protruded into the room about half their length (roughly 2.4 feet).⁶⁵

Based on the evidence from the wounds received by those in the room, the accuracy of those firing into the room was poor, despite the 15-foot maximum range. The initial wounds John Taylor and Joseph Smith received were not immediately fatal and in John Taylor's case not fatal at all. John Taylor's initial wound was in his thigh. Joseph Smith's initial wounds were in his upper thigh/lower abdomen.⁶⁶ This suggests problems in aiming the muskets, difficulty with visibility, and an inability to hold the muskets steady in the cramped space at the top of the stairs.

65. *History of the Church*, 6:620.

66. *History of the Church*, 6:620, 627; Willard Richards to Brigham Young, June 30, 1844, in *History of the Church*, 7:147–48; Jesse, "Return to Carthage," 17 n. 30.

In addition, the musket barrels were being vigorously deflected downward by the canes of John Taylor and Willard Richards.

Wounds Received

Willard Richards made three reports about the Smiths' wounds. The first was in his June 27, 1844, recital for the *Times and Seasons*, "Two Minutes in Jail." The second was in a letter to Brigham Young three days later, on June 30.⁶⁷ The third was in a letter to the Saints in England, dated July 9, 1844.⁶⁸ Willard Richards reported six wounds in Hyrum Smith's body. These were as follows: (1) a wound to left of his nose; (2) a wound under his chin to the right of the midline (which we believe was an exit wound for the ball that struck the left side of his face); (3) a wound through his lower back without an exit wound at the front of his abdomen, but with sufficient force to shatter the watch in his vest pocket; (4) a graze wound to his breast bone; (5) a wound just below the left knee; and (6) a wound to the back of the right thigh. Four of these wounds were confirmed by defects found in Hyrum Smith's clothing.⁶⁹

Joseph Smith was shot through the right upper thigh, right lower abdomen, right breast, right shoulder near the neck, and under his heart—with a likely exit wound behind the right clavicle. The wound in his right hip and shoulder may have been exit wounds. Unfortunately, none of his clothes have survived.

Several accounts claim that Joseph Smith's body was propped against the well and that he was shot in the chest by four of the militia acting under

67. *History of the Church*, 6:619–20, 627; Willard Richards to Brigham Young, June 30, 1844, in *History of the Church*, 7:147.

68. Willard Richards and John Taylor to Elder Reuben Hedlock and the Saints in the British Empire, July 9, 1844, in *Journal History*.

69. *History of the Church*, 6:619–20. The clothes Hyrum Smith was wearing when he was shot are in the possession of his great-grandson Eldred G. Smith. There was an entrance hole through the left trouser leg, another hole through the back of the right trouser leg, and a hole through the back of the right side of his vest, pants, and shirt. The right edge of the front of the vest had also lost an irregular section of fabric approximately two inches wide by three inches long. The defect in the vest was larger at the top and came to a point at the bottom. It had been stated that this defect was made by a musket ball that struck Hyrum Smith's chest and then continued into the floor of his mouth. But the defect in the fabric was broad at the top, coming to a point at the bottom, instead suggesting it was made by a musket ball exiting the skull and tearing the fabric from the top downward. The lack of damage to the top of the skull also suggested the damage to the fabric was made by an exiting musket ball. Lyon, "Hyrum Smith's Clothes and Pocket Watch." See also Tracy, *In Search of Joseph*, 75–77.

the direction of Colonel Levi Williams.⁷⁰ Another account claims one of the Warsaw militiamen drove a bayonet through his body and left him transfixed to the well casing.⁷¹ None of the wounds reported by Willard Richards to Brigham Young supports these stories.⁷²

John Taylor was shot first through his left thigh, then, several seconds later while making his way to the bed, he was hit in his left leg below the knee, in his left forearm, and in his left hip.⁷³ He also believed he had been hit in the abdomen by a ball from outside the window that shattered his watch, but Neil and Gayle Ord have established that the watch was not hit by a musket ball but rather was shattered when John Taylor fell against the windowsill after being shot from the door.⁷⁴ Willard Richards's left earlobe was grazed by a musket ball.⁷⁵

The musket balls fired from the hallway—and that struck the four occupants of the room—total at least thirteen: Hyrum Smith, five; John Taylor, four; Willard Richards, one; Joseph Smith, three or possibly four. One account written forty-one years after the martyrdom claims there were thirty-five holes in the walls.⁷⁶ Given the number of wounds received by those in the room and the account by Wood, we think it likely that somewhere between forty-five and fifty-five musket balls were fired into the room. Since it was probable that no more than three men were able to fire into the room at any given time, they would have had to reload or receive loaded muskets up to eighteen times to inflict the damage catalogued here.

Willard Richards titled one of his reports of the martyrdom “Two Minutes in Jail.” We think the actual time was longer, perhaps as long as nine minutes. First, it would have taken twenty to thirty seconds to exchange muskets with those firing, and with only three men able to fire

70. See Leonard, *Nauvoo*, 397 n. 50.

71. Woods, “Mormon Prophet.”

72. Willard Richards to Brigham Young, June 30, 1844, in *History of the Church*, 7:147. The wounds reported by Willard Richards in Joseph Smith's body do not support the story that he was propped up against the well and shot by a firing party of four men after he fell to the ground. Willard Richards counted four wounds in Joseph Smith's body, two of them in the chest. Both of the chest wounds are believed to have occurred when Joseph Smith was trying to jump from the window. The wound Willard Richards mentioned above Joseph Smith's clavicle probably was an exit wound; had he been shot after falling to the ground, we would expect Richards to have found three or four more chest wounds.

73. *History of the Church*, 6:618; Willard Richards to Brigham Young, June 30, 1844, in *History of the Church*, 7:147.

74. *History of the Church*, 7:104; Ord and Ord, “Artifacts of the Martyrdom”; Leonard, *Nauvoo*, 397 n. 47.

75. *History of the Church*, 6:619.

76. Woods, “Mormon Prophet.”

into the room and between forty-five and fifty-five shots fired into the room at an interval of between twenty and thirty seconds, it would have taken between five and nine minutes to fire into the bedroom that many times. Second, the attackers were also confronted with two unexpected developments: the intended victims were not in the jail cells and they were armed. Remember, the men in the room wounded at least three of the attackers. All of this increased the time it took to complete their murder of Joseph Smith.

Wound to Hyrum Smith's Lower Back

The most perplexing physical aspect of the assassinations was the wound to Hyrum Smith's lower back. We can reconstruct the wound from his clothes. The ball entered the lower part of his back on the right side, about 47 inches from his trouser cuff. The ball then traversed his abdomen, striking the pocket watch in his right vest pocket with sufficient energy to smash the crystal and the ceramic face of his watch, but the ball did not penetrate the skin of the abdominal wall. Both John Taylor and Willard Richards claim the ball that produced this wound came through the open east window.⁷⁷ John Taylor believes a member of the Carthage Greys fired the shot. This was possible, yet it was just as likely that a member of the Warsaw Militia fired the shot.

We explored the possibility the shot came in through the window from two perspectives: a shot from a tree and a shot from the ground. A drawing made by Frederick Piercy on site in 1853 and published in 1855, eleven years after the martyrdom, shows a tree on the southeast corner of the jail lot. However, this tree was too far to the southeast to provide a pathway to the bedroom where Hyrum Smith was standing. A second tree was in line with the east window but was too small to support the weight of a man.⁷⁸

This left the possibility of a shot from the ground. We calculated the distance from the jail a shooter would have required to hit Hyrum Smith in the lower back. If the bullet pathway increased 1 inch from the back to the front of his body, assuming a standard 10-inch-body thickness, then a musket would have to have been fired from 32 yards away. If the rise on the

77. *History of the Church*, 7:102; *History of the Church*, 6:617, 619–20.

78. *Comprehensive History*, 2:256; Piercy, *Route from Liverpool*, illustration xv. No trees are evident in a woodcut published in William M. Daniels, *A Correct Account of the Murder of Generals Joseph and Hyrum Smith at Carthage, on the 27th Day of June; 1844 by Wm. M. Daniels, an Eye Witness* (Nauvoo, Ill.: John Taylor, 1845), nor in an engraved version of the image in a later publication. See the illustration in Leonard, *Nauvoo*, 393.

bullet is reduced to half an inch, the distance would increase to 64 yards, and if dropped to 0.25 inches, the distance would lengthen to 128 yards.

We stood outside Carthage Jail about 25 yards from the jailer's bedroom door on June 16, 1999, at about 4:20 p.m. (CDT or 5:20 p.m. CST), approximately the same time as the assassinations likely occurred and eleven days earlier in the year. The day was sunny, as it was in 1844. The sun shone above the roofline of the jail, and the east window was in shadow. We could not see individuals in white shirts standing in the jailer's bedroom unless they stood at the windowsill. Considering these circumstances and the poor accuracy of a smoothbore military musket, we concluded that if a shot from the ground hit Hyrum Smith, then it was not an aimed shot, rather one that found its mark by chance.

We also concluded that either the ball came from some distance away or that Hyrum Smith's skin absorbed a substantial amount of energy. The skin is the most elastic organ in the body and when struck from within will stretch outward considerably. Even a bullet from modern firearms will stretch the skin outward several inches. The damage to Hyrum Smith's watch was sufficient to break the crystal, knock off the hands, knock off most of the enamel finish from the watch face, split the front of the watch case, and indent the watch face about 0.125 inches. Yet the damage to the watch was substantially less than that expected from a 69-caliber musket ball fired with a powder charge equivalent to a pistol (see figs. 21 and 22, pictures of Hyrum Smith's watch and a watch struck by a 69-caliber

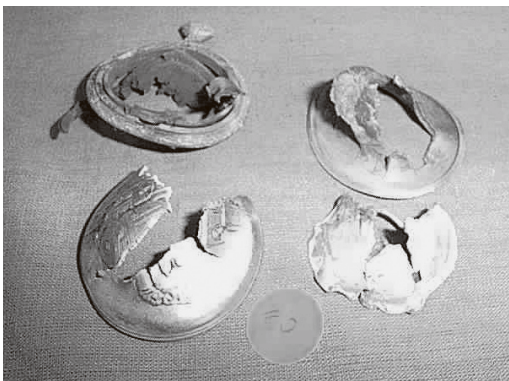


FIG. 21. Damage to a twentieth-century pocket watch with a metal face protector. The watch was hit with a 69-caliber musket ball driven by a black-powder charge of 20 grains, equivalent to that fired by a smoothbore musket about 100 yards away. Photograph by Joseph Lynn Lyon.

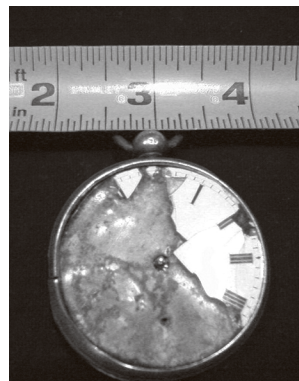


FIG. 22. Face of Hyrum Smith's pocket watch hit by a 69-caliber musket ball on June 27, 1844. Photograph by Joseph Lynn Lyon.

musket ball fired with a velocity equivalent to a shot fired from about 75 yards away). However, the diameter of the depression the ball left in the face of Hyrum Smith's pocket watch was consistent with what we expected from the impact of a 69-caliber musket soft-lead ball.⁷⁹ There was a circular depression on the face of the watch between the 4 o'clock and 8 o'clock positions. The depression was asymmetrical, being 0.75 inches at its longest diameter and 0.70 inches at its shortest. When we fired musket balls into eight different pocket watches, the balls made irregular holes through the watchcases, varying in width from 0.535 inches to 0.85 inches and in height from 0.30 inches to 0.92 inches.

Although the wound to Hyrum Smith's lower back may have occurred after he was dead, the eyewitness accounts and the physical evidence do not support this option. Both Willard Richards and John Taylor agree that Hyrum Smith fell to the floor on his back and did not move again, and neither eyewitness mentions Hyrum Smith being shot again after Joseph Smith was killed. John Taylor could see Hyrum Smith's body from the head of the stairs, where he was waiting to be moved after Joseph Smith's death, and declared the body had not moved.⁸⁰ Willard Richards says that after the attackers ran outside the jail, some returned while he was hiding John Taylor in the iron prison cell. However, the men turned and ran as soon as the cry "The Mormons are coming" was heard.⁸¹ This and the fact that the attackers knew their shots would summon the main company of the Carthage Greys, encamped on the town square about 600 yards away, precluded any lingering at the jail. The Greys were said to have arrived within a few minutes of the start of the attack, just in time to see the attackers running into the woods.⁸²

The suggestion that the wound on Hyrum Smith's lower back was made after his death also was not supported by the clothing he was wearing at the time of the martyrdom. Such a wound, if made after death, would have been made by someone firing at very close range into his body after turning the body over. There is no evidence of powder burns, or their residue, on the light-colored fabric of the vest where the ball entered his back.⁸³ If Hyrum Smith were shot after death, it would have been at very

79. Lyon, "Hyrum Smith's Clothes and Pocket Watch."

80. *History of the Church*, 7:107.

81. *History of the Church*, 6:621; 7:102-7.

82. *History of the Church*, 6:621.

83. While testing an 1816 musket's effect on pocket watches on June 26, 1999, we fired a musket about six inches from a cloth pocket holding a pocket watch. The muzzle blast set the fabric on fire and left a charred hole, about one inch in diameter, in the cloth.

Comparison of Information about the Martyrdom

Event or Action	Evidence—eyewitness and/or physical evidence						
	Richards	Taylor	John Hay	Doctor	Lawyer	Physical Evidence	Others
Location at Time of the Attack							
Jailer's bedroom	Yes	Yes	Yes	Yes	Yes	Bullet holes in door	
Coats removed	Richards said every-one but himself had removed their coats.	Yes					
Vest	Mentions Hyrum's vest				Defects in Hyrum's vest		
Initial Indication of Attack							
Sees men rushing jail	Yes	Yes					
Initial shots by the murderers	Yes	No—first shot mentioned is the one through the keyhole				No evidence	
Second shot through door latch	Yes	Yes				Damage to edge of door	
Shot through door panel	Yes	Yes		Yes		Hole present	
Painted faces	No mention	Yes					
Hyrum Smith's Wounds							
Back	Yes	Yes				Hyrum's watch	Damage to skull
Left side of nose	Yes	Yes				Death mask	Coroner's jury
Throat	No	No					
Front of chest	Yes	No					
Other balls hit him	Yes	No					
Joseph Smith Retaliates							
Type of pistol used	Six-shooter	Six-shooter	Six-barreled revolver	Allen pepperbox		Museum	
Number wounded	No	Two or three	Four	One			
John Taylor Runs to the Window							
Runs to window and is shot	Yes	Yes					
Ball hits watch	Yes	No—"fell inside from some, at that time, unknown cause"					
Falls to the floor	Yes	Yes					
Crawls toward bed	Yes	Yes					
Is hit three more times	Mentions Taylor being shot						
Is hit again but doesn't give a number	Yes		Mentions				

Joseph Smith Runs to Window			
Runs to window	Yes	Mentions	
Left leg out of window	No	No	Wounds to right side
Is shot through right side	Yes	No	Men who dressed body for burial
Is shot through chest	Yes	No	
Falls out of the window	Yes	Yes	
Is shot after falling from window	Yes	No mention	
Willard Richards Runs to the Window			
Sees bayonets	Yes	No	
Richards moves Taylor to the cell area	Yes	Yes	Indirectly—says they found Taylor in the cell but doesn't say how he got there
Doctor Arrives			
Extracts ball from Taylor	No	Yes	Not directly
Dresses wounds	No	Yes	Yes
Blood stains	No	No	Yes
Anyone shot after Joseph's death	No mention	No mention	
Number of shots fired into the room			35
Mention of pistols except Joseph's and Hyrum's	No	No	Yes—"Smith had two six-barreled revolvers"
Physical Evidence			
Hyrum's clothes	Preserved by family and currently in possession of Eldred G. Smith		
Jailer's bedroom door with gunshot damage	Present at the jail and attested to by several newspaper accounts dating from the 1860s to the present		
Bloodstains	Were present until sometime in the 1980s when they were removed		

close range given the 4-foot-9-inch to 4-foot-11-inch length of the musket and the short stature of people of that era. Yet there is no charring of the vest, trousers, or shirt that he was wearing.

We propose another possible explanation of the wound. Remember that Hyrum Smith was pushing against the door with his left shoulder. When he was shot through the face, he stood up, releasing pressure on the door. The door swung partway open, striking his left shoulder and turning him to face away from the door, exposing the right side of his back to the opening. One of the attackers, with his musket held under his right arm about 49 inches above the floor, fired through the door opening and the ball struck Hyrum Smith in the back. The force of the ball then turned him another 180 degrees, and he fell to the floor with his head away from the door.

The lack of bloodstains on the back of Hyrum Smith's underwear, shirt, trousers, and vest was surprising. Even with a massive arterial hemorrhage from the wound in the floor of the mouth, a substantial amount of blood would have been isolated in the venous system of the legs and abdomen and would have remained in liquid form for several minutes. Gravity would have caused some of this blood to flow from the wound in his back. If Hyrum Smith had fallen on his left side, this blood would have settled to this side of his body, but if he had fallen on his back, as John Taylor and Willard Richards state, then a substantial amount of blood should have exited from the wound for several minutes after he was shot. We have no explanation for the lack of blood on the back of these items of clothing, but it is possible that the clothes were washed sometime in the past by a family member.

With the cooperation of Eldred G. Smith, a great-grandson of Hyrum Smith, we inspected and measured the clothes he was wearing when shot. The musket ball that hit Hyrum Smith's watch passed through the back of the vest, trousers, shirt, and underwear. All of these holes measured between 0.5 inches to 0.62 inches, were slightly elongated, and were located 47 inches above the cuff of the right pant leg. The pants also had a hole through the back of the right leg and through the front of the left leg, where he was shot after falling to the floor (fig. 23). There was no exit wound from either of these wounds, and the entrance holes in the fabric were elongated toward the head, suggesting both balls entered at an upward angle. When Hyrum Smith fell, his right leg must have fallen outward in a frog-leg position. (Some of the wounds to his legs were on the sides and back of his legs, not the front, and his right leg must have been splayed out exposing the back, not the front.) The wounds to the right thigh and lower left leg were made by attackers firing from the door and were likely the result of the musket barrels being knocked downward by Willard Richards and John Taylor. The fabric defect on the left knee was 0.625 inches by 1.5 inches, and the fabric defect over the right thigh was more irregular but about



FIG. 23. Hyrum Smith's pants. Notice the damage from a bullet hole on the left knee and right hip. Eldred G. Smith Family Collection. Photograph by Alan Wood.

0.625 inches in diameter. There was also a 0.625-inch hole in the vest with a linear defect on the right front side of the vest measuring 0.62 inches by 1.5 inches, about an inch below it, and a corresponding defect in the right shirtfront. The circular nature of the upper hole and the irregular nature of the lower hole suggest damage caused by a ball traveling downward. The most likely diameter of the ball that made these holes is 0.64 inches. The holes in the various pieces of clothing were only slightly smaller than the diameter of the musket ball that made them, and the fabric probably stretched a little rather than being completely destroyed.

Summary

This multidisciplinary investigation of the martyrdom has examined the accuracy of the firsthand accounts and evaluated the crime scene. The surviving physical evidence is consistent with an assault by men armed with 69-caliber muskets—the standard musket issued to militia units in Illinois. That military muskets were used is supported by Willard Richards’s mention of bayonets,⁸⁴ by the diameter of the bullet holes in the door, by the diameter of the bullet holes in Hyrum Smith’s clothing⁸⁵ and face, and by the dent in his watch.

The limited space at the head of the stairs, the difficulty of reloading a muzzle-loading musket, and the wounds to John Taylor and Joseph Smith suggest that no more than three men were firing into the room at any time. The number of shots fired indicates the attackers had only minutes to kill the men in the room. The fact the attackers remained in the hallway, rather than entering the room to shoot the four men, is best explained by the fear of the firearms possessed by the men in the bedroom. Once Joseph Smith had discharged his six-barreled pistol, his companions used only their walking sticks for defense, but the attackers did not know this and continued firing from the hallway until they were sure they had killed the religious leader.

Joseph Smith sacrificed himself by running into the line of fire from the open door. This act ensured that there were two friendly eyewitness accounts of the martyrdom and it revealed his courage and selfless dedication to the people he loved.

84. *History of the Church*, 6:620.

85. *History of the Church*, 6:619–20, 627; Tracy, *In Search of Joseph*, 56–57; and our physical investigations as noted above.

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