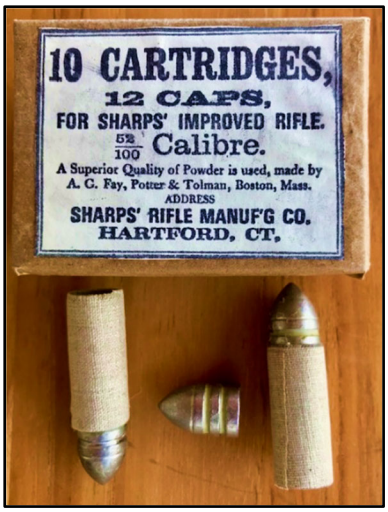
The Authentic Sharps Cartridge Project Part Two: The 1863-1865 Linen Cartridges

by
Bill Skillman

With Dan Wambaugh & Brian White

"In the end it can be safely stated that: You do not know your Civil War gun unless you know and understand its ammunition."
Dean S. Thomas



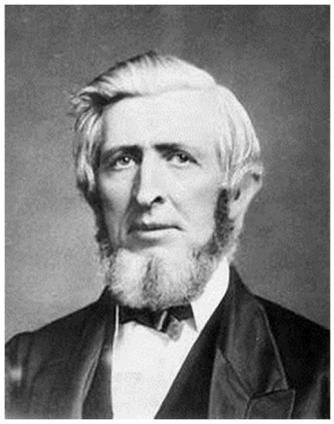
Original 1863-65 Sharps cartridge and packet

2023 Sharps cartridges and packet

In Berdan's United States Sharpshooters in the Army of Potomac, author Captain Charles A. Stevens paid tribute to the Sharps rifle and the ammunition that won them acclaim: "*The open sighted Sharps rifle, using both linen or skin cartridges, 52. Caliber, conical ball, was the best breechloading gun at the time made, a perfectly safe and reliable arm, combining accuracy with rapidity, just what a skirmish line needed for effective work*". (31) While the Ordnance returns list thousands of '*linen'* or *'skin*' cartridges issued to the Sharp Shooters from 1863-1865, there is little evidence to show how those cartridges were made by the Sharps Cartridge Works.

The focus of this article is to document and recreate the Sharps linen cartridges used between 1863 and the end of the Civil War. Compared to the early 'Improved Sharps' cartridges made between 1861-1863, there is significantly more information about the 1863-65 cartridges, thanks to the extensive research provided by Dean S. Thomas in his book Round Ball to Rimfire Part Two-Federal Breechloading Carbines and Rifles.

The 'New Style/Improved' Sharps Cartridge: With the introduction of the Sharps Rifle Manufacturing Company's New Model 1859 Military rifles and carbines came a newly designed cartridge as well. Winston O. Smith wrote: "*Soon afterward, the improved linen cartridges with flat bases made of goldbeaters skin were used. It was not necessary for the block to clip off the bases of these cartridges because the primer flame would burn through the skin*". (30)

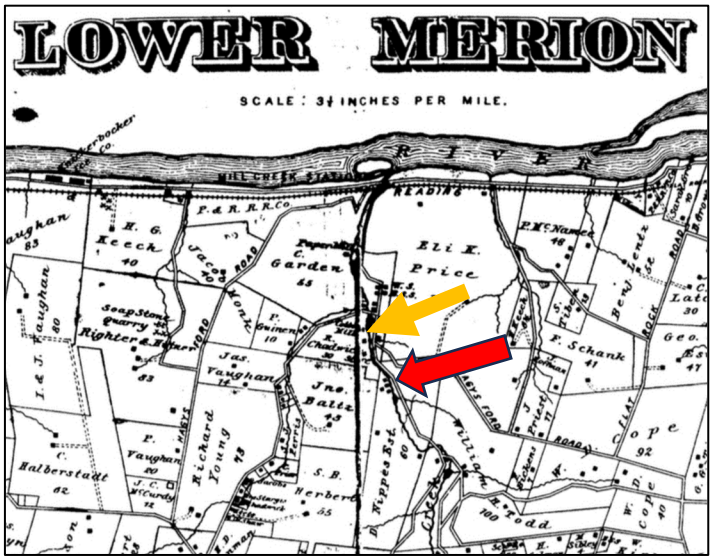


Christian Sharps

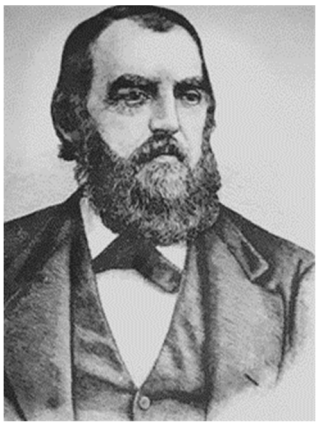
Richard S. Lawrence

Robert Chadwick and the Hartford Cartridge Works (1853-1863): In 1849, Christian Sharps and Albert S. Nippes entered into a contract to manufacture two hundred Model 1849 breechloading rifles. Albert was a thirty-four-year-old, third-generation gunsmith and manager of his family's factory, that had been manufacturing military arms for the United States since the War of 1812. Located in Lower Merion Township (on the outskirts of Philadelphia, Pennsylvania), Mill Creek supplied a steady supply of waterpower to operate the machinery for the small factories along its banks. From its source at Villanova, Mill Creek drops 250 feet over six miles before reaching the Schuylkill River. The property adjacent to Nippe's factory belonged to the Chadwick family, who owned the Merion Cotton Works.

In 1817, twenty-two-year-old William Chadwick escaped from England, secreted aboard a sailing ship bound for America. England prohibited skilled workers from leaving the country, and Chadwick was a seasoned cotton spinner. After his arrival Chadwick worked in cotton mills in Massachusetts and Rhode Island. He married and moved to Delaware County, Pennsylvania and employed by the Bancroft Mill. Gaining experience and technical knowledge (and saving his money), Chadwick worked at a number of cotton mills, rising to manage the Laurel and Valley Forge mills. In 1830, Chadwick purchased 30 acres of timbered land and the water rights along Mill Creek. Within six years, Chadwick had erected a new stone mill, installed machinery and three built residences. He named the new mill *Roseglen*. Over the next twenty-five years the mill produced cotton (oil lamp) wicks and cording.



Map Lower Merion-Mill Creek; (yellow) Chadwick Cotton Mill & (red) Nippes Rifle Works


Robert Chadwick

When Christian Sharps arrived at Mill Creek, *Roseglen* was managed by William's twenty-five-year-old son, Robert Chadwick. The previous year Robert, accompanied by his sister, Sarah Elizabeth Chadwick to England to visit relatives. The sea voyage was necessary on account of Sarah's fragile health, and the family thought the trip to visit relatives would restore her health. After six months, Sarah returned to Mill Creek, her strength and vitality restored. During Christian Sharps stay at the Nippes factory, he became acquainted with the Chadwick's, especially Sarah. Within three years, Christian and Sarah would marry (4)

In 1851, Christian Sharps moved to (West) Hartford to provide technical assistance for the newly established Sharps Rifle Manufacturing Company. Meanwhile, Robert Chadwick, (after a six-week sojourn to manage a cotton mill in Wheeling, Virginia), arrived at Hartford to supervise the new cartridge factory, (located on the grounds of the Sharps factory complex). Within two years, Chadwick raised enough capital to purchase the cartridge works outright. The 1855 Hartford business directories list Robert Chadwick as '*Superintendent of Sharps cartridge manufactory'.*

In November 1858, Robert Chadwick, representing the Sharps Rifle Manufacturing Company, attended the Virginia State Fair in Richmond. After the Fair closed, Chadwick met with Governor Henry Wise to demonstrate the Sharps rifles. The Governor sneered "*that if he was going into battle, he would rather have the old musket, and furthermore, would have my men pour out part of their powder, and not fire until they were within winking distance*". Chadwick replied: "*Well, Governor, if you were to meet a regiment armed in a like manner perhaps you would be right, but I would take a regiment armed with Sharps rifles and have all your men killed before they reached winking distance*". After recovering from his shock, Governor Wise was favorably impressed by Chadwick's sales pitch. A year later, following John Brown's raid on the Harpers Ferry armory, Governor Wise telegraphed the Sharps company to express one hundred rifles and ten thousand cartridges to Richmond.

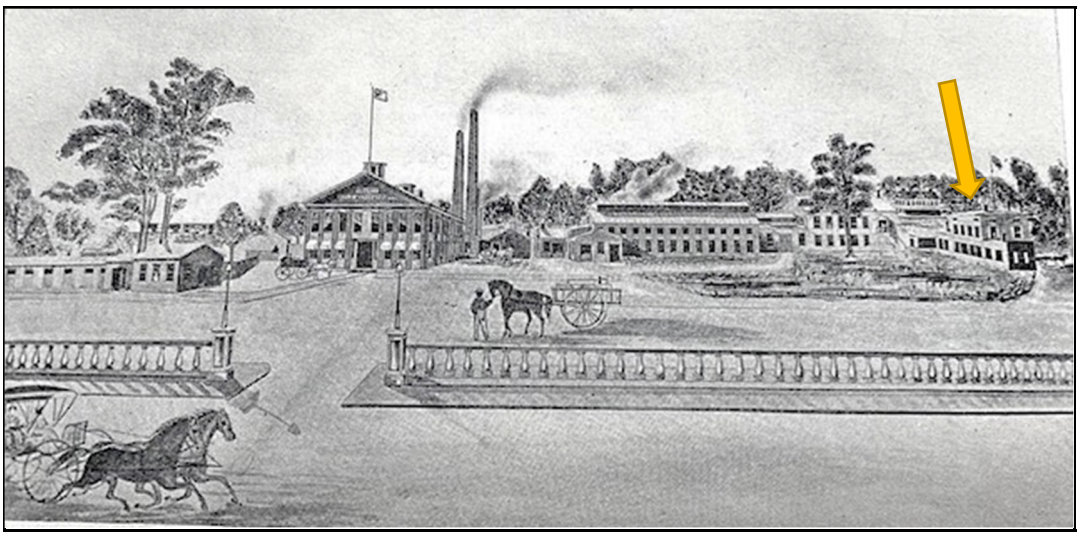
During his ten-year ownership, Chadwick's factory produced millions of cartridges for Sharps rifles and carbines; Colt, Savage, and Whitney revolvers; as well as U.S. military small arms ammunition.

Below is the annual production of Sharps cartridges by the Hartford Cartridge Works (1861-June 1863) and Sharps Rifle Cartridge Works (June 1863-Summer 1865) throughout the Civil War:

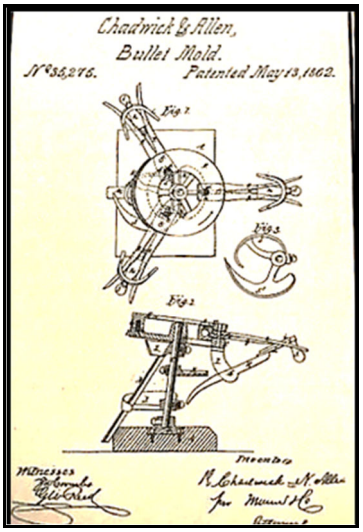
Year	Number	Cost/1000	Note
1861	2,650,000	$21	(*Period covers from Jan-June 1861; third & fourth quarter missing)*
1862	3,282,400	$21	(*200,000 specifically made for Berdan's Sharpshooters in January/February*)
1863	2,350,000	$20	(*Ordnance Dept opens bids to private contractors, U.S. Arsenals begin to make Sharps cartridges)*
1864	1 million	$20	*(Only U.S. contract for SRMCO cartridges in 1864. U.S. Arsenal production=12,883,410)*
1865	1 million	$28	*(Final U.S. contract for SRMCO linen cartridges in 1865. U.S. Arsenal production=3,893,318)*

At the height of ammunition production (1862-63), the Hartford Cartridge Works turned out *80,000 cartridges a week*.

Upon the death of his father, Robert Chadwick sold the Cartridge Works to the Sharps Rifle Manufacturing Company on June 11, 1863. Chadwick returned to Mill Creek to resume management of the family cotton mill. Unfortunately, as SRMCO assumed control of the Cartridge Works, U.S. government contracts dropped off dramatically. During the last two years of the War, Sharps secured only two contracts (totaling 2 million cartridges) a fraction of overall production.



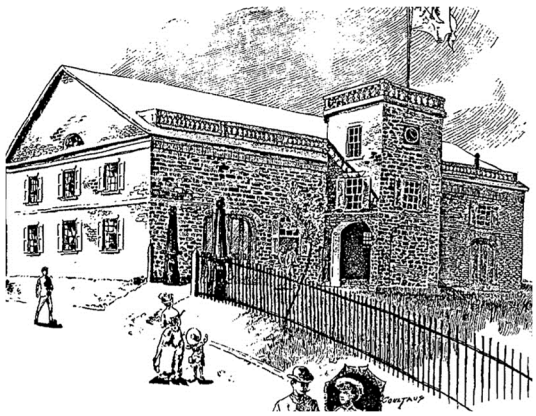
Sharps Rifle Manufacturing Co. (left) and Hartford/Sharps Cartridge Works (yellow arrow), circa 1855



Chadwick-Allen Bullet Mold System

The Sharps Cartridge Works (1863-1865): In December 1862, newly appointed U.S. Ordnance Purchasing Agent, Captain Silas Crispin, arrived at his post at the U.S. Arsenal on Governor's Island in New York. One of his first acts was to alert Chief of Ordnance, Major James Ripley, of the possibility that the Sharps Cartridge Works (being the sole supplier of ammunition for Sharps rifles and carbines), might create a monopoly and significantly raise the price for their cartridges. Major Ripley may, or may not have known, that Crispin was working on his own proprietary cartridge for the flawed Gallagher carbine (patented April 12, 1864; No. 49,329). Despite lacking any concrete evidence of Sharps/Hartford's actual intentions, Ripley authorized Crispin to begin to solicit bids from private cartridge firms to manufacture Sharps linen cartridges.

Captain Silas Crispin



U.S. Arsenal-Governor's Island, New York Harbor

Beginning in the spring of 1863, Chrispin awarded contracts to D.C. Sage, Hazard Powder Works, and Johnson and Dow to produce 7 million cartridges.

At the same time, U.S. Arsenal 'laboratories' were ordered to expand ammunition production to include Sharps cartridges. Unfortunately, the Arsenals had been issued the *1861 Ordnance Manual*, that provided instructions to make '*Old Style'* (clip tail) paper cartridges (designed for Model 1851-55 carbines). In a puzzling display of '*bureaucratic deafness'* the Watervliet, New York Arsenal (that made all the cartridges for the Army of Potomac's Cavalry Corps) persisted on making paper 'cut tail' cartridges until 1864. It wasn't until the promotion of Colonel A.B. Dyer to Chief of Ordnance that he ordered the existing inventory of 2 million paper cartridges to be broken up and replaced with ones made of linen. During the last two years of the Civil War, U.S. Arsenals produced nearly 17 million Sharps linen cartridges.

The only Arsenal to consistently produce high quality Sharps cartridges was the Washington (DC) Arsenal; benefiting from samples sent directly from Hartford Cartridge Works. A July 1863 inspection of Washington-made linen cartridges showed remarkable consistency: "*Sharps rifle ball* (weighs) *is 458 grains, powder 62.4 grains; Sharps carbine ball 458.4 grains, powder 63.6 grains*". While news to his superiors, Washington Arsenal supervisor, Major Ramsey, understood the .52 caliber Sharps cartridges were interchangeable for both rifle and carbine. Two months later, Ramsey explained to Brig. Gen. James Ripley, how his arsenal issued ammunition to the two branches of the Army: "*…our habit is to issue the linen cartridges received from the* (Sharps) *factory for the Sharps Rifle. For the carbine we issue Watervliet cartridges*."

A major factor driving the demand for Sharps ammunition was due to the evolving tactics of the U.S. Cavalry. Innovative commanders were beginning to deploy their troopers to function like mounted infantry. This evolution, and its effectiveness, was demonstrated by Brig. Gen. John Buford on July 1, 1863, whose dismounted cavalry brigades were instrumental in delaying Gen. A.P. Hill's division until the arrival of Major Gen. John F. Reynolds with the First Army Corps, ultimately securing a Union victory at Gettysburg. This tactical change meant a greater demand for carbine ammunition, especially for the widely issued Sharps.

The 1865 Sharps Cartridge Works Fact-Finding Tour: In January 1865, George Penfield, (SRMCO's sole sales representative and original stockholder since 1851), was dispatched to the front lines around Petersburg, Virginia to interview infantry and cavalry officers about the quality of Sharps ammunition being issued. Penfield interviewed members of *Bowen's Independent Rifles* (Co. 'A', 151st New York Infantry) that purchased their own Sharps rifles shortly after they enlisted. The veterans praised the Sharps-made cartridges; as well as the pellet primers ("*when we can get them*"). However, the ordnance officers with the First Division, Fifth Corps complained the two companies of New York Sharpshooters had been issued inferior '*skin cartridges for some time*". Penfield possibly arranged for a case of Sharps factory cartridges to be shipped to the Sharpshooters, who reported them "*superior*". I am surprised Penfield didn't interview the remaining members of the U.S. Sharp Shooters in Brigadier Gen. Regis DeTrobriand's brigade of Second Corps. The Sharp Shooters could have provided invaluable '*battlefield testimony'* about the superior range, accuracy, and performance of both their Sharps rifles and ammunition. When Penfield interviewed officers of the Army of Potomac's Cavalry Corps, they voiced unanimous contempt for the Watervliet Arsenal made Sharps cartridges. When Penfield returned to Hartford, he was convinced the cartridges produced by the Sharps Cartridge Works were the most effective ones on the battlefield. Now he had to convince the Ordnance Department.

On January 2, 1865, SRMCo President, John C. Palmer wrote to Chief of Ordnance, Gen. A.B. Dye to secure a contract for cartridges to accompany the December 1864 order for 1,000 New Model 1863 Sharps rifles and carbines.
Aware of the Ordnance Department's recurrent complaint that the SRMCo Cartridge Works ammunition were "too expensive", Palmer provided an itemized breakdown of materials and labor needed to produce 1000 cartridges:

- *70 lbs. Lead 16c* *$11.20* *(@ .16 cents/pound)*
- *9 lbs. Powder 35 ½* *3.20* *(@ .35 ½ cents/pound)*
- *5 ½ Linen 80* *4.40* *(@ .80 cents/yard)*
- *100 paper boxes* *1.00*
- *Wax and tallow* *.30*
- *Varnish* *.25*
- *Bank note paper* *.05*

- *Gum & paste* .30
- *Casting* .25
- *Labor* 2.50
- *1200 caps $1.25* 1.50 *(12 percussion caps included with 10 cartridges)*

Despite his field research and cost analysis, Palmer could only secure a single, and final, contract for 1 million cartridges from the Ordnance Department. However, for us modern researchers, Palmer's letter identifies all the materials needed to re-create Mid to Late War linen cartridges produced by the Sharps Cartridge Works.

The Original Conical Ball: There were two approaches used to create conical balls for Sharps cartridges; the Hartford Cartridge Works (and private contractors) cast theirs, while the U.S. Arsenals made 'pressed' or 'swaged' balls.

Original Sharps Cartridge Works cast ball (left) Original Watervliet Arsenal swaged ball (right)

The base of Arsenal swaged conical balls have a concave indentation created by a mechanical punch that removed the ball from the die. The shape is like the skirt of a Minie/Burton ball, but much thicker

Overall Length	Band Diameter		Band Width		Recess	
.918 inches	*1*	.512	*1*	.058	*Width*	.207
	2	.529	*2*	.092	*Depth*	.110
	3	.548	*3*	.160	*Skirt*	.160

I have not located any contemporary Ordnance reports to indicate the swaged ball's 'skirt' expanded to form a gas seal and improve the accuracy of the 22-inch carbine barrel. The 1861 Ordnance Manual describes the 'pressed ball' process on page 266:

Ball-Cartridges.

MAKING BALLS.—Lead balls are made by compression, by means of machines for that purpose. Balls thus made are more uniform in size and weight, smoother, more solid, and give more accurate results, than cast balls.

The lead is first cast into round cylindrical bars, .58 and .63 inch in diameter for the calibres .58 and .69 inch respectively, and 21 inches long, and then rolled to .46 and .56 inch in diameter for the same calibres respectively; length, 25 inches. These bars are fed to the machine, which cuts off a part sufficient for one ball and transfers it to a die, in which the ball is formed, with cavity and rings, the surplus metal being forced out in a thin belt around the ball in the direction of its axis. The balls are trimmed by hand, with a knife, and are then passed through a cylinder-gauge of the proper size.

On May 13, 1862, Robert Chadwick and Norman Hall received patent #35,275 for a rotating ball molding system: "*The machine is composed of a series of bullet moulds pivoted to a circular frame which is arranged to rotate about a central shaft. Attached to the frame is a series of levers with appendages which are caused to open and close the mould by the rotation of the levers with the moulds, around a suitable system of stationary cam. The moulten lead is poured into the moulds successively, and after the metal is set the bullets are discharged by the rotation of the circular frame*". Chadwick's invention dramatically increased the output of cast bullets. While form, weight and quality of the lead balls depended on the tolerances of the machinery; Hartford cast conical balls were recognized as superior compared to competitors.

A Comparison of two Sharps Linen cartridges: For the 1863-1865 Authentic Sharps Cartridge Project I purchased an original Sharps linen cartridge from *American Civil War Relics*. The ability to handle the cartridge, to measure and weigh it, and compare it to photographs substantially improved my understanding of how it was made. This helped with the next phase of research into locating and purchasing the materials to reproduce the original cartridges.

TALAS/Brown Holland (left) Original

Original, TALAS-bank note & skin base

Original (left) ASCP Beetled Linen

Dimensions	Length (inches)			Weight (grains)		
	Original SRMCo.	*TALAS Holland*	*Williams Beetled*	*Original SRMCo.*	*TALAS Brown Holland*	*Williams Beetled*
Cartridge	2.086	2.064	2.081	524.8 grs	488.6 grs	480 grs
Ball	1.020	.908	1.050	427.9	414-411	438
Linen case	1.373	1.336	1.392	?	9.3	7.8
Linen-double thickness	.014	.018	.013			

The original Sharps linen wrapper is tight, shiny, and smooth to the touch. Brian informed me this is due to the type of finishing done to raw linen. I measured the thickness of the original wrapper (double thickness) and found it thinner than the TALAS linen (.004 versus .008 inches). The length of the original cartridge is slightly tapered (formed by the wood cartridge stick). The '*bank note paper*' is very thin and fragile (.003 inches thick). I doubt it could keep the base sealed if damp or roughly handled.

***The Authentic Sharps Project*: Conical Ball:** In 2020, Dan Wambaugh sent me twenty Lyman (*Sharps Ringtail # 557-489*) ringtail conical balls that I modified by sawing off the ringtail to match the original 'Improved' Sharps bullet. Because the Lyman mold is discontinued, I ordered from Moose Molds a *Sharps Christmas Tree .544-480-Flat base*. The table below provides the dimensions of each bullet:

Mold Mfg. Model #	Ogive	Weight	Band 1		Groove 1		Band 2		Groove 2		Band 3		Remarks
			Diameter	*Width*	*Diameter*	*Width*	*Diameter*	*Width*	*Diameter*	*Width*	*Diameter*	*Width*	*Notes*
Original	.510	458 gr	.457	.087	.520	.088	.536	.088	.544	.070	.591*	.154	*in linen
Moose 544-480	.503	480 gr	.525	.075	.477	.075	.535	.121	.472	.079	.596*	.209	* in linen TALAS
Lyman 557-489	.506	490 gr	.526	.139	.477	.053	.531	.120	.474	?	.546	.163	

The Original Linen: In 1864, Superintendent of the Frankfort Arsenal, Major T.T.S. Lindsay wrote to Captain Silas Crispin, (U.S. Ordnance Dept. purchasing agent, stationed on Governor's Island in New York City): "*In reply I would state that I paid in March last by contract for Brown Linen Hollands, thirty-three cents (.33) per yard and in June by open*

purchase for Brown Linen Hollands 27 inches wide, forty-two and one-half cents (.42) per yard for Blay (means 'plain') Linen, 36 inches wide, fifty-five cents per yard (.55)". By 1865, the Sharps company paid .80 cents per yard for beetled linen, reflecting the high demand for this cloth.

What is Hollands? I first thought '*Hollands*' was the name of a textile mill, but none of the 1860's New England business directories had a mill by that name. Further research revealed: *Holland* cloth is a: *plain woven unbleached or dull-finish linen. Originally the name was applied to any fine, plain-woven linens imported from the continent of Europe, and especially to the product obtained from the Netherlands"*

To determine what modern linen comes closest to matching the original material, I enlarged photos of surviving cartridges to count the threads and analyze the color. Since the original linen cases measured 1 3/8th inches, this corresponded to an average between 72-76 threads. Color analysis was a major challenge, as 155 years have passed since the last linen cartridges were manufactured; (not to mention long term effects by environment, storage, and handling). Of the nearly 40 million Sharps cartridges manufactured by Hartford Cartridge Works, private contractors, and U.S. Arsenals between 1861 to 1865, only a tiny fraction remain intact today. Cartridge linen color ranges from white (*American Civil War Relics*), light gray (*Shiloh Relics*) to light-dark tea color (*McPheeters Antiques/Union Drummer Boy/Horse Soldier*).

- **Domestic or imported?** Brian White informed me the Northern mills were overwhelmed with contracts to clothe the armies; so, the U.S. (and eventually, the CSA) imported hundreds of thousands of yards of cotton, finished wool and linen throughout the War. In addition to Sharps cartridge wrappers, beetled linen was dyed and used as linings for Federal uniform coats and forage caps, among other uses.
- **How was linen finished?** During the Civil War, two different approaches were used to finish linen: beetling and calendaring. Beetling consisted of dampening and sizing the linen then running it through large rollers fitted with mechanical wooden mallets. As the rollers rotated, the mallets pounded the linen, flattening the fibers to create a smooth, water-resistant finish. Calendaring involved passing wetted linen between heated steel rollers that pressed the linen into progressively thinner widths, while imparting a tight and smooth finish. Brian added: "*The varieties of beetled linen produced then were more varied and extensive than it is now, with all different weights and qualities of linen fabric being beetled for different uses. Most original Sharps tubes are finer quality beetled linen than what is on the modern market".*

  Dan and Brian provided a link to *William Clark & Sons* mill in Northern Ireland (in operation since 1737) that still employs the traditional beetling process: "*A shade range of coarse linen plain weave, stiffened with starch and pounded to produce a soft linen canvas with a polished soft finish and resilient stability. This product is unique to William Clark as we are the only authentic linen Beetlers in the world*".

***The Authentic Sharps Project* Linen**: For the 1863-1865 SRMCO and Washington Arsenal linen cartridge wrappers, I purchased one yard of Holland/beetled linen, (imported from William Clark & Sons) from Najecki Revolutionary War Reproductions: "*a finer quality and tighter weave linen that has a glazed finish and is known as 'beetled' linen. This linen was used to line hats, pockets, sleeves, and some women's garments. 30" wide)*. I purchased a second yard of beetled linen through Burnley and Trowbridge of their '*White glazed-beetled*' linen.

Linen Source/Address	Thread Ct	Width	Type	Price/Yrd	Product #
TALAS https://www.talasonline.com	62 threads /inch	60 inches	Aircraft Hinging linen Natural (Brown Holland)	$29.	6626-1
Burnley and Trowbridge https://burnleyandtrowbridge,com	60 threads /inch	32 inches	White, Glazed-Beetled	$28	6671-1
R.L. Najecki www.najecki.com/repro/Linen.html	60 threads /inch	30 inches	White, Glazed Holland Beetled	$22	*William Clark & Co.- Ireland*

THIS ARTICLE IS FOR EDUCATION PURPOSES ONLY

IF YOU DO NOT HAVE EXPERIENCE, THE SKILL OR PATIENCE-DO NOT ATTEMPT

CASTING MOLTEN LEAD BULLETS AND WORKING WITH BLACK POWDER CAN BE DANGEROUS TO YOU AND OTHERS

Materials used to create Authentic Sharps Linen Cartridges

The Original Sizing: As late as 1864 the Ordnance Department was uncertain if Hartford/Sharps sized their linen for cartridge wrappers. I was surprised they didn't consult Sharps President John Palmer, until I read a letter by Lt. Col. William. A. Thornton (Watervliet superintendent): *"I have never used linen in place of paper in the manufacture of the cartridge…It's use is peculiar to the Sharps Establishment and if its adoption must be entered into here, will we not have to obtain permission from the Sharps Company, for I believe that said cartridge made by the company is patented*". I found Lt. Col. Thornton's response confusing. Two years earlier, *Major William A. Thornton*, (superintendent of the Washington Arsenal), wrote to Ordnance Chief James Ripley: "The *making of Sharps Cartridges with paper must be abandoned and linen used in the formation of the cylinder…From this date, I will make no more of paper, but I will make the powder cylinder of linen*". In 1864, the Washington Arsenal enjoyed the reputation of producing linen cartridges equal to the Hartford/Sharps Cartridge Works. Dean S. Thomas wrote: "*This writer has not found any exchanges of letters among Ramsay, Crispin and Palmer on the subject of the patentability of Sharps linen cartridges, and of course, they were not patented*." (34)

In January 1865, 2nd Lieutenant Howard Stockton (Washington Arsenal) submitted an evaluation of the new linen cartridges being made by the Watervliet Arsenal to newly promoted Ordnance Chief, Gen. A.B. Dryer: "*There is a great want of stiffness in the cartridges, partly owing perhaps to the fact that the linen of which the cylinders are made is not sized*". Lt. Col. Peter V. Hagner, (Watervliet's superintendent), was quick to respond to Stockton's stinging review: "*Major Benton advises that the linen as purchased be subjected to a second sizing, so as to make the cartridge stiffer. I think this plan makes a neater looking cartridge perhaps if the linen is not very firm and thick, but it introduces into the gun a larger amount of incombustible deposit and adds nothing to the serviceableness. I thought it better to use a little sizing rather than a great deal and have employed more dexterous (*young girls*) workers*". (34) It is interesting that *none* of the front-line Ordnance officers and sharpshooters/soldiers interviewed by George Penfield reported unburned linen residue from their Sharps Cartridge Works/Washington Arsenal cartridges.

Initially, I followed Major Benton's recommendation of applying two applications of sizing to the TALAS/Brown Holland cartridge wrappers. However, I discovered during shooting trials that Lt. Col. Hagner's comments 'spot ***on'***. After the fourth shot, the cartridge 'hung up' halfway into the chamber. When I pushed harder, the cartridge wrapper bent in half. After removing the ruined cartridge, I found the chamber caked with 'gritty' residue. A short nylon 'baby bottle' brush was needed to remove fouling, every four shots.

During the 2022 Authentic Sharps Cartridge shooting trials, the beetled linen cartridges made by Brian White performed flawlessly. Dan fired 30 consecutive cartridges through his Garrett Sharps without a single failure to feed. Brian informed me he used a window squeegee to remove excess sizing a linen sheet (something I didn't do with the TALAS/Brown Holland linen); I found a 6-inch rubber roller works equally well. The historical record is silent if the beetled linen was sized overseas or after it arrival to the U.S.

***The Authentic Sharps Project*-Sizing Preparation:**

- *Whisk 1 ½ tablespoons of cornstarch into 2 ½ cups of tap water to remove lumps.*
- *Pour mixture into saucepan and bring to boil for 1 minute (I reduced the heat to low for 4 minutes).*
- *Cool to room temperature*.*
- *Stir in ½ cup of water.*
- *Store in glass or plastic container.*

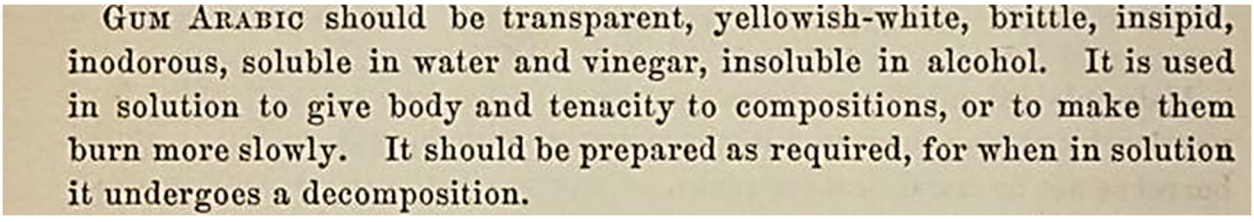
**Once cooled, the sizing's color and consistency will look/act like Ghost Buster 'ectoplasm'.*

***The Authentic Sharps Project* -Application**:

- Lay pre-cut beetled linen (either 31.5-inch bolt or individual 4 x 1 $^{3/8}$-inch strips) on a flat, non-porous surface (I used a stone countertop)
- Use a 2-inch brush to apply sizing.
- While linen is wet, use rubber roller/window squeegee to press out excess.
- Place damp linen on a wire frame or suspend from hanger.
- When dry, cut linen into 4 x 1 $^{3/8}$-inch strips (for Shiloh/original)

The Original 'Gum & Paste': George Penfield's letter is the first evidence that '*gum*' was used as an adhesive. It isn't clear when the transition from waterglass to Gum of Arabic was made, (likewise, goldbeater skin to bank note paper). Once it was discovered the shellac-treated arsenal packs protected Sharps cartridges from shock and moisture, it was no longer necessary to use the more expensive materials and extra labor. (33) Ironically, until the arrival of Gen. A. B. Dryer, the Watervliet Arsenal shipped their Sharps cartridges wrapped in plain paper wrappers bound with twine, just like their rifle musket ammunition. Col. Dryer ordered all Sharps cartridges to be shipped in waterproof pasteboard boxes, like the SCW and Washington Arsenal.

What is Gum of Arabic? Gum of Arabic is natural gum from the hardened sap from two species of acacia tree (*Acacaia Senegal and Vachelia seya*l) found in the Middle East. During the 18 and 19th centuries, gum was exported from the countries of *Trarza* and *Brakna* by the French colonies (*Sahel region-now comprising Senegal, Mali, Mauritania, Niger and Burkina Fasco*); and British protectorates (*Sudan, Somalia, Egypt, Ethiopia*). Gum of Arabic is water soluble and edible. Today it is widely used by the food and soft drink industries; in printing, ink, and paint production; cosmetics, and glue (for envelopes, stamps, and repair damaged cigar wrappers). The U.S. Ordnance Department lists Gum Arabic in their 1861 Manual:


GUM ARABIC should be transparent, yellowish-white, brittle, insipid, inodorous, soluble in water and vinegar, insoluble in alcohol. It is used in solution to give body and tenacity to compositions, or to make them burn more slowly. It should be prepared as required, for when in solution it undergoes a decomposition.

***The Authentic Sharps Project*- Gum Preparation:**

- Add 1 ½ Tablespoons of Gum to 1 cup of water in a small Pyrex bowl
- Whisk virorously to break up lumps.
- Fill a saucpan with water (½ height of Pyrex bowl), and bring to boil.
- Turn off heat and place Pyrex bowl/Gum in saucepan
- Continue to stir Gum until completely absorbed*
- When cool, pour Gum solution into a air-tight glass container.

** Gum has the color and consistency of SAE 30 weight motor oil.*

***The Authentic Sharps Project* 'Cartridge Stick':** Lacking a lathe to fashion an oak 'cartridge stick', I used a 12 x .535-inch brass tube. Around one end I wrapped a ¾ inch section of clear packing tape that increased the diameter to .546 inches. This forms the 'bullet end' of the linen wrapper (base/third ring-band).

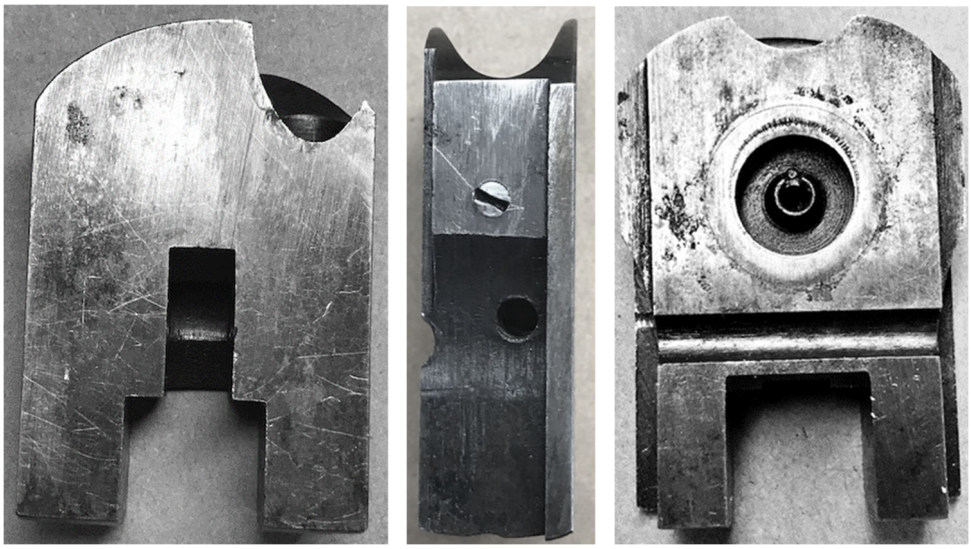
Always make a 'TEST CARTRIDGE' (sans powder). The 'TEST' cartridge is to confirm the diameter and length of your Sharp's chamber/counterbore. Use a Sharpie to write '**TEST CARTRIDGE'** on one side of the wrapper.

Original/Shiloh chambers run 1.908 inches in depth. However, Italian Sharps chambers vary (Garrett/Pederosoli tend to run shorter). The linen cartridge wrappers I made for the Garret Sharps measured 1.286 inches (compared to 1 $^{3/8}$ inches for the original/Shiloh). The NM 1863 Farmingdale Shiloh (.54 caliber) will accept cartridges with an overall length between 2.08 (1/8 inch inside chamber) to 2.10 inches (flush fit).

WARNING: *NEVER ATTEMPT* TO CUT 'THE TAIL' OFF A LINEN CARTRIDGE!!

If a linen cartridge sticks out of the chamber sleeve-REMOVE AND DESTROY.

The leading/upper edge of the early Model Sharps breechblocks were honed to a knife edge. Below is an original Model 1853 breechblock, note the face plate's 'knife edge 'designed to shear the tail off paper cartridges. I ran my finger over the edge and found it as sharp as a Solingen blade. Following the poor performance of Sharps carbines at the West Point trials, Richard S. Lawrence redesigned the system that became the Model/New Model 1859 carbines and rifles, that used linen cartridges that fit inside the chamber and eliminated the need to cut off the base of cartridges.



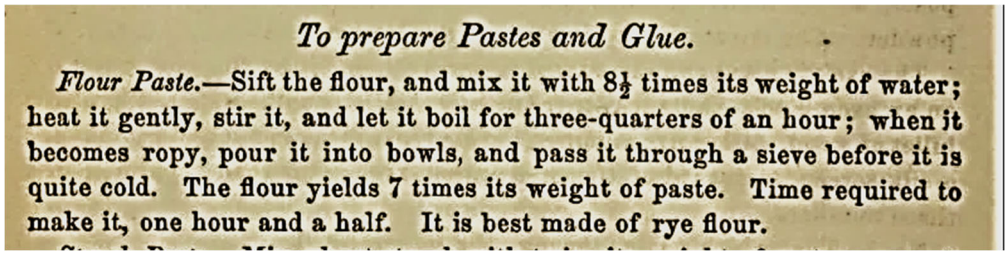
An original Model 1853 breechblock-note the face plate's knife edge for cutting paper cartridges

By closing the block on a 'too long' linen cartridge won't cut, but instead slide upwards against the gas check face; this creates a 'dam' that blocks the flame from igniting the powder charge. However, a ***spark can cause the linen to smolder until the block is lowered. The sudden exposure to air will ignite the powder, causing severe injury or death.***

I experienced this situation after cutting off the tail of a 'too long' blank paper cartridge. After three caps failed to ignite the powder, I opened the chamber when a long flame 'wooshed' back, scorching the sleeve of my blouse. I was extremely lucky that was the only damage. Had it been a live cartridge the results would have been catastrophic.

*** If a linen cartridge is too long/sticks out of the chamber**
*** Do not close the breechblock**
*** Insert a cleaning rod into the muzzle and gently push the cartridge from the chamber.**
*** Immediately break up cartridge to prevent it from being re-used.**

The Original 'Flour Paste': The 1861 Ordnance Manual (below) provided detailed instructions how to create adhesive paste, that the Sharps Cartridge Works used to close the linen cylinder/cartridge wrapper. (19)



To prepare Pastes and Glue.

Flour Paste.—Sift the flour, and mix it with 8½ times its weight of water; heat it gently, stir it, and let it boil for three-quarters of an hour; when it becomes ropy, pour it into bowls, and pass it through a sieve before it is quite cold. The flour yields 7 times its weight of paste. Time required to make it, one hour and a half. It is best made of rye flour.

***The Authentic Sharps Project*: Creating Paste.** The TALAS website offers '*pre-cooked*' wheat flour (used as a natural adhesive for antique books), that replicates the 1861 Ordnance Manual paste.

- Add one cup of pre-cooked TALAS wheat paste to a small Pyrex mixing bowl.
- Gradually add tablespoons of water and whisk until the paste thickens.
- Put one inch of water in a saucepan and bring to boil.
- Turn off heat, set Pyrex bowl into saucepan for 10 minutes to thicken paste.
- Remove from pan, strain paste through small sieve into Pyrex bowl.
- Keep paste covered until ready to use (paste can ferment)

I found a mixture of 2 to 3, water to flour; mix created the strongest bond. To skip this 'authentic' step, Elmer's *Extra Strength* glue sets faster and stronger than Ordnance paste.

***The Authentic Sharps Project*: Forming the cartridge wrapper.**

- Place the 4 x 1 $^{3/8}$-inch linen strip perpendicular to you (short edge facing you)
- Align the 'bullet end' of the cartridge stick to the right edge of the linen strip.
- Keep the linen taut, roll the linen around the former. Leave a one inch 'flap' free.
- Use the left hand to keep cylinder taut.
- Apply thick layer of paste to exposed 'flap'.
- Roll cylinder closed.
- Align seam to flat surface and roll back and forth (2-3 times) to set glue.
- Remove wrapper from cartridge stick.
- Mark the 'bullet end' with a Sharpie
- Place wrapper upright and allow to dry.




The Original Lubrication: The conical balls cast by the Sharps Cartridge Works were lubricated with *Wax and Tallow*". The 1861 Ordnance Manual called for:

> To Grease the Balls.—Place them on their bases on a tin frame capable of holding about 50 balls, and immerse it in a melted mixture of 1 part of tallow and 8 of beeswax, kept warm, until the cylindrical part of the ball is covered. Remove the frame, and let it stand till the grease hardens.
> Three frames are required for each boy.

The ratio of 1:8 lubricant (tallow to beeswax) stemmed from feedback by the U.S. Dragoons on the western frontier. They found the lubricant used for the first supply of cartridges too soft, and the blazing desert sun caused it to melt into the paper wrappers. The saturated paper caused the heavy lead bullets to break loose and spill powder inside the cartridge boxes. Field inspections showed 2-3 cartridges per trooper were lost this way. Modern Sharps researcher, William Mapoles, confirmed the "*mixture of tallow and beeswax (1:8) stayed semi-solid in the (Arizona) 90-degree heat*" when recreating cartridges to shoot through original Model 1851-55 Sharps carbines. (21-b)

Conventional wisdom among black powder shooters is: "*your most accurate shot will be the first one*". When a percussion Sharps is fired, black powder residue '*fouling*', progressively builds up in the grooves and effects the stabilizing 'spin' of the ball. A lubricated ball, as it travels up the bore, acts like a piston; depositing a thin film of melted tallow/wax behind to soften the fouling. Subsequent bullets compress and remove enough fouling to maintain *reasonable accuracy*. However, modern black powder cartridge shooters notice their groups start to 'open up' after 5-10 shots. That is why during competitions, black powder cartridge shooters run a wet and dry patch through the bores of their Sharps after each shot to preserve accuracy.

I have wondered how many shots a U.S. Sharp Shooter could fire through their Sharps, and expect '*reasonable accuracy*'? In other words, how many shots could they fire before fouling enlarged the '*cone of impacts*' to a point where they no longer could predict where the bullet would strike? Today's marksman fire factory made ammunition and can reasonably expect to hit a 100-yard target within one Minute of Angle (within 1.047 inches) of center. Dedicated competitive shooters, who hand load their ammunition, achieve similar (or better) performance out to 1000 yards. By comparison, Ned Roberts (whose grandfather, Alvaro Annis, served in the U.S. Sharp Shooters), in his book The Muzzle Loading Cap Lock Rifle, wrote the *average* 'group' for bench rest muzzle-loading target rifles was 2 inches at 100 yards. Exceptional rifle makers like Horace Warner (former Co. C, 2nd USSS) created hand-made, muzzle-loading target rifles capable of sub-MOA groups at the 200-yard competitions, popular during the 1880's-1900.

***Authentic Sharps Project*: Lubricating the Ball.** For the Authentic Sharps Cartridge Project, I tried different lubricants (listed below) but found no noticeable difference in fouling management. A major variable was (based on the amount of residue left in the bore) using 2-Fg compared to 3-Fg black powder, the latter powder producing less fouling but higher velocities.

Lubricant	Melting Point (Fahrenheit)	Tallow-oil/Wax ratio
Beeswax	144-147	0/8
Jojoba Oil (substitute sperm whale oil)	158	1.5:2

Lamb suet/tallow	108-113	1:8
Beef suet/tallow	90-95	2:8

To test lubricant variables, I treated five conical balls with one of the lubricant combinations. I replicated an experiment done by a NSSA blogger, by (a) completely immersing one set of bullets 'tip first'; and (b) dipping the 'cylindrical part' (base to top groove). The Ordnance Manual indicates the *'cylindrical part'* of the conical balls were lubricated:

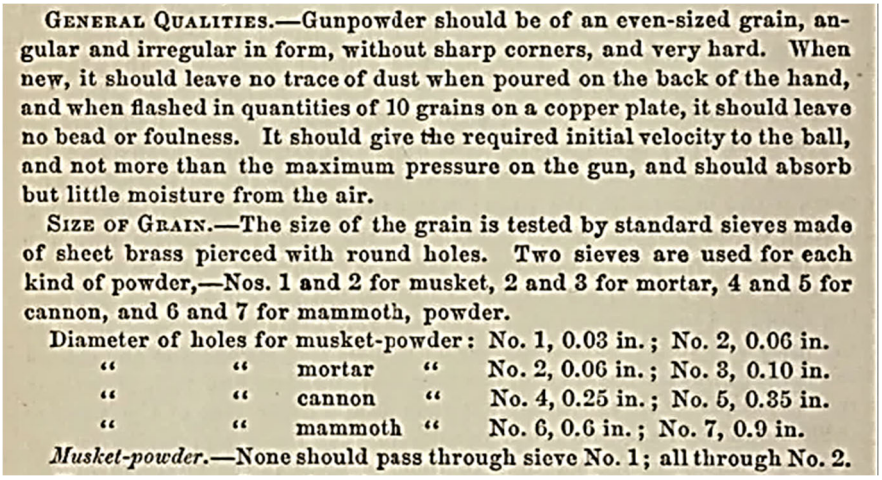
- Use cookie sheet/tray (line with parchment paper).
- Arrange balls with a 2-inch space between each.
- Use a double boiler to slowly add wax/tallow (preferably on an outdoor grill) Stir until completely melted.
- Use forceps/pliers to gently grip ball by the upper band
- Dip ball in melted lubricant, from base to top groove.
- Set on parchment paper or cool pan to dry.

Some modern researchers have suggested the original Sharps bullets were not lubricated, despite period information from Ordnance Manual and Sharps Rifle Manufacturing Company records. When going through my late uncle's supply of sixty-year-old cast Minie balls, I discovered dried 'clots' of tallow/wax lubricant 'shedding' off the grooves. It is possible, after 100-160 years, this happened to the original lubricant used with Sharps bullets. However, after I purchased an original Sharps Rifle Mfg. Company arsenal pack, there was no evidence of lubricant fragments inside, (however, there was 35 loose grains of original *A.G. Fay, Potter and Tolman* gunpowder).

After being dipped, conical balls remained near the hot vats to cool and excess lubricant to sheet off. I recreated this process by:

- Pre-heat convection oven/grill to 200 degrees Fahrenheit.
- Place bullets on parchment paper/cookie sheet.
- Place in oven for 8-10 minutes (until excess lube pools at base)
- Remove tray, let cool.
- Use thumbnail/popsicle stick to remove excess lube from base.
- Balls have a bright sheen, are slippery to touch, with the grooves filled with lubricant.

The Original Powder Charge: The U.S. Government relied on civilian contractors to provide gunpowder for military service, both before and during the Civil War. Due to the demands for hundreds of tons of gunpowder, the 1861 Ordnance Manual devoted an entire chapter (Chapter Nine) that detailed the raw materials, manufacturing processes, and specifications for the manufacturers to follow. Among the details for raw materials was where they originated from (salt peter-*East Indies*; sulfur-*Sicily/refined in France,* charcoal-native *willow wood*). The Ordnance department classified the prepared powder into four general classes:



GENERAL QUALITIES.—Gunpowder should be of an even-sized grain, angular and irregular in form, without sharp corners, and very hard. When new, it should leave no trace of dust when poured on the back of the hand, and when flashed in quantities of 10 grains on a copper plate, it should leave no bead or foulness. It should give the required initial velocity to the ball, and not more than the maximum pressure on the gun, and should absorb but little moisture from the air.

SIZE OF GRAIN.—The size of the grain is tested by standard sieves made of sheet brass pierced with round holes. Two sieves are used for each kind of powder,—Nos. 1 and 2 for musket, 2 and 3 for mortar, 4 and 5 for cannon, and 6 and 7 for mammoth, powder.

Diameter of holes for musket-powder: No. 1, 0.03 in.; No. 2, 0.06 in.
" " mortar " No. 2, 0.06 in.; No. 3, 0.10 in.
" " cannon " No. 4, 0.25 in.; No. 5, 0.35 in.
" " mammoth " No. 6, 0.6 in.; No. 7, 0.9 in.

Musket-powder.—None should pass through sieve No. 1; all through No. 2.

Since 1853, the *Hartford Cartridge Works* & *Sharps Cartridge Works* used gunpowder made by *A.G. (Addison Grant) Fay, (Samuel) Potter and (Thomas M.) Tolman* for their military and civilian ammunition. On February 20, 1863; A. G. Fay,

Potter and Tolman; (with new partners, Adolphus Merriman, Samuel Staples, and Lorenzo Eaton) successfully petitioned the Commonwealth of Massachusetts' Committee of Manufacturers to incorporate under a new name: *The Massachusetts Powder Company.* The *Massachusetts Powder Company* business office was located at 233 State Street in Boston, with the powder works located in the town of Barre, Worchester County, (in 1866, the company name changed to the *American Powder Company*). During peak wartime production, the Powder Works produced 80,000 barrels of gunpowder *per week*, while maintaining an excellent safety record, being one of the few mills that didn't suffer ruinous and fatal explosions. All of the Sharps cartridge labels read: "*A Superior Grade of Powder is used. Made Expressly by A.G. Fay, Potter and Tolman of Boston, Mass*".

At Barre, *Fay, Potter and Tolman* powder was packed into twenty-pound barrels made of white oak (*length=20.5; width/top=18; base=16; staves=.5 inches*) bound with hickory or cedar hoops. Those barrels designated for military use were marked: "*on both heads in white oil colors, the head painted black, with the number of the barrel, the name of the manufacturer, year of fabrication, and the kind of powder (musket, mortar, cannon, etc.)-the mean initial velocity, and the pressure per square inch on the pressure piston*". The barrels were rolled on their sides onto a canalboat or wagon (secured with straw to prevent shifting during transport) to Warf No. 1 in Boston. There, the powder would be loaded on a steamer or packet bound for cartridge manufacturers in Washington DC, Hartford or other destinations.

From 1861 until the spring 1863, Sharps cartridges contained an average of 60 (+ 3) grains of powder. A July 24, 1863, inspection of Sharps cartridges at the Washinton Arsenal showed: "*Sharps rifle ball (weighs) is 458 grains, powder 62.4 grains; Sharps carbine ball 458.4 grains, powder 63.6 grains*". Both the *Sharps Cartridge Works* and Washington Arsenal cartridges had the smallest deviations of powder charge of any manufacturer or Arsenal. By mid-1864, the powder charge for Sharps carbines (made by Arsenals) was increased to 65 grains to '*improve the gradation of the sights*". (32).

***Authentic Sharps Project*: The Powder Charge.** In 1849, Christian Sharps sent a letter to Ordnance Chief, Major Alfred Mordecai, recommending '*government musket powder'* be used to charge the cartridges for his breechloader, instead of the finer grained '*Hazard's pistol powder'.* Sharps explained the slower burning powder generated consistent velocity; with less gas leakage and '*striations*' (erosion to the breechblock face). (38)

In his book Civil War Carbines. Myth vs Reality, Peter Schiffers evaluated eleven original carbines that were issued to Federal troopers during the Civil War. Schiffers described the history and development of each weapon and included opinions (favorable or unfavorable) of the original officers and troopers issued them. Then Schiffers tested how well the carbine performed, and if praise or criticisms were warranted. What made Schiffer's experiments noteworthy is he cast conical balls from original molds and extracted black powder from original cartridges, then fired them through a chronograph to determine their velocity. Schiffers found Swiss #4 (1 ½ Fg) came closest to the 1860's Government Musket Powder (± 3%). William P. Mapole's subsequent shooting trials of Sharps firearms (Model 1851-1863) confirmed Schiffers results. Swiss 1 ½ Fg is the only modern powder made with willow charcoal and has the composition and velocities of the original *AG Fay, Potter and Tolman* powder (21a &b). Unfortunately, this project began during the Covid-19 pandemic, when black powder was in short supply. I initially used Goex 2 Fg, and later, Schutzen 2 Fg black powder for the ASP cartridges.

Part Three: Assembling the 1863-1865 Sharps Cartridge

Directions for Making Ball Cartridges

(*Sharps Rifle Manufacturing Company for New Model 1859 cartridges*)

"Cartridge paper or linen cloth, cut in strips of one and three-eighths inches for the Army size ball, and two inches for the 60 (.44 caliber) and 90 (32 caliber) ball, and of sufficient length to wind twice around the larger end of the cartridge stick and form a cylinder, securing the end with gluten or paste, withdraw the stick, place a piece of bank-note paper or gauze three-fourths of in inch square on the reverse end of the stick form it over the end, apply the gluten or paste to the part which overlies the circumference of the stick, and insert in the cylinder, forcing it to the rear end and withdraw the stick. When the cylinder is dry, charge with sixty grains of powder and insert the rear end of the ball the ring thereon, moisten with adhesive preparation, and choke the clothe into the ring of the ball…"

The Original Cartridges: Forming the Cylinder: *"Cartridge paper or linen cloth, cut in strips of one and three-eighths inches for the Army size ball, and of sufficient length to wind twice around the larger end of the cartridge stick and form a cylinder, securing the end with gluten or paste".* Photo 4, marking the wrapper end that -fits the ball.




The Original Cartridges: Forming the base: *"…place a piece of bank-note paper or gauze three-fourths of in inch square on the reverse end of the stick form it over the end, apply the gluten or paste to the part which overlies the circumference of the stick, and insert in the cylinder, forcing it to the rear end and withdraw the stick*". I found 1 x 1" hair curling tissue the best medium for the base paper, it compresses easily over the former and creates a uniform and secure bond with the linen. *Gum of Arabic* is a better adhesive than Elmer's, as it's 'tackier' and dries faster.




The Original Cartridges: Charging the Cartridge:

To Fill the Cylinder.

Implements.—1 *charger*, made of a cylinder of wood or brass pierced with two holes through its length, holding the exact charge of powder; a funnel attached to one end of the cylinder, and a discharge-pipe to the other. The holes in the cylinder are made to communicate and shut off, alternately, from the funnel holding the powder, and the discharge-pipe at the lower end, by a reciprocating motion given to the cylinder by the hands.

Fill the funnel with powder; insert the discharge-pipe in a cartridge, holding the charger in both hands, and turn the cylinder; the charge of powder is deposited in the cartridge: insert the pipe in the next, and turn the cylinder in the opposite direction; and continue in the same way for all the rest.

Cartridges may be filled with a copper charger made to hold the exact charge, pouring the powder by means of a small funnel which is inserted in the cartridge.

***Authentic Sharps Project*: Charging the Cartridge**: The original SRMCO and Arsenals measured their powder charges by volume; and while the Arsenal '*cartridge charger*' sounded intriguing, I couldn't find an illustration to recreate one. I chose to weigh the powder charges, using a Hornady GS1500 electronic scale. Each charge was weighed to the original

specification (*60. 0 grains; range +.2-3 grains*). A funnel directed the charge into the linen wrapper, then was slowly withdrawn to settle the powder, (there is no historical evidence a 'drop tube' was used to compress the powder). By weighing the powder charge, I could adjust the powder charge that produced the best accuracy for the NM1863 Shiloh. For distances of 50-100 yards, a powder charge of 52-55 grains of 2 Fg powder produced 10 shot strings of 1.87" and 2.35" (rifle's fore stock, cradled by support hand, rested on 18"x6" inch wooden block; with the bore swabbed after each shot with damp-dry patch)

The Original Cartridges-Soft/Hard Wads?: On March 13, 1865, Lt. Col. L.H. Walsh (of the 3rd Pennsylvania Cavalry), wrote Chief of Ordnance A.B. Dyer, with his evaluation of the Sharps cartridges issued to his regiment: "*I have tested these* (SRMCo*) cartridges and have found that they are, in my opinion, far superior…I would also state that the ball contained in the Johnson and Dow cartridge, when fired with the Penfield (SRMCo) powder, penetrated deeper than the ball belonging to 'Sharps improved Cartridge'. This is probably owing to the different quality of the wad, the former being harder than the later, but not sufficiently hard to injure the grooves of the carbine*" (32).

I was perplexed by Lt. Col. Walsh's comment that the cartridges had a; "*different quality of the wad, the fomer being harder than the later*". A lubricated 'soft wad' between the powder charge and ball, would (a) provide an effective 'gas seal', while (b) distributing more lubricant over the length of the bore. With no further information to go by, I looked to post-War cartridge developments. During the 1870's, Sharps produced center fire brass cartridges with a pasteboard disk over the powder charge, with a lubricating wad made of sperm whale oil and beeswax under the bullet. This combination of enabled Sharps-armed buffalo hunters/Creedmore target shooters consistent and accurate shooting over long distances (300-1000 yards). Walsh's comments suggest Sharps (and possibly others) may have added wads to their cartridges much earlier than originally thought.

With further research, I discovered wads had been introduced during the 1858 Ordnance Trials at West Point, NY. When Peter Schiffers disassembled original Burnside and Maynard cartridges, he found both contained wads sandwiched between the ball and powder charge. A unique feature of the Burnside cartridge was it contained both a paper wad (to cover the powder charge), and a disk of tallow and sperm whale oil to soften fouling. Schiffer found the Burnside carbine's accuracy to be excellent at all ranges (55-210 yards)**.**

In 1970 the hunting of sperm whales was internationally banned. A few individuals who attempted to sell pre-ban whale oil were arrested and fined. This prompted chemists and the automobile industry, (that used whale oil to lubricate transmissions) to seek an alternative. They discovered oil from the Jojoba plant possessed the essential polymers to serve as a substitute. Peter Schiffer found a wad comprised of jojoba oil and beeswax was a suitable replacement for Burnside cartridges. (28).

***Authentic Sharps Project*: Soft/Hard Wads.** I created two sets of wads using a hallow ground punch to create .50 x .205 inch wads from corrogated cardboard. 'Soft wads' were saturated in a melted mix of 1/8 tallow-beeswax; the 'hard wad' was untreated. A wood dowel seated the wad over the powder charge. During shooting trials, wads separated from the bullet, 8-12 feet from the muzzle. None showed evidence of scorching or deformation.

Inserting cardboard (soft) wad

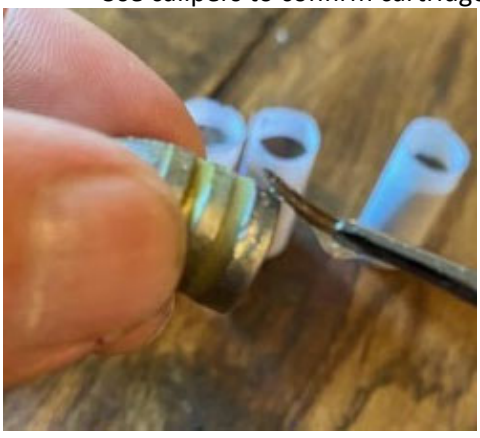
Seating the wad

Further research into the development of post-War Sharps center fire cartridges has led me to reconsider my preliminary thoughts of 'hard' and 'soft' wads. During the '*great buffalo slaughter*' between 1870-1888, professional hunters used paper patched bullets with a pasteboard disk placed over the powder charge, and a 3/8th inch 'wax cookie' disk of sperm whale oil and beeswax. This kept black powder fouling 'soft' for hunters until they exhausted their supply of cartridges or killed enough buffalo to keep the skinners busy until sundown. This topic requires further research, stay tuned.

***Authentic Sharps Project*: Applying the Adhesive:** The original instructions called *insert the rear end of the ball the ring thereon, moisten with adhesive preparation, and choke the clothe into the ring of the ball…*" I experimented with three approaches: a thin bead of Gum applied to the (a) interior of wrapper; (b) third/bottom band, (c) interior of bottom groove. (a) Linen collapsed when the ball was inserted into the cylinder; (b) inconsistent-some cylinders collapsed under pressure; (c) balls seated perfectly-but the linen needs to be crimped.

***Authentic Sharps Project*: Inserting the Ball**:

- Seat the bullet using a slight, side to side motion, until the linen covers the bottom ring and one half of the bottom groove.
- Set aside to dry.
- Use calipers to confirm cartridge's overall length.



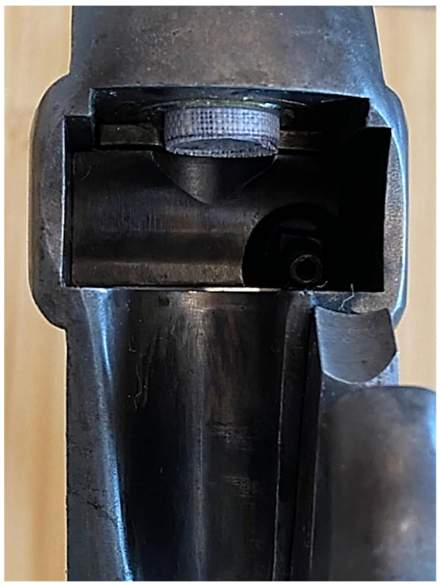
Bullet Type/Cartridge	Cartridge Weight (grains)	Linen Type	Cartridge Overall Length (inches)	'Go' range
Original	424.8	Beetled	2.09 (avg)	Nd
Lyman-Modified Ringtail	495.2	TALAS	2.06 (avg)	2.01-2.08
Moose-Wambaugh/Custom	424.1	TALAS	2.10 (avg)	1.99-2.09
Moose-.455-480	479.3	Clark-Beetled	2.04 (avg)	1.99-2.06
Moose-.455-480	481.3	TALAS-Holland	2.06 (avg)	2.02-209

- Create a ***'Go-No Go'*** gauge to identify cartridges that are too long/short for your Sharps' chamber.

- I apply a strip of blue masking tape on the table/workbench that matches the correct chamber length.
    - The correct ***GO*** length for a .54 caliber (Shiloh Sharps) linen cartridge ranges between 2.05-2.09 inches.
- After finishing a cartridge, I compare it to the ***GO*** gauge; cartridges that are shorter/longer than the ***GO*** gauge are 'culled', taken apart, and the wrapper recut or thrown away.

Chamber lengths of Italian Sharps (Garrett, Pederosoli, IAB, and Armi-Sport) run shorter than original/Shiloh percussion carbines and rifles. It is crtical that you:

- Use calipers to measure the chamber depth (from the reciever/sleeve ring to the rifling).
- I slide a bamboo skewer along the base of the chamber until it strikes the rifling. I mark the point where the skewer and sleeve/reciever meet. Calipers confirm the chamber's overall length, that translates into the length of the linen wrapper.
- *ALWAYS make a SAMPLE CARTRIDGE* (linen wrapper with bullet-but no powder; use corn meal filler instead). Confirm the ENTIRE SAMPLE CARTRIDGE fits inside the gas sleeve/chamber.
- A ***GO*** cartridge fits flush (OR SLIGHTLY INSIDE) to the chamber/sleeve edge.
    - When loading a cartridge, the ogive (curved surface to the point of the bullet), and upper ring/band will engage the rifling.
    - Gently push the rest of the cartridge into the chamber until you feel the bottom ring engage the rifling.
- The entire cartridge is now inside the chamber, the paper base flush to (or slightly inside) the chamber sleeve/ring. (see below).



NO GO CARTRIDGE

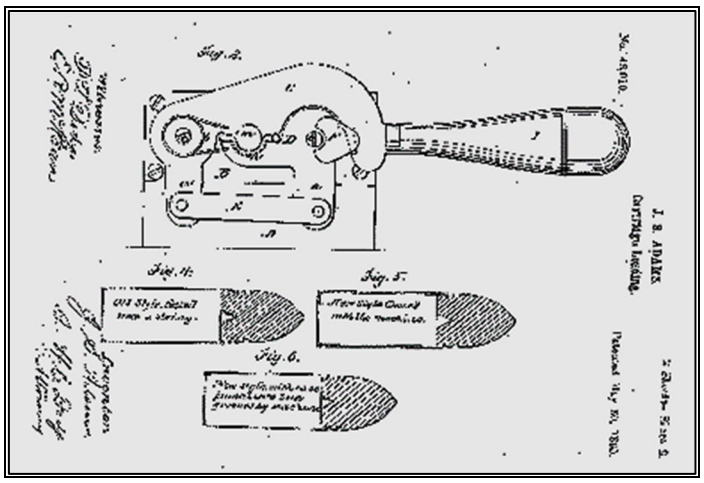
GO CARTRIDGE

IF ANY LINEN sticks into the Sharps chamber-*DO NOT CLOSE THE BLOCK*

1. ***STOP!!!***
2. ***GENTLY PUSH A CLEANING ROD DOWN THE MUZZLE AND EJECT CARTRIDGE FROM CHAMBER***
3. ***DETACH BALL FROM LINEN CYLINDER, DUMP POWDER***
4. ***DISCARD LINEN WRAPPER***
5. ***REMEASURE AND CUT LINEN TO CORRECT LENGTH TO FIT FOR YOUR SHARP'S CHAMBER***

The Original Cartridges-Choking the cartridge: In 1864, John S. Adams, a gifted engineer at the Washington Arsenal, invented a '*Implement for Compressing Cartridges Around Bullets*': *The operation is as follows: after the case has been filled with powder the forward end of the case is gummed (*with Gum of Arabic*) on the inside and the base of the bullet inserted therein. The cartridge, being held in the left hand, is then laid on the rest (n), the front end being inserted in the hole (m) until the point of the bullet comes in contact with the plug, which being properly adjusted, brings the groove in the bullet directly in line with the edges of the jaws which are instantly brought together by pressing down on the handle, by which means the case is pressed into the groove all*

around at once and in a most perfect manner. To ensure perfection in the operation it is usual to operate the handle two or three times in quick succession, the cartridge being turned or rolled over by the left hand at the same time. In this manner the work is rapidly and accurately performed." (1)



John Adams Cartridge Choker

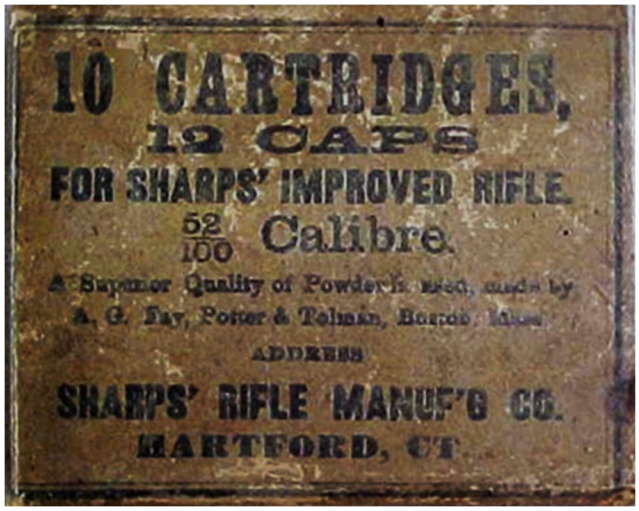
Palio cigar cutter/choker

***Authentic Sharps Project*: Cartridge choker.** The original SRMCO cartridges I've examined all show the linen's leading edge firmly embedded in the ball's bottom groove. I created a '*poor man's cartridge choker'* after spying a *Palio* cigar cutter/scissors at my local tobacconists store. A fine-tooth rat-tail file was used to flatten and smooth the sharp edges. Because of the off-set jaws, it was necessary to rotate the cartridge two to three times before all the linen was securely fastened inside the groove.

- Hold cartridge in left hand.
- Position jaws around the leading edge of wrapper.
- Slowly close jaws, pushing the linen into the bottom groove.
- Rotate cartridge and repeat until all of the linen adheres to the groove.
- Set cartridge aside to dry.

Dan Wambaugh discovered a *YouTube* video created by John Crossen who, using a 3-D printer, has recreated the Adams Cartridge Choker. While Mr. Crossen's components are molded from resin-plastic composite, he demonstrates they are strong enough to operate like the original metal parts. The rest of the parts can be purchased at a hardware store (the PDF file identifies the parts and part numbers). Google Drive PDF file and YouTube link: http://youtube.com/@crossencartridge6403/videos.

***Authentic Sharps Project*: Packaging the cartridges.** To protect the fragile linen cartridges for the 'Improved Sharps', the Sharps Cartridge Works packaged them in paste board boxes, wrapped in shellac-treated paper. The packaging prevented the cartridges from jostling against each other; and the treated wrapper provided protection against moisture. Each box contained ten cartridges and twelve percussion caps (wrapped in newspaper cylinder). Initially, Sharps included the percussion caps with each box of cartridges, but due to increased costs, John Palmer submitted a request to be reimbursed for the caps. The Ordnance Department granted the request, then ordered all private contractors to follow Sharps example and add percussion caps with their cartridges.



Original Sharps Cartridge Works box

Authentic Sharps Cartridge Project box

For my pasteboard boxes, I created a '*cartridge data form'* that is secured to each box with a rubber band. The form lists manufacture date/box #, mold/caliber, ball weight, overall length, powder/charge, wrapper/base, lube/wad. The sheet is stapled to a ASCP Range Sheet after each shooting trial to record the components that produce the best accuracy.

***Authentic Sharps Project*: How well do they Shoot?** On July 23rd, I met with Dan Wambaugh and Brian White, to conduct the 2023 Authentic Sharps Cartridge trials. Dan used his Garrett '*Berdan Sharps'*, Brian, his '*Old Busted*' Pederosoli, while I brought my '*Truthful*' Farmingdale Shiloh. Dan and Brian admitted they hadn't been to the range in months due to the demands of their uniform business. Bullets were cast from pure lead in modified Moose molds; the .54 caliber conical balls were lubricated with tallow/wax and secured to beetled linen wrappers with Elmers/Gum Arabic; and charged with 60 grains Goex 2 Fg powder (Dan & Brian); and 52/60 grains Schutzen 2 Fg (WES). RWS caps provided ignition. A 6 x 3-foot cardboard backstop was set at 100 yards; with three, 3-inch green dots, placed every 20 inches, representing breast/ 'eagle' plates as aim points. All shooting was done from a rest. To create an authentic 'feel', we fired 'by skirmishers'; with one man taking aim and firing, while his partner loaded and waited to hear '*ready*', before discharging his rifle.

As means of comparison, Regulations called for a: *target will be a circular board or boards three feet in diameter. The middle of the target will be marked by the center of a black circle eight inches in diameter. The rest of the target will be painted white…. The circular target should be raised at least three feet from the ground.* Below are the January 1863 target practice results for three 1st U.S. Sharp Shooter companies, note the differences in target dimensions:

Company 'E Target Shooting *January 13, 1863*	*Report of Co. D. Target Practice* *Januy 14, 1863*	*Report of Target Practice of Co. G* *Januy 15, 1863*
Distance 200 yards *Size of Target* 23 x 26 *No. of Men present* 15 *" shots fired* 16 *" struck target* 5 *" missed* 11 *Whole measure of shots* 52 inches *Average " " "* 10.4 " *W. G. Andrews* *Acting Lt. Comdg. Co. E.*	*Distance* 200 yards *Size of Target* Length 3 ft 1 in Width 2 ft. 1 in *No. of men* Seven *" of shots fired* Forty Two *" of " Hits target* Twenty one *" " Missed* Twenty one *Whole measure of shots 245 ¾ inches* *Average distance from center 11 ¾ inches* *J. McClure* *Capt. Comdg Co. D*	*Distance* 200 yards *Size of target* 18 x 24 inches *No of men present* 38 *No of shots fired* 114 *No. of shots hit* 34 *No. of shots missed* 80 *Whole measure of shots* 318 inches *Average measure from center 8 12/13* *C.A. Stevens* *Lt. Comdg. Co. G*

While the Potterville range has a 200-yard backstop, none of us were confident we could shoot better than the USSS, so the 100-yard stand was used. An important objective of the shooting trial was to evaluate the effects of black powder fouling on accuracy, so none of the Sharps were cleaned until the trial was over. "*Total inches*" was derived by measuring each shot from the target center to the center of a bullet hole; the average score was calculated by dividing "*total inches*" by number of shots fired by an individual skirmisher that trial, (*Dan and Brian shot three trials, I shot four, due to the smaller powder charge for 2/4 cartridges*).

The table below lists our individual results:

Name	**Dispersion From Center**		**Dispersion From Center**		**Dispersion From Center**	
Dan	**Trial 1**		**Trial 2**		**Trial 3**	
Total (in inches)	36.06		49.437			
Avg. (from center)	7.225		8.2395			
Bill	**Trial 1 (*52 grains*)**		**Trial 2 (*52 grns*)**		**Trial 3 (*60 grns*) 4**	
Total (in inches)	19		19.875		29.875	43.75
Avg. (from center)	3.8		3.975		5.975	7.29
Brian	**Trial 1**		**Trial 2**		**Trial 3**	
Total (in inches)	31.50		57.875		46.0	
Avg. (from center)	7.875		14.468		11.50	

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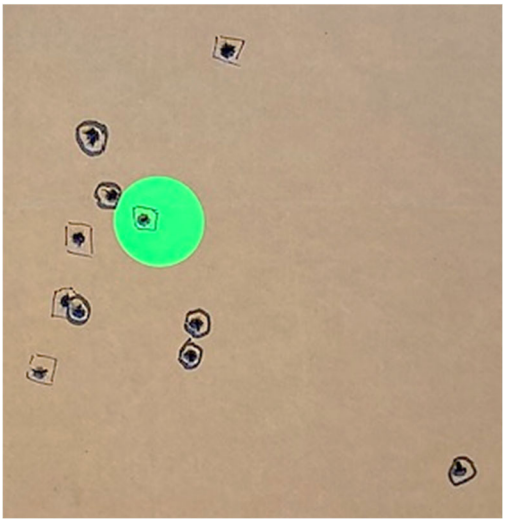
The smallest '*total inches'* and '*average from center'* were made on the first trial. Each subsequent trial produced wider dispersions; indicating '*reasonable accuracy'* was being degraded. The photos below (my target) demonstrate the effect of black powder fouling on accuracy; **Target 1**/Trial 1: *Circle*=shot 1-6; Trial 2: *Square*=shot 7-12. **Target 2**/Trial 3: *Triangle*=shot 13-17; Trial 4: *Upside down Triangle*=shot 18-22 (one hit wood support).



During our shooting, Brian wistfully commented he hoped to find a spent Sharps bullet. As he stooped to examine the pock marked muck of the backstop, he detected a flash of silver. Sure enough, after a bit of digging, he pulled up a pair of very deformed Sharps bullets. Handling the mangled, one-ounce pieces of lead was sobering; the damage one of these bullets would cause when it struck a soldier.

***Authentic Sharps Project*: Conclusion**

This article reflects the final evolution of cartridges developed for the 'Improved Sharps' series of percussion carbines and rifles that saw service during the Civil War. Ironically, during the last months of the War, John Palmer (president of the Sharps Rifle Manufacturing Company) submitted a proposal to the Ordnance Department to convert Sharps percussion weapons to accept the .52-56 caliber rimfire cartridges used by the Spencer Repeating arms. The Ordnance

Department rejected Palmer's proposal, only to reverse themselves a year later, when they authorized Sharps to convert thousands of new and used Sharps carbines/rifles to accept the new 50-70 centerfire cartridge.

For those Sharps enthusiasts who wish to shoot the same type of linen cartridges used by the U.S. Sharp Shooters, I believe the materials and procedures outlined in this article accurately reflect those used by the Sharps Cartridge Works. By carefully following the directions, you can make a linen cartridge with the look and function of the originals.

Be safe, have fun and see you on the skirmish line.

Bill Skillman

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