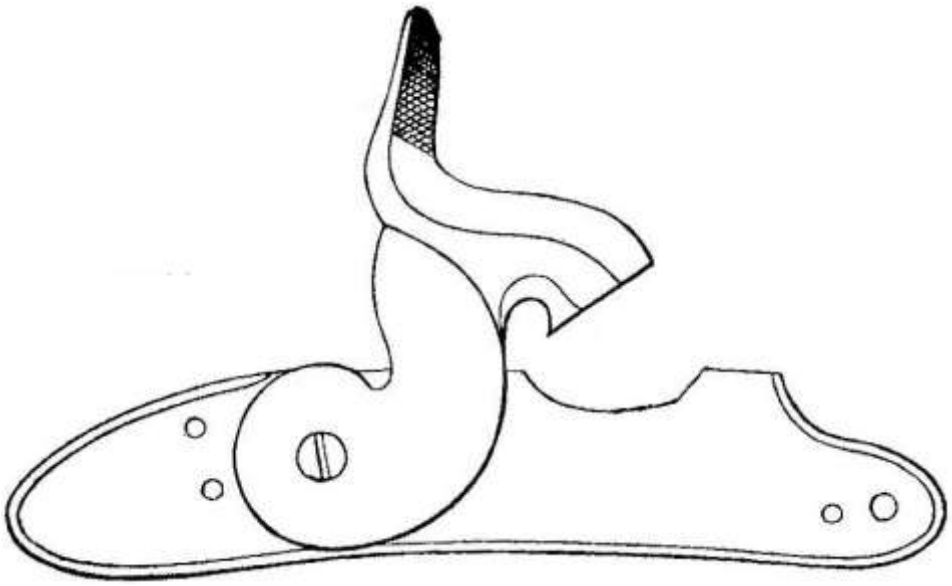
The Imperial Royal

Austrian

Infantry – Rifled Musket

Standard Operating Procedures

for Officers



Vienna, 1857

Translators Forward:

This is a translation of “Das kaiserlich ˝ königliche österreichische Infanterie – Feuergewehr. Auf die hohen Vorschriften basirt und zum Gebrauche für den Officeier”, or in English: “The Imperial Royal Austrian Infantry - Rifled Musket Standard Operating Procedures for Officers” for the Model 1854 Lorenz rifled musket.

Both my American Civil War Shooting Assn. (ACWSA) team and reenacting group portray the 2nd Wisconsin Volunteer Infantry, who used these rifled muskets during the Civil War. I jumped at the chance to buy the first one I ever saw offered, but have been frustrated that I couldn’t find a lot of documentation in English about them.

When S & S Firearms (www.ssfirearms.com) started offering reprinted copies of this manual in its original tongue, I immediately purchased a copy, but only translated a few passages of it until recently.

Translating this book was challenging. It’s written in an Austrian dialect of German, using an obsolete script called Fraktur. With no Optical Character Recognition software for Fraktur available, the books entire contents was retyped into modern script, then translated from German into English using Google Translate.

Converting measurements was also challenging. All measurements in the book use the Austro-Hungarian system predating the metric system, and while the names of the units (e.g., Schritte, Linien, Punct, etc.) commonly appear throughout German speaking Europe, the actual distance they measured varied depending on where you were, even within the borders of the Austro-Hungarian Empire.

Highlights:

- The table on page 45 is useful to all musket shooters, not just Lorenz owners. It lists common problems, the probable defect(s), and what needs to be done to fix it.
- The original page numbers have retained to ease referencing back to the original document.
- All measurements have been converted, but the original measurements appear alongside of them in case you want to apply your own conversion factors.

Acknowledgements: Thanks go to fellow North-South Skirmish Assn (N-SSA) member Jonathan Klein for his help translating the first couple pages, proofing some of the first section, and helping with paragraphs 81-83 on the ‘Guard Ammunition’. My daughter, Amy proofed the entire manual. I especially want to thank N-SSA member Don Dixon for confirming with authority our suspicions on the guard ammunition, providing the measurement specifications used in Vienna, Austria when these rifled muskets were made, answering my questions during the translation and extensive proofing.

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Content

Introduction

Parts of the Infantry and Pioneer Corps are armed with the same rifled-muskets.

The guns have wrought iron barrels and are constructed according to a system by which the closely-fitting lead ball is loaded directly onto a powder charge, so that when fired the shot compresses along the longitudinal axis, increasing the diameter of the ball, pressing it into the rifling, whose direction it must follow. But, this rifling doesn't run parallel with the bore axis, rather it circumscribes a long twist, so the fired bullet in the course of its progress takes on a spinning motion along its own longitudinal access which it maintains for a distance outside of the muzzle along its flight path.

This type of rotation is essential for an accurate shot, to compensate for the detrimental effects of air resistance that a fired bullet encounters along its intended flight path.

Since the rifles of the infantry itself, as well as those of the Jäger and other troops are constructed according to the same system, they all use the same munitions. The same bullet is suitable for all foot soldiers.

Firing is controlled by a percussion lock, and the ignition medium is a copper percussion cap.

All the rifles have the same rifling and construction, but there are two different rear sights. Two-thirds of the line infantry unit will have rifles with fixed sights, and the other third of the unit, along with its Sergeants, will have rear sights that are adjustable from 246-737 yards (300-900 Schritte). Regardless of the rear sight used for aiming, all the infantry rifles have similar construction.

The only difference between the rifles with one-piece rear sights that the majority of the soldiers use and the ones carried by 1/3 of the unit and its Sergeants, is the adjustable rear sight mounted on the barrel which can be flipped up.

The adjustable rear sight is still by comparison not excessively high, barely more than an additional half inch (half Zoll) above the barrel circumference. Once flipped up it can be used for more distant targets, out to as far as 737.5 Yards (900 Schritte), because the initial bullet speed is very fast, namely over 1224 feet (1180 Fuß) per second.

The bullet leaves the muzzle with a velocity of 1224 fps (1180 Fuß) and would continue its flight at its initial speed if not for air resistance. The bullet will progressively slow from its initial speed with each moment of continued flight duration.

However, that speed and the gun's accuracy can only be obtained when the bullet is properly and consistently loaded into the barrel. Loading, as well as firing requires a great deal of care and attention.

Soldiers must be well trained with their weapons, knowledgeable on how to use them properly, and motivated to maintain them at all times.

Section I.

Construction of the Rifle

§1

Main components.

1. The main components of the rifle are:

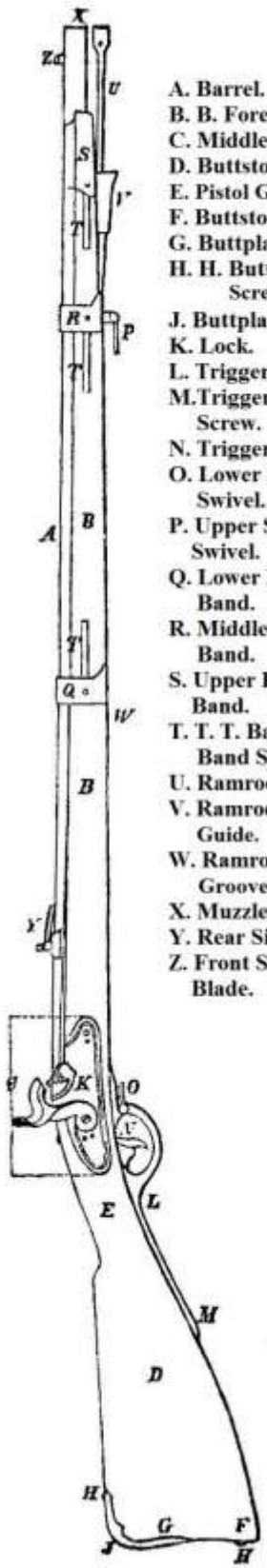
1. The Barrel,	3. The Stock,	5. The Ramrod, and
2. The Lock,	4. The Furniture,	6. The Bayonet.

§2.

Barrel.

2. The barrel is a 37.33 inch (36 Zoll) long, cylindrically drilled iron tube whose walls are thinner in front, but are thicker in back, where the ignited powder exerts the most pressure.

Fig. 22 [1].



A. Barrel.
B. B. Forearm.
C. Middle Stock.
D. Buttstock.
E. Pistol Grip.
F. Buttstock Toe.
G. Buttplate.
H. H. Buttplate Screws.
J. Buttplate Heel.
K. Lock.
L. Trigger Guard.
M. Trigger Guard Screw.
N. Trigger.
O. Lower Sling Swivel.
P. Upper Sling Swivel.
Q. Lower Barrel Band.
R. Middle Barrel Band.
S. Upper Barrel Band.
T. T. T. Barrel Band Springs.
U. Ramrod.
V. Ramrod Guide.
W. Ramrod Groove.
X. Muzzle.
Y. Rear Sight.
Z. Front Sight Blade.

Barrel Axis.

3. The hollow, cylindrical bore of the barrel, .5473 inch (6 Linien, 4 Puncte) in diameter, and the center line, or barrel axis line, is a line drawn in its center running entire length of barrel.

Rifling.

The barrel's bore is not smooth, but cut with 4 furrows, called the grooves.

Fig. 2.

A. Breechplug.
B. Tang screw hole.
C. C. Barrel Walls.
D. Bore.
E. F. Rifling.

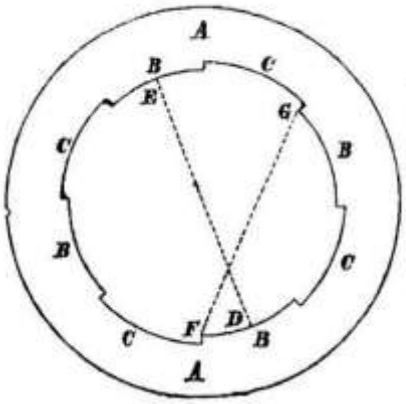


Fig. 3.

A. Barrel Wall.
B.B.B.B. Lands.
C.C.C.C. Grooves.
D.E. Land-to-Land diameter.
F.G. Groove-to-Groove Diameter.

Lands.

4. The four remaining ridges between the grooves in the barrel are called Lands.

The inside of the barrel is thus divided into eight equal parts, four lands and four grooves opposing each other.

The grooves are cut .0072 inch (1 punct) into the bore. The Lands and Grooves each measure 1/8 of the bore circumference, travelling in the direction of the rifling.

The rifling serves as a guide for bullets passing through the bore by pressing the lead into the grooves on the barrel wall and forcing the projectile to follow the direction of the lands.

Twist.

5. Lands are cut like a long screw along the bore in a spiral, twisting to the right almost a half turn along the barrels length. An imaginary length of 82.966 inches (80 Zoll) would be needed to complete a full rotation.

Accordingly, the rifling is described as a 35/80 or 0.44 twist, with an angle of 88 degrees and 47 minutes to the bore axis.

Because our rifling only completes about a half turn in the length of the barrel, it is called a half-twist barrel. The rifling has the correct twist necessary to stabilize the bullet along its longitudinal axis, which is important to overcome the detrimental effects of wind resistance, and therefore to produce accurate shots

Compression.

6. The projectile compresses slightly in the breech when the powder ignites, increasing its circumference, and it is very important that the bullet expands into the .089 inch (1 linien) deep rifling within 5.185 or 6.222 inches (5 or 6 Zoll) of the chamber. [The enlarged chamber section is called the Fall.]

When beginning to load a cartridge some resistance will be felt from the muzzle down to the level of the rear sights. Then the bullet will go down far easier from there down into the breech [The enlarged chamber section is called the Fall.].

Muzzle.

7. The upper opening through which the charge is loaded into the barrel, and from which the loaded bullet flies, is called the muzzle.

Caliber.

8. The width of the muzzle, and that of the entire bore is called the gun's caliber and measures .54734 inch (6 Linien, 4 Puncte), except however, at the bottom or the bore, where the dimension increases by .0072 inch (1 Puncte). [The enlarged chamber section is called the Fall.]

Breech.

9. The outside barrel is shaped in the form of an octagon from its lower end up to around the rear sight, however, only five sides are ground flat, and the part inside the barrel channel of the stock remains rounded.

This heavier rear part of the barrel, in which the ball is seated and where the combustion of the powder takes place, is called the chamber.

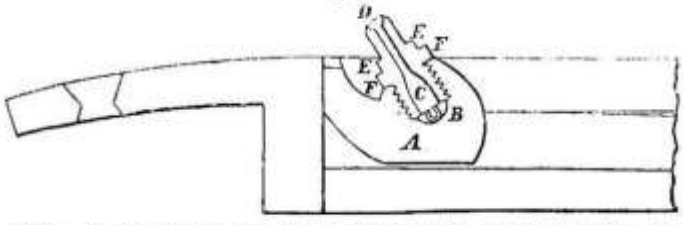
The external barrel diameter is 1.0803 inch (1 Zoll, 6 Puncte) at the breech, .7922 inch (9 linien, 2 Puncte) in the middle, and only .07418 inch (8 Linien, 7 Puncte) at the muzzle. Thus the barrel is .3385 (3 Linien, 11 Puncte) thicker at the breech than it is at the muzzle.

The barrel weighs 4.1376 pounds (3 Pfund, 11 Loth), and the entire rifle, without the .0928 pound (24 Loth) bayonet, weighs 9.4352 pounds (7 Pfund, 20 Loth).

Nipple Seat and Ignition Channel.

10. At the very bottom of the iron of the barrel is the nipple-seat, which is attached as one piece to the barrel, and includes the ignition channel that measures .1296 inch (1 Linie, 6 Puncte). This leads on one end to the chamber, and at the other end, to a female threaded opening designed to accept the nipple.

Fig. 4.



A. Nipple Seat. B. Ignition Canal. C. Ignition Chamber. D. Cone Face. E. Square. F. Shoulder.

The Nipple contains the touch-hole; it has a conical shape to receive the percussion cap atop a quadrangular Square that is used to screw the nipple in and out. Beneath the quadrangles is the Nipple disk and below that emerge the screw threads.

The Nipple is inclined at a 52 degree angle from the barrel, and it takes 4 ½ turns to tighten the disk against the nipple-seat.

Ignition Channel.

11. The touchhole of the nipple widens into a funnel shape as it reaches the fire channel, as it is .0432 inches (6 Puncte) wide, and on the top surface of the nipple, which is called the contact face, is bored cylindrically.

12. The nipple is replaceable and if it breaks, or becomes enlarged from the wear of escaping gas, it must be changed.

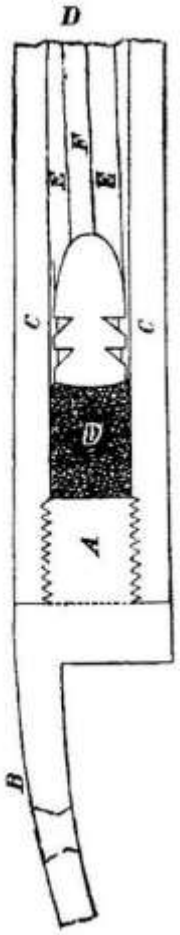


Fig. 2.
A. Breechplug.
B. Tang screw hole.
C. C. Barrel Walls.
D. Bore.
E. F. Rifling.

Breechplug.

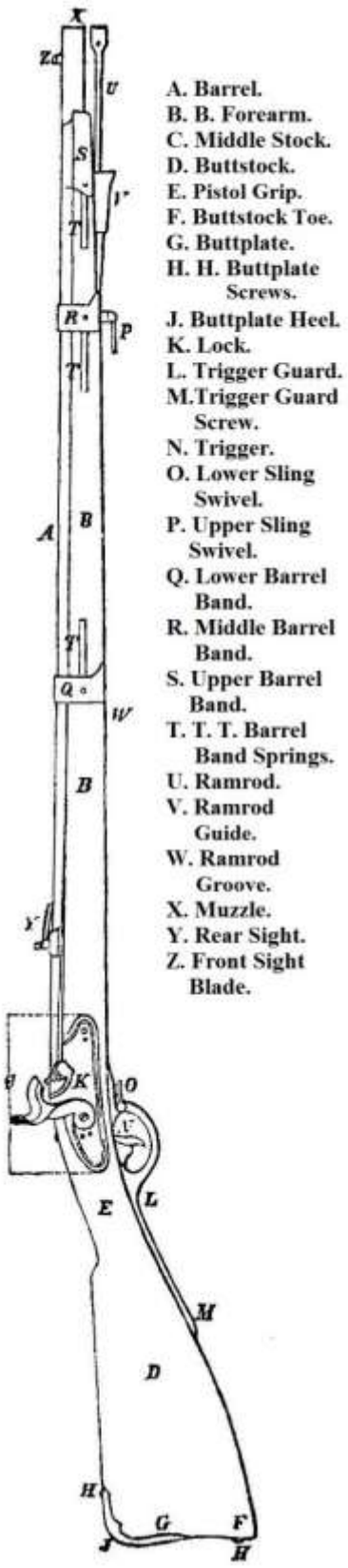
13. The breech plug forms the rear closure on the bore. It has a very flat face, which cuts into the bore to where the ignition channel intersects the chamber. - It extends behind the breech – and has a hole drilled where needed to accept the tang screw.

Sight Reticle and Blade.

14. Above the barrel are attached two reference points used to aim the firearm that must lie at the same level and direction as the axis of the bore.

The one closest to the eye, i.e., the rear sight, is 5.1854 inches (5 Zoll) from the rear end of the barrel, where it has a diameter of 1.0227 inch (11 Linien, 10 Puncte). The notch of the rear sight should be .9507 inch (11 Linien) above the axis of the bore.

Fig. 22 [1].



The upper reference point is called the front sight, and is located 1.2963 inch (1 Zoll, 3 Linien) from the muzzle, and .6122 inch (7 Linien and 1 Punct) above the barrel axis line, i.e., the height difference between the two sights is .3385 inch (3 Linien and 11 Puncte).

The distance between the two sights is 30.8530 inches (29 Zoll, 9 Linien).

Line of Sight and Sight Angle.

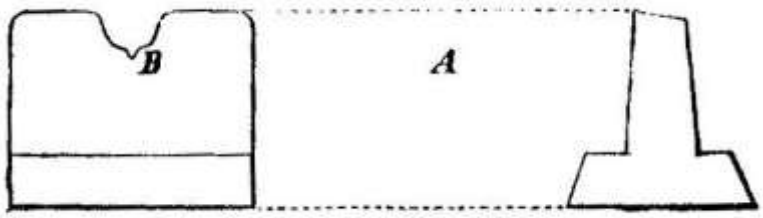
15. The straight line aligning the eye, rear sight, front sight and target is called the line of sight.

The angle formed by the line of sight and an imaginary line extended from the axis of the tube, is called the sight angle, and measures 37 minutes.

The necessity and importance that the front and rear sights remain at their prescribed dimensions and locations is covered in Section VII of this document.

16. The Front Sight – Affixed on its base, is soldered onto the barrel, and used to mount the Bayonet. Its sharp edge and muzzle crown must be protected from damage, especially when mounting the bayonet. If damaged, it must be repaired.

Fig. 7.



A. Rear Sight. B. Notch.

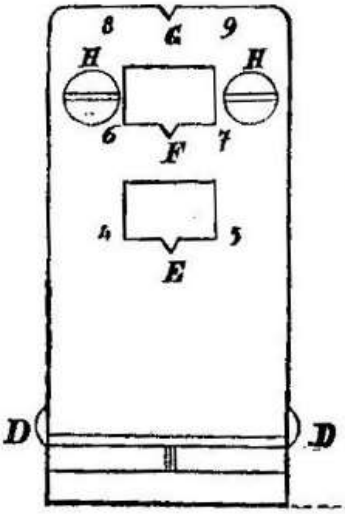
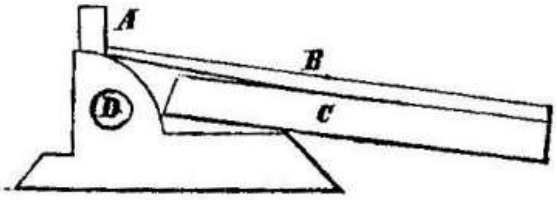


Fig. 8.

A. Rear Sight. B. Sight Leaf. C. Sight Flange.
D. Pin. E.F.G. Notches. H.H. Screws.



17. There are two different rear sights; a fixed sight used by two thirds of the unit, and an adjustable sight with apertures for long-distance shooting for one third of the unit and the non-commissioned officers.

18. Both rear sights are mounted in slots atop the outer barrel wall. While the front sight is fixed, either rear sight can be moved from side to side. Once the gun is zeroed in the correct position to shoot in a straight line, the rear sight is staked in place. The soldier must observe and ensure the sight always remains in that position in the slot. A bumped sight is easily recognizable by its position in its slot, and must be immediately shown by the soldier to the noncommissioned officer so it can be corrected immediately, by carefully and gently tapping the side of the sight. If the sight moves easily without significant resistance or even merely by the touch of a finger, it must be reported so the situation can be remedied.

Apertures.

19. The notch on the bottom of the long-range sight is used for aiming at targets up to 245.8 yards (300 Schritten); the sight leaf is raised for aiming up to 737.5 yards (900 Schritten). The placement of the openings have been deliberately calculated, and are called apertures. The notch must be in its original, unaltered, sharply cut shape. These apertures are on a spring leaf that is held in place on a flange by two screws which folds up and down on a pin through the base which also stops the movement of flange when erect.

20. The method for aiming through the various rear sights is as follows:

Sight pictures for both rifle sights in general: At 122.9 yards (150 Schritten) with the front sight on the abdomen of the opponent; 163.9 yards (200 Schritten) with the front sight on the chest; and 245.8 yards (300 Schritten) with the full front sight on the chest.

With the long range sight erected: 327.8 yards (400 Schritten) through the opening and Aperture No. 4-5 with a fine front sight at the abdomen; 409.7 yards (500 Schritten), using the same aperture with a full front sight at the head; 491.7 yards (600 Schritten) through the opening and the Aperture No. 6-7 with a fine front sight at the abdomen; and 573.3 yards (700 Schritten) with a full front sight at the head. 655.6 yards (800 Schritten) through the No. 8-9 notch on the top edge of the sight leaf with a fine front sight at the abdomen and 737.5 yards (900 Schritten) with a full front sight at the head.

So at 327.8, 491.7, and 655.6 yards (400, 600, 800 Schritten) through the corresponding numbered apertures with fine front sight at the abdomen, and at 409.7, 573.3, and 737.5 yards (500, 700, 900 Schritten) with the full front sight at the head.

21. The rules and regulations, "Aim and Hitting" and "target shooting" are included in Austrian Army regulations.

22. Finally, it is noted that all diligence and effort must be made to maintain the rifle in standard, as-issued condition by the soldiers in its cleaning and maintenance, and the non-commission officer in his inspections. Both will be discussed further in the following sections.

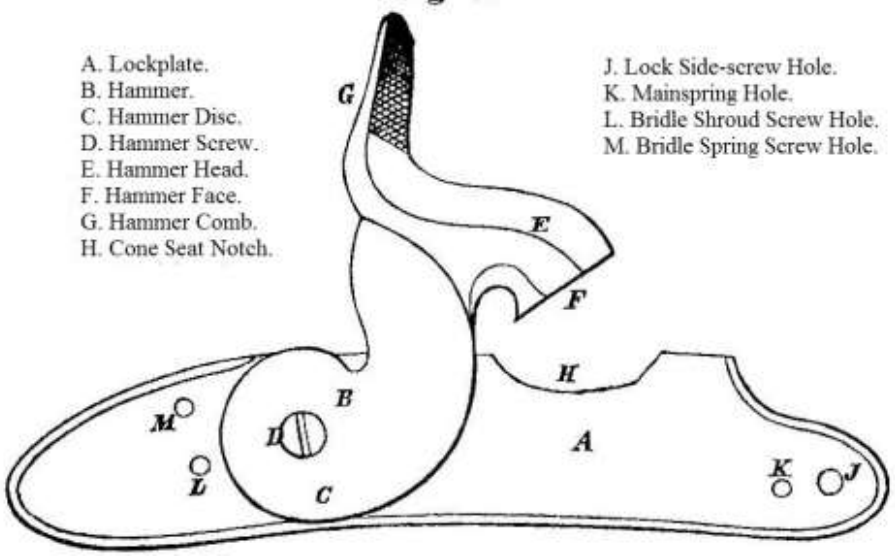
§3.

The Lock.

23. The lock is an artificial mechanism made to crush a percussion cap, which in turn ignites the powder charge. It must be carefully treated and maintained to operate properly. It delivers a short and strong impact directly onto the nipple to make the spark, which is called the percussion.

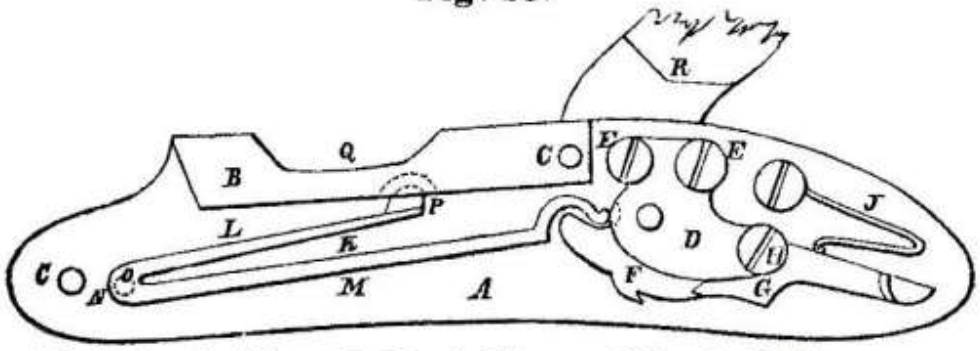
24. That lock is embedded into the stock where dust or moisture cannot penetrate its inner mechanism. It is secured by two carriage bolts to the stock that must be firmly tightened.

Fig. 9.



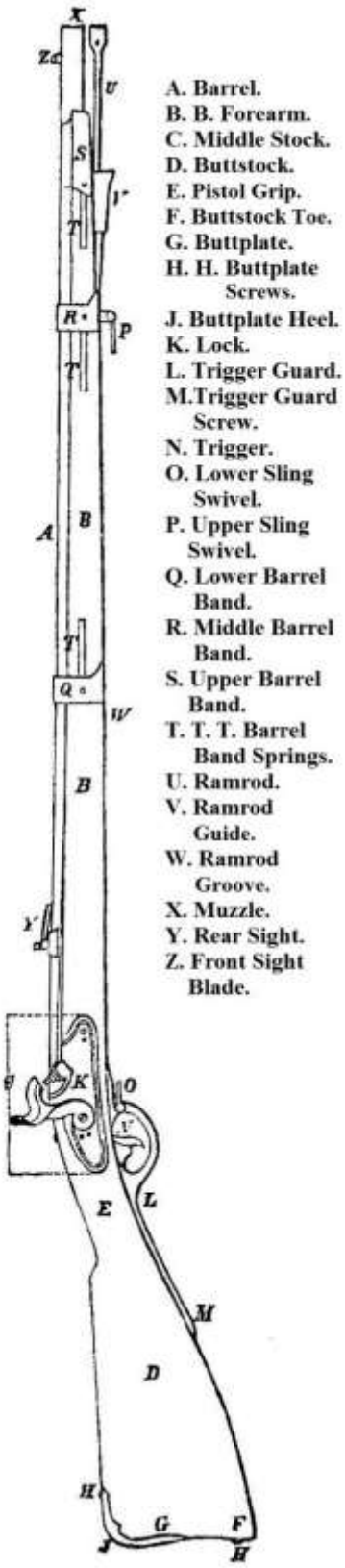
25. The lock consists of two main parts which are connected.

Fig. 10.



A. Lockplate. B. Bolster. C.C. Lock Side-screw Holes. D. Bridle.
E.E. Bridle Screws. F. Tumbler. G. Sear. H. Sear Screw. J. Sear Spring.
K. Mainspring. L. Short Arm. M. Long Arm. N. Pin. O. Pin Hole. P. Lobe.
Q. Notch for Nipple Seat. R. Hammer Neck.

Fig. 22 [1].



Locking and Percussion Device.

The main components of the lock mechanism are located inside - and the percussion device, i.e., the hammer, on the outside.

26. The lock plate includes a thicker iron part, called the bolster that has a cutout where the barrels nipple-seat rests.

Lock Mechanism.

27. The locking mechanism consists of: 1. The main-spring. 2. The tumbler. 3. The bridle. 4. The sear, and 5. The sear-spring.

Mainspring.

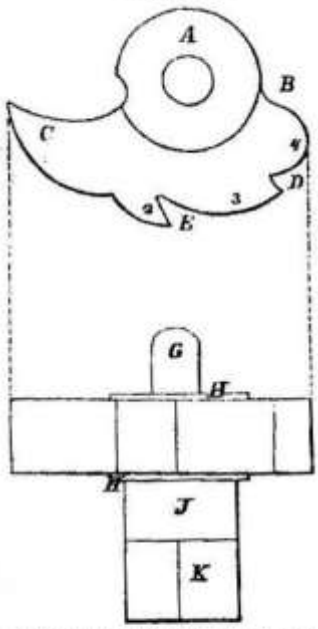
28. The mainspring is the moving force in the lock mechanism. It is bent over double and is fixed in place by a lobe and a pin in the plate. The former is located at the upper end of the short arm, the latter at the bend between the long and short arms. Both arms are movable and the longer arm has a round shape, called the horn, at its end and affect the firing pin spring with a force of 16.1 to 17.3 pounds (13 to 14 Pfunden) on the tumbler.

After it is put in place, it must be protected as not to unnecessarily weaken its strength because a weak main spring no longer functions and causes problems. The long arm must also move freely, i.e., it must not touch the lock plate along its length when moving and rub against it. Rubbing is usually indicated by shiny streak left on the inside of the lock plate. When noted this deficiency should be reported and fixed.

Tumbler.

29. The Tumbler controls the spring tension of the outer Percussion mechanism, namely the hammer.

Fig. 12.



A. Tumbler wear disc. B. Tumbler back. C. Tumber horn. D. Full cock notch. E. Safety notch. 1.2.3.4. Tumbler Lobes. G. Tumbler pin. H.H. Wear Disc chamfer. J. Arbor. K. Square.

It has two co-rotating axles, one on each side, and on its interior axis has a lobe that is divided into four unequal segments. The axles are called the Tumbler-axis, the one that fits into the lock plate is called the arbor and the other side that fits into the bridle is called the pivot. The tumbler rotates on its axis between two parallel walls - the lock plate and bridle - and this rotation must be free and not wobble; if the bridle is too tight it will not move freely - and if the holes in the lock plate or bridle are too large, or the bridle not tightened enough, it will wobble.

The square is located on the arbor, where the hammer is attached and held in place with the hammer screw.

Lobes.

The four sections on the outside edge of the tumbler are called the lobes.

Tumbler Horn.

The mainspring makes contact with the Horn, and rubs against it when the hammer is cocked. While the short arm of the mainspring is fixed, the long arm is tensioned when it is raised and released when the long arm is forced down again.

The mainspring must not go beyond the horn as clamping against the body of the tumbler would inhibit the proper expression of power.

Safety Notch.

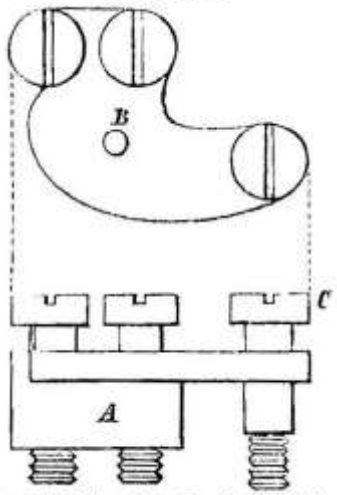
The second lobe contains the safety notch, which is cut very deeply at an oblique angle.

Firing Notch.

The third lobe contains the firing [Full Cock] notch, which is cut in the direction of the center of the tumbler, and is only deep enough so the end of the sear can rest in it.

Finally, the fourth remaining piece is called the tail lobe, and has no particular importance.

Fig. 13.



A. Bridel Shroud. B. Tumbler Pin Hole.
C. Sear Screw.

The friction of the tumbler rotation between the bridle and lock plate is minimized as much as possible by the chamfered surfaces around the axles, which alone rub while the remaining parts of the tumbler walls are free.

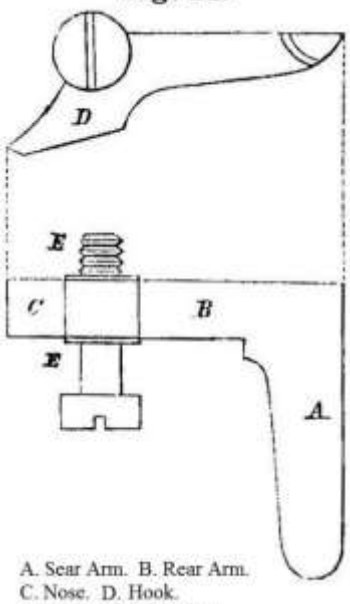
Bridle.

30. The bridle shroud forms one of the bearings for the tumbler axle and holds the tumbler pin. It is attached to the lock plate by the two screws. Through their rear is a hole for the sear screw, which acts as a fulcrum for the sear.

These three screws must always be fully tightened, yet allow the tumbler and sear to move normally.

Over tightening the screws would clamp the tumbler, which would be a major problem.

Fig. 14.



A. Sear Arm. B. Rear Arm.
C. Nose. D. Hook.
E.E. Chamfered surface

Sear.

31. The sear is a double-sided lever which has a hole for the sear screw, which serves as a pivot point. The sear serves the purpose of holding the hammer in the half and full cock positions through its engagement with the tumbler. Like the tumbler, it fits between the lock plate and bridle and also has a chamfers on both sides to reduce friction.

The sear nose engages the tumbler notches, while the much longer trailing arm and the right angle bend of the sear rod pin, are used to transfer pressure from the trigger when you want to fire.

Sear Spring.

32. The sear nose is held in the tumbler notches by pressure against it from the sear spring. It cannot jump out at random and resists pressure from the trigger blade.

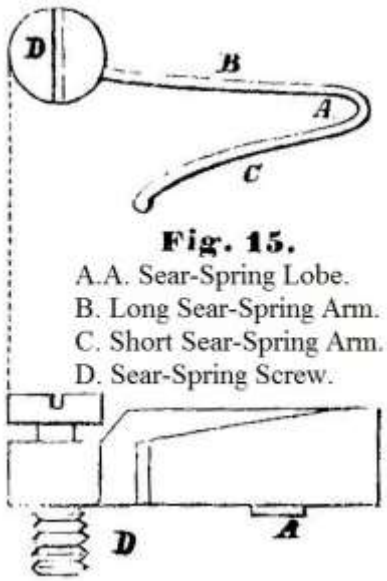


Fig. 15.
A.A. Sear-Spring Lobe.
B. Long Sear-Spring Arm.
C. Short Sear-Spring Arm.
D. Sear-Spring Screw.

The sear spring, like the mainspring, has two arms: its upper, longer arm has a bent loop for the sear screw, and a lobe that catches in notch in the lock plate while pressing the lower and shorter movable arm onto the back arm of the sear to hold the sear nose against the tumbler or in the notches.

The sear spring must have just the right tension, otherwise the lock will be too easy or difficult to operate.

33. If the tumble is broken or sear nose is very blunt, the lock engagement is deficient, and those parts need to be either be repaired or replaced.

It is also necessary that the sear rotate freely between the bridle and lock-plate and, just like tumbler, not wobble.

Oiling.

34. All the parts in the lock that rub or bind in its movement must be oiled so they move as freely as possible; and it must indeed be pure olive oil, so that it does not thicken or gel, becoming more of a hindrance than a help. It is also good to prevent dust from getting into the lock, which mostly occurs when the lock is disassembled for maintenance; it is especially important to protect the lock from dust.

Oiling is usually done with the lock still assembled, by putting a very small drop of oil on the following points:

1. On the tumbler, where the mainspring horn loop rubs.

2. On the two middle [Full and Half Cock] notches, where the catches rub the sear nose.

3. On the back of the sear spring, where the lobe goes into the lock plate

4. On tumbler pin pivot in the bridle - and

5. On the tumbler arbor between the hammer and lock plate.

Lock Disassembly.

35. The lock should never be disassembled by soldiers, and only removed with permission of the Noncommissioned Officers during inspections or special cleanings. Also if a bayonet needs disassembly, or in the rare cases when it is necessary to separate the hammer and tumbler, it will be done by the Noncommissioned Officer, under the supervision of a gunsmith.

If a Noncommissioned Officer is charged with the disassembling a lock, he first separates it from the stock by unscrewing the two lock screws and then carefully removes the lock from the stock. He then proceeds as follows:

1. Cock the hammer and clamp the mainspring;

2. Release the hammer and remove the mainspring;

3. To remove the Bridle, release the tab on the sear spring, then unscrew the sear spring screw all the way and remove it and the sear spring.

5. Unscrew the bridle screws and take out the bridle.

Lock Reassembly.

36. In contrast, the lock is reassembled in reverse order:

1. Install the bridle shroud and bridal screws.

2. Insert the sear spring screw and spring.

3. With the thumb of the left hand clamping the sear spring and sear screw together, complete final tightening of the screw.

4. Install the mainspring, then cock the hammer to tighten the tension on it.

5. Let the hammer down to increase the spring tension by holding the lock in the left hand with the curved forefinger of the right hand on the hammer head and pressing the sear arm with the thumb.

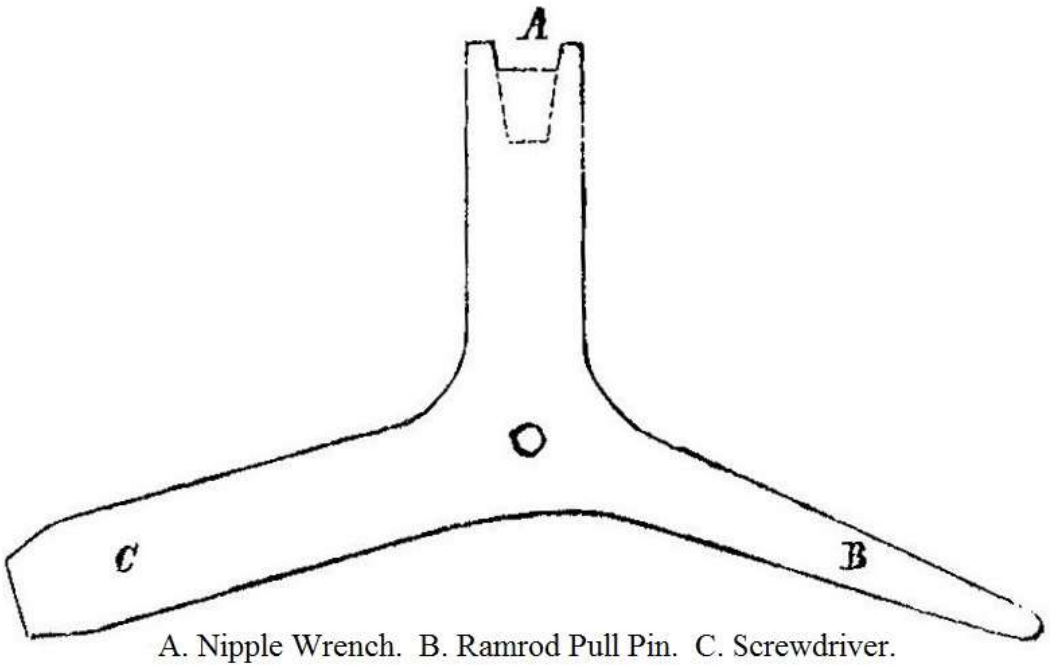
Screws.

37. All screws should be tightened to the end of their threads, but no torque is to be applied, which would eventually destroy the threads, i.e., a stripped lock, and cause the mechanism to bind. Likewise, leaving the screws loose will cause the gradual expansion of all thread holes and a sloppy mechanism, ultimately causing hammer malfunctions.

Screwdriver and Spring Vise Application.

38. The screwdriver is very carefully and slowly applied, so as not to mar the slots of the screw heads, or slip off the screw slot, thereby damaging not only the underlying parts, but also the screwdriver.

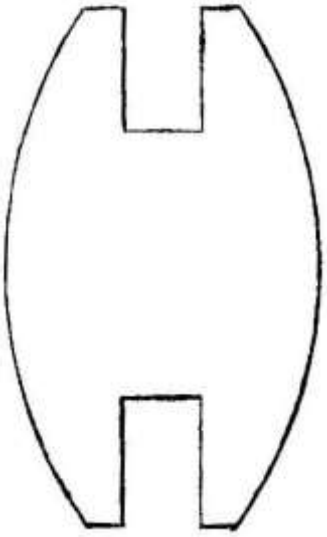
Fig. 16.



A. Nipple Wrench. B. Ramrod Pull Pin. C. Screwdriver.

When using the screwdriver, it should always be inserted perpendicular into the slot of the screw head and gently held there by the thumb of the left hand. If holding the gun cannot be achieved by hand a stable surface should be used that is well lit and dust free so as not to soil the greased iron parts, defeating the purpose of oiling as earlier described in this manual.

Fig. 17.

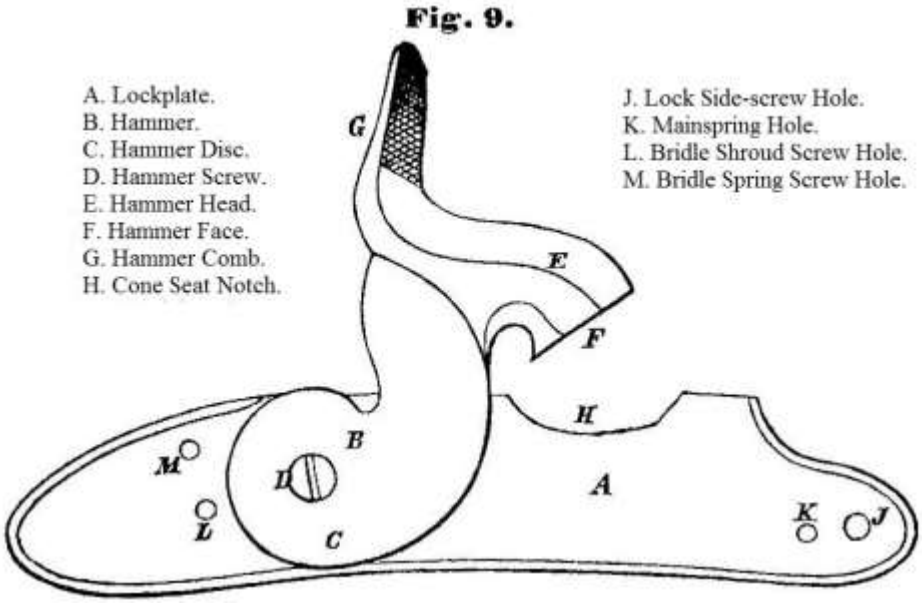


Finally, when using the mainspring with the vise, it should be applied vertically with the spring arms positioned perfectly between the jaws to prevent them from jumping out of the clamp.

The Percussion Device, the Hammer.

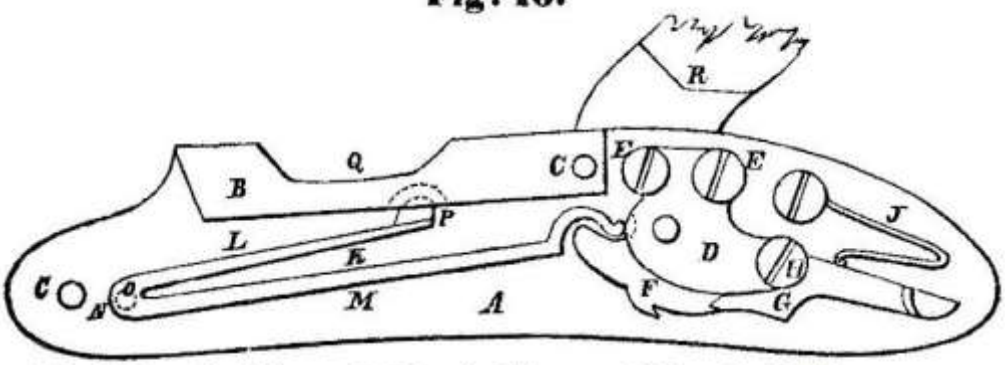
39. The hammer consists of the head with a face that is located within the cavity on its front; and the hammer comb, whose surface is roughened with cross-cuts; and finally at the other end of the hammer is the disc, which is affixed to the squares of the tumbler, connecting it to the hammer.

Fig. 9.



When the lock is dismounted from the stock, the bolster on the lock plate prevents the released hammer from rotating further.

Fig. 10.



A. Lockplate. B. Bolster. C.C. Lock Side-screw Holes. D. Bridle.
E.E. Bridle Screws. F. Tumbler. G. Sear. H. Sear Screw. J. Sear Spring.
K. Mainspring. L. Short Arm. M. Long Arm. N. Pin. O. Pin Hole. P. Lobe.
Q. Notch for Nipple Seat. R. Hammer Neck.

The hammer has to rotate without any interference at full force to the percussion cap to properly ignite it every time.

Therefore, for the full impact the hammer should exert on percussion cap against the nipple face, it is absolutely necessary that it is firmly seated on the squares of the tumbler.

Any looseness must remedied immediately, because unless the hammer falls down squarely on the face of nipple, and this is not perfectly uniform, this by itself could cause misfires of the percussion caps.

Furthermore, whether or not the hammer has a staggering gait still needs to be checked, to confirm it is an extension of the tumbler notches through the lock plate and Bridle, and if not it also requires repair. These two evils - the hammer wobbling on the square and a staggering gait – are both caused by not tightening the Bridle shroud - are generally regarded as the unilateral cause of problems with the hammer striking the surface on the percussion cap. The hammer itself is high in iron and shaped such that it does not bend easily.

Lock mechanism

40. The lock mechanism, or the effect of the locking mechanism, on the one hand, releases tension from mainspring spreading open, transferring their power from the long compressed arms onto the tumbler, while cocking the hammer compresses both mainspring arms clamping them against each other, rotating the tumbler horn upward. Therefore, while outside the hammer is hurling forward, inside the immutable connection is turning the tumbler back.

41. On the other hand, the pressure exerted by the sear spring drives the sear into the recessed notches of the tumbler, expressing a ratcheting effect that arrests the reverse rotation or slipping of the tumbler. The cocked hammer will be held in place as the sear spring presses the sear into the tumbler notches. The trigger releases the sear spring pressure when back pressure from the trigger blade, pressing up on the sear arm, frees the nose from the notch that is preventing it from following their spring tension.

42. The sear nose can be easily raised from the full cock notch, namely, when the hammer is cocked and pressure by the trigger blade transferred to the nose of the sear, the release of the hammer requires very little trigger pressure because of the way it’s made. A hard trigger pull may mean the lock needs lubrication; if not, it must be reported immediately to remedy the situation.

43. If the hammer is not fully cocked, but only pulled back as far as the safety notch - where it cannot strike the percussion cap - the mainspring tension is significantly weaker, because the spring is far less compressed.

The sear releasing from this notch arbitrarily, or even by mistakenly pulling the trigger, is totally prevented by the notch being cut very deeply and at much more oblique angle; therefore, it is also called the safety notch.

44. Finally, for tumbler assembly to be operating correctly, the sear nose needs to drop into the tumbler notches, without hindrance or hesitation before it absorbs the tension from the mainspring. An indicator of a properly working tumbler assembly is the crisp sounding snap of the sear nose dropping into the tumbler notches when the hammer is cocked. Where this is not noted, there is a problem that needs to be reported and repair authorized.

§4.

The Stock.

15. The stock connects of the lock to the barrel, providing a means to use of the rifle.

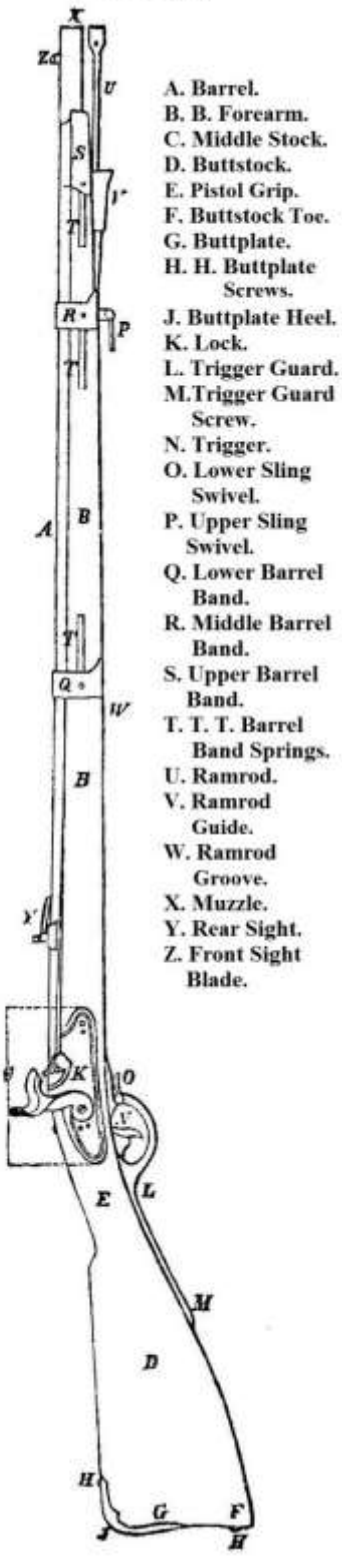
It is made from kiln dried red beech wood, nearly reaches the muzzle, and has to accommodate the barrel, the lock and the other components of the rifle - some of which are inletted.

46. The stock is divided along its length into four main sections. They are: 1. The Forearm. 2. The Bed for the lock. 3. The Pistol Grip, and 4. The Butt.

Forearm and its Furniture.

47. The forearm extends from the upper end of the stock nearest the muzzle to the lock. Running almost its entire length is a semi-circular cutout, which is specifically called the barrel channel.

Fig. 22 [1].



On the reverse side of the stock, concurrent with the bed for the lock are holes drilled for the lock side screws. These holes are reinforced with a side plate.

Since the wood between the lock side screws and the side plate - as well as that which surrounds the cut at the lower part barrel channel - can be very thin, particular caution is needed to protect this part of the stock.

48. The barrel is held in the barrel channel by three iron bands: of which the upper band sits at the muzzle end, and has a funnel provided for easier insertion of the ramrod; the middle barrel band has a sling swivel; and the lower band binds up the exposed ramrod channel, which is internally bored from that point to the iron ramrod striker plate.

Each of the three bands is held in place by a band spring inset into the stock.

The Stock Bed and its Furniture.

49. The bed of the stock is designed to hold the lock section. The stock must enclose the lock mechanism perfectly, and the various cuts within it need adequate clearances, so no internal parts in the lock rub on the wood, which would of course only inhibit it working. Additionally, for precisely for this reason, the hammer shank cannot leave streaks - when this occurs there is usually binding.

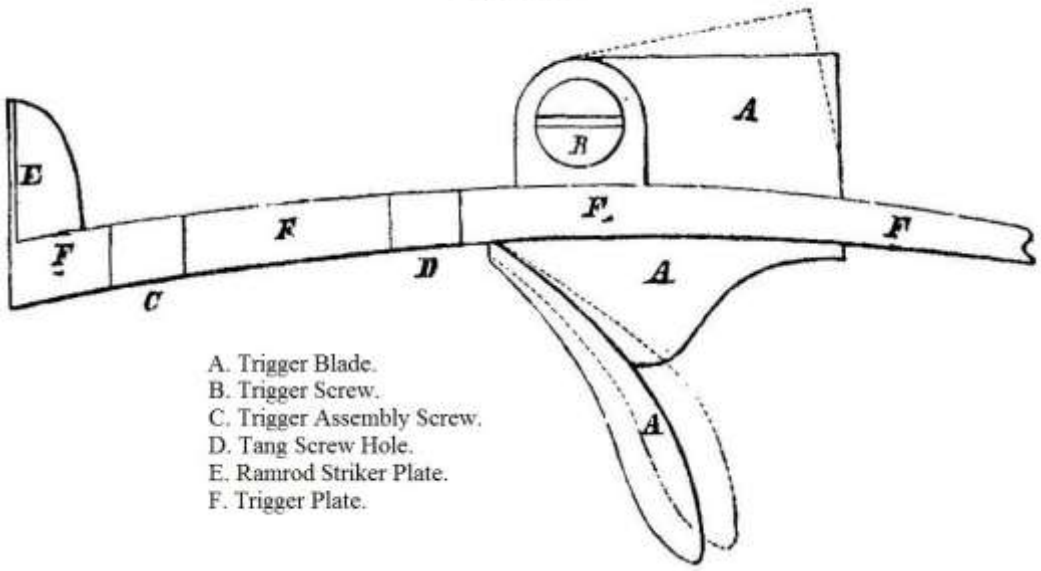
Side Plate.

50. On the side stock opposite the lock plate, a single plate to holds and supports the two lock screws is inletted into surface.

Trigger Plate.

51. Furthermore, the Trigger Assembly is located in the bed, below the lock, with its loosely mounted trigger blade. It consists of the finger pad and the trigger blade, which are connected by a trigger screw that anchors it and serves as the rotation point for transforming the leverage along the trigger blade. At the front end of the Assembly is the striker plate upon which the supplied ramrod rests.

Fig. 21.



The trigger assembly is held in place by the screw that extends down from atop the tang and into the partially overlapping trigger guard on the stock.

52. The trigger blade, from its position inside the stock, transfers force from the trigger onto the sear arm. The blade should not be too close nor too far away from the sear arm. To properly operate, therefore, it is important that when the hammer is cocked - in both safe and full cock positions - it has a small amount of play, about two fingers forward and back. However, when there is no play, or when the trigger pull is hard or heavy, or when there is a noticeable wobble in its movement, the defect should be reported to remedy the situation.

Trigger Guard.

53. The curved trigger guard is used to cover the protruding trigger beneath the stock. It has two screws, one above and one below the loop, which are called trigger guard screws. The top one goes into trigger assembly, and the lower one into the stock.

54. The lower sling swivel is attached to upper part of the trigger guard loop.

Fig. 22 [1].

Pistol Grip.

55. The pistol grip is the curved part of the stock that connects the bed to the rifle butt.

Buttstock.

56. The pistol grip is used to apply the rifle to the shoulder. Behind the pistol grip is the buttstock, which increases in width all the way to the rear, which is called the butt. At the lower end, the butt is covered with an iron buttplate for protection that is secured to the wood using two buttplate screws.

Fig. 23.

Its front, wider edge is the heel and the narrower rear edge is the toe.

Should any damage appear on the stock, it should be reported to remedy the situation.

§5.

The Furniture.

57. The furniture includes all iron parts located on the stock already discussed. Namely: 1.the three barrel bands and the three retainer springs, 2. the trigger assembly, 3. the trigger guard and the two sling swivels, 4. the buttplate, and 5. the plate for the lock screws along with all screws.

§6.

The Ramrod.

58. The ramrod is a round, steel shaft which has at its upper end a hollowed cup matching the shape of a compression bullet nose that is used to push the breech during loading. The lower end of the rod is threaded to accept the wiper or ball screw.

However, in order make getting a handhold easier, the pulling pin of the projectile to the screwdriver is inserted through the hole drilled through the lower part of the ramrod Head, which serves as a handle.

The steel shaft has an enlarged reinforcement below the Ramrod Head - the swell – which somewhat aids situating it into the rifling.

§7.

The Bayonet.

59. The bayonet consists of a straight, 18.6 inch (18 Zoll) long steel blade connected to a socket by a curved neck. It has two ribs and characterized as four-bladed.

Fig. 24.

A. Blade. B. Socket. C. Rotating Ring. D. Cut-out. E. Screw. F. Neck.

The socket is used to fix the Bayonet onto the barrel, where it is locked down with a rotating locking ring.

60. Thus, the socket of the bayonet is planted on the barrel muzzle with the front sight inserted into the cut-outs of the bridge, stud mortise, and corresponding opening of the locking ring, then tightened after fixing by twisting the ring.

61. Caution should be exercised when fixing the bayonet. An examination of the number of work orders submitted show that fixing bayonets too roughly ruins the edges of the front sight blades.

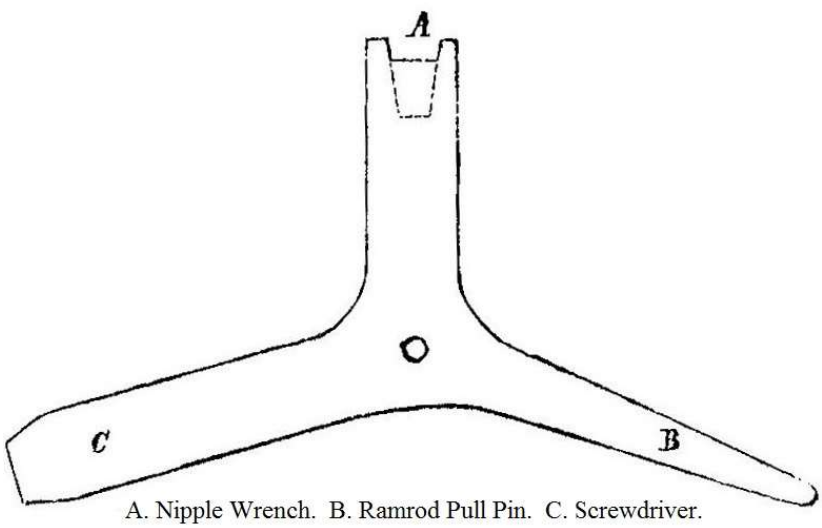
62. The locking ring must remain reasonably loose on its rotational surfaces so it, and the screw mounted there, should be oiled to prevent any rust that would cause excessive friction.

Section II.
Accessories, Tools and Other Aids

§8.
The Accessories, Wiper, Screwdriver, Pull Pin.

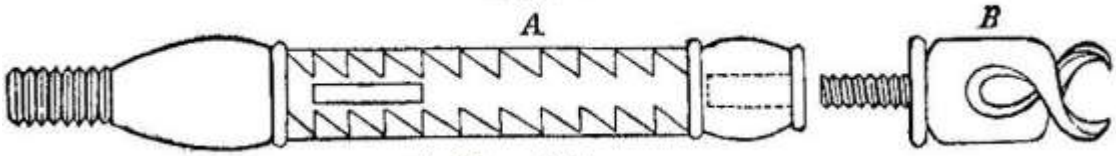
63. Each rifle comes with an iron wiper, into which an iron worm is screwed, as well as a combination tool with a screwdriver, ramrod pulling pin and nipple wrench.

Fig. 16.



A. Nipple Wrench. B. Ramrod Pull Pin. C. Screwdriver.

Fig. 26.



A. Wiper. B. Worm.

64. Caution must be used when using the combination tool on the nipples and screws. See text number 38.

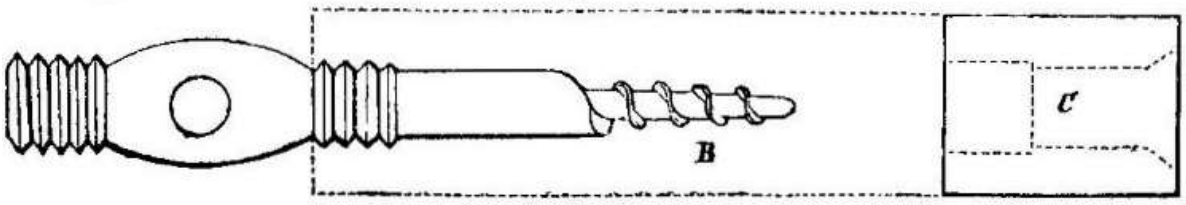
65. Every man with a musket must be issued these items, and a number of worms will be distributed in each Company.

Ball-Screw.

The ball-screw consists of the drill and guide sleeve. The latter is lowered into the

rifling, guiding the drill to the highest part and center of the compression bullet, and holding it there during drilling to prevent damage to the rifling.

Fig. 27.



The Ball Puller. B. Borer. C. Ball Puller Guide

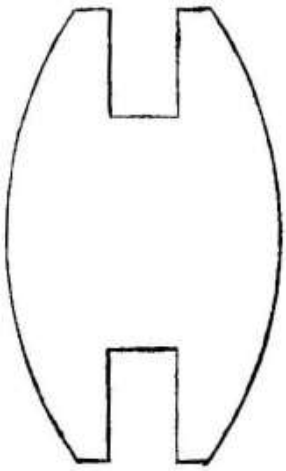
Mainspring Vise.

66. Finally, each Sergeant has a main spring vise and knows how to use it to disassemble and reassemble the lock.

§9.

The Cleaning Kit.

Fig. 17.



67. Every soldier and Sergeant is required to have a cleaning kit for their rifle consisting of: 1. Some linen cloth. 2. Two 5.2 by 3.1 inch (5 by 3 Zoll) cloth rags – one saturated with pure tallow for metal parts and the other with olive oil for the wooden stock. 3. One 9.3 by 3.1 inch (9 by 3 Zoll) flannel rag for the bore enriched with pure tallow, 4. A small rifle brush, 5. Some small feathers and 6. A small glass vial with pure olive oil.

§10.

Other Aids.

Tompion.

68. A tompion, a 2.1 inch (2 Zoll) long wooden cylinder whose diameter is slightly smaller than the rifle caliber, seals the muzzle from moisture and dust on marches, in the barracks, and wherever else needed. It has large lead plate on the upper end, and three to four layers of pure tallow cloth held in place with a nail on the bottom

that completely fill the grooves when inserted into the bore. The clearance between the wooden cylinder and the barrel walls, together with the impregnated cloth strips must be periodically checked, especially if it gets wet or soiled, because this moisture or dirt would inevitably cause rust.

Inspecting rifles in storage for this is particularly important.

Practice Cartridge.

69. During every loading exercise, a cloth-covered practice Cartridge must be inserted into the chamber to protect the breech plug face and the ramrod threads. It is 1.55 inch (1.5 Zoll) long and the same diameter as the ball diameter. Inside the cloth is a lead weight.

The practice cartridge must be kept completely clean and dry, even a small amount of rust on it can cause big problems.

70. A reserve nipple is also part of the accessories, along with two nipple picks which are carried in the cartridge pouch.

Note.

Be diligently mindful of the condition of the rifle, the accessories, tools and other aids.

In addition, each man must bear the prescribed ammunition and Company Supply must stock a reasonable number of wooden mop sticks. (See No. 119)

Section III.
Ammunition.

§11.

Service ammunition.

71. Service ammunition cartridges contain: gun powder, the Compression bullet, and percussion caps.

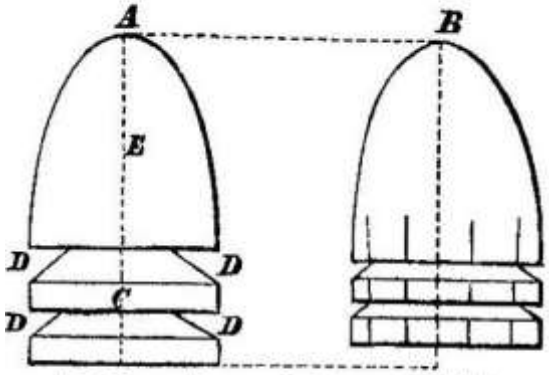
Gunpowder.

72. The gunpowder is a granular mixture of 80 parts of saltpeter, 12 parts sulfur and parts 14 charcoal. One charge has 62.15 Grains (55 Gran) of gunpowder.

Compression Bullet.

73. The compression bullet is a lead projectile weighing an average of 452 Grains (400 Gran). Like round balls, it can be cast in molds, but it is now cut and swaged with new machines. It consists of two sections: Namely the upper nose and the cylinder. This design provides two parallel grooves around its axis length for the compression of the projectile beyond its original size.

Fig. 29.



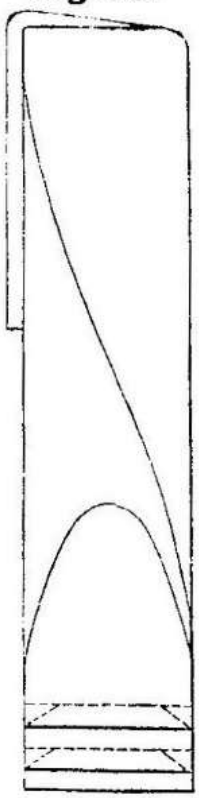
A. In Natural State. B. Compressed After Firing. C. Cylinder. D. Compression Grooves. E. Ogive.

74. The diameter of the compression bullet is .5401 inch (6 Linien 3 Puncte), i.e., smaller than the rifle caliber by a Punct, which gives it clearance. The bullet nose is an ogive, .5617 inch (6 Linien, 6 Puncte), and the Cylinder is .4321 inch (5 Linien) high, which gives a total height of .9939 inch (11 Linien, 6 Puncte). The two rings are separated by .0864 inch (1 linien) wide gaps that are .1296 inch (1.5 Linien) deep.

When fired, the high pressure of the expanding powder gases compress the bullet, squeezing out all clearance between it and the lands and grooves, sending it out of the barrel with the full pressure exerted behind the bullet and no pressure escaping between the bullet and rifling.

The compression bullet forms to the spiral shape of the rifling, and follows the rotating spiral grooves down the barrel axis, maintaining its rotation in the air after leaving the bore throughout its trajectory to the target.

Fig. 30.



Cartridge.

75. The cartridge consists of a closed sleeve of paper containing the gunpowder and ovoid body of the compression bullet. Around the whole sleeve with the projectile with the bullet nose inside, is a wrapping of solid straw paper closed on the end beneath the bullet.

The closed end of the cartridge and surroundings is immersed in mutton tallow, and the other end is folded longitudinally to close the powder tube. This folded part is where the cartridge is torn when you want to load it.

76. The lubrication fills the rifling when loading the cartridge, coats the barrel, softens the residue of burnt powder - the so-called fouling - and facilitates the loading; but mainly allows for smoother ramming of the ball into the bore.

Percussion Caps.

77. The percussion cap is made of copper in the shape of a hat with an explosive preparation pressed inside that is protected from moisture and preserved with a coating of shellac. The hat has four splits around its opening and each of the four

splits are bent at right angles, forming a shape that is easy to feel. The splits help prevent splintering of the percussion cap during shooting.

78. Soldiers receive 8 percussion caps in each package of 6 cartridges, so there are 2 extra caps in each package. Immediately after opening the cartridge package, the 8 caps should be put into the cap pouch located on the cartridge bag strap.

79. Fired percussion caps are thrown away, while unfired caps are kept and must be stored according to regulations.

§12.

Blank Ammunition.

80. Blank cartridges have a paper spacer instead of a compression bullet.

The blank cartridge is a cylinder of rolled writing paper containing 56.5 Grains (50 Gran) of old musket gunpowder and a 1/20 arc plug made from gray graft paper. Like the service cartridge, the plug is located in the lower part of the cartridge, covered by the powder charge.

§13.

Guard Ammunition.

81. Guard ammunition differs from the usual service ammunition in that you load a bare compression bullet, which is slightly smaller in diameter, onto the powder charge so you can unload the rifle by pointing its muzzle slightly downward without using the ball-screw or other implements.

Lead Ball.

82. When lead balls are loaded they are held in place with wadding.

83. Everyone must be provided with tompions to keep the bores clean, dry and prevent rust in their chambers.

Section IV.
Unloading the Rifle

§14.

84. Percussion caps are removed before unloading.

Guard Ammunition.

85. Guard ammunition is removed from the barrel using the ball screw on the ramrod and, together with the guide sleeve, it is twisted into the bullet loaded in the chamber, then pulled out.

With the bullet removed, the rifle is tilted muzzle-down, and the gunpowder shaken out immediately, ensuring the crown never touches a stone or hard object.

Blank Ammunition.

86. Blank ammunition is unloaded similar to the Guard ammunition.

Service ammunition.

87. A service cartridge is usually shot into the ground. Unloading by pulling them out of barrel should be avoided when possible.

88. When it is necessary to pull out a loaded cartridge, the guide sleeve of the drill is first lowered into the bore, brought against the bullet and drilled slowly. With the drill sufficiently engaged, the ball is lifted slowly and carefully, together with the guide sleeve from the bore.

Violently jerking the ramrod and pulling the ball-screw from the bullet must be avoided because the projectile would compress and become more difficult to extract from the bore.

89. After removal of the bullet, the gunpowder is unloaded as previously mentioned.

90. The balls drawn under such circumstances must be kept for future re-use.

Notes. For all unloading, use only the ball-screw and never the wiper, because of its smaller diameter in the bore.

Section V.
On The Treatment of Rifles by the Soldier

§16.

General Rules.

91. The rifle must be treated with great care and always maintained in top condition.

92. Rust is the biggest enemy for the rifle and must be avoided at all costs. It is easier to prevent than to cure once it occurs. Correspondingly, any uncleanness should be avoided.

93. Every soldier must be familiar with the condition of his rifle. He must know it completely, and so he can immediately detect and report any problems and repair the situation.

94. Repairs are nearly always done by the unit's armorer. Work by anyone other than a gunsmith is prohibited.

95. The procedure to report a perceived defect for repair by a gunsmith is known; men should be reminded they can neither be slow in reporting faults nor miss inspections by the battalion weapons officer.

Repair List.

A defective rifle is submitted by the Company with a repair list pinched between the hammer and nipple on which the gun number and the perceived defects are noted.

Repair Journal.

An entry is then made in the repair journal with the following sections: 1. Gun number, 2. Assigned user's last name, 3. Problem,

4. Repair, 5. Inspection Following Repair, 6. Acquisition by the Company, and 7. Notes.

Numbers 1 and 2 are filled in by the Company; 3 and 5 by the visiting inspector; and 4 by the gunsmith repairing the defect; and finally 6 by both company armorer accepting repaired rifle and the Officer of the Day.

The recently-repaired gun is tested by the Weapons Officer. If it is acceptable, the Journal is updated. If unacceptable, the visiting inspector reexamines it and either finds it acceptable or reassigns it for repair and only then is the Journal updated. The repaired rifle and repair list is returned to the Officer of the Day of the Company that it came from, and the journal is updated.

§17.

96. Men must understand how to disassemble the rifle properly. To thoroughly clean the rifle and all of its parts, gun disassembly is in five steps, in the following order:

Rifle Disassembly.

97. 1. Remove sling.
2. Remove lock screws.
3. Remove the tang screw.
4. Remove the three barrel bands in order.
5. Remove the barrel with the hammer at half-cock.

98. If only the barrel needs to be detached, the lock does not need to be removed.

99. When removing barrel bands, you can protect the finish of the barrel and stock by using a fitted piece of hardwood.

The barrel bands are tight, so coating the snug parts with tallow will help remove them, but excessive force should never be used. Gouging the wood at a tight spot will only make it tighter.

There are always two locations where the barrel band and stock come into direct contact. The wood and front half of the barrel bands are designed to be tight at those points.

Knocking on the back of the barrel bands is hazardous for the stock and should never be done.

100. The removal of the barrel from the stock must be done very gingerly and carefully. The right hand holds both the stock and barrel towards the breech with the nipple pointing down, while the left hand supports the rifle beneath in the middle of the tube, ready to immediately catch the freed barrel. The barrel is then rotated with the nipple moving towards the ground, which separates the barrel into the left hand, while the right hand holds the stock.

101. Finally, in rare cases where a local inspector directs or the need arises to remove the trigger guard, trigger assembly, or the butt plate, the appropriate screws are slowly twisted out and the parts gently separated. These parts should usually be cleaned on the stock.

Reassembling the Rifle.

102. Reassemble the rifle in reverse order of disassembly, namely;

1. Replace the barrel with the hammer at half-cock.
2. Slide the three barrel bands onto the stock.

3. Put the hammer down.
4. Replace the tang screw.
5. Replace the sling.

103. Inserting the barrel into the channel of the stock must be done carefully.

104. The process specified in No. 99 must be also be followed when replacing the barrel bands. Cleaning and lubricating the inner walls should never be skipped, and the tang screw must be well cleaned, the shaft greased and the threads oiled.

§18.

Cleaning.

105. Before and after each use, the rifle is thoroughly wiped inside and out with a dry linen cloth. In foul weather the metal parts will sweat when brought into a warm place from a colder temperature. The beaded moisture on the metal parts is condensation. Wiping is be useless while there is a considerable temperature difference because moisture continues to condensate on the metal. The temperature difference equalizes quickly and soon the condensation evaporates by itself, and the rifle is then ready for wiping.

Special Cleaning.

106. Prevention of rust on all metal parts is easily avoided with grease. But once rust has occurred somewhere, it must be immediately saturated with oil and repeatedly wiped with a cloth wound on a wooden stick; this method will soften and remove the rust quickly.

107. The use of any abrasives, such as lime, or polish is strictly prohibited.

The Stock.

108. The stock is to be kept unaltered, neither painted nor varnished, and only occasionally preserved with a coat of olive oil, especially in high summer and during prolonged wet weather. It is moistened with olive oil, then rubbed with a cloth rag, until it has a matte gloss.

Metal Parts.

109. Metal parts are wiped with a linen cloth inside and out along with the bayonet, ramrod, lock and accoutrements. When that is not adequate, they are cleaned with the gun brush, then coated with grease.

110. The same is true of the iron parts of the accessories and other aids, and also bayonet and scabbard fittings.

Touch hole.

111. The touch hole in the nipple is cleaned with a feather and, if necessary, with a pick.

Excessive oil should be avoided, because it could interfere with the detonation of percussion caps and gunpowder inevitably causing a misfire.

Lock.

112. Cleaning the lock is usually performed without dismantling it. As previously stated, if a special cleaning of the individual parts is needed, the lock will be dismantled only by the sergeant, who alone has the required main spring vise.

113. Ordinary cleaning of the lock is done with items the men already have. All surfaces and intricacies of the mechanism are cleaned with the rifle brush, dried and then wiped with grease.

114. The sergeant sees to the oiling of all parts listed in No. 34.

115. If for whatever reason, the lock has been disassembled by the sergeant, the men should clean all the component parts before he reassembles it.

The pivot points on the bridle screws and the threads should be moderately oiled.

116. When reassembling the lock, the screws should be double-checked for tightness.

Trigger Blade.

117. If, as noted in No. 101, the trigger assembly is removed, before reinstalling it should be cleaned and a small drop of oil put on the pivot point.

Bore.

118. For cleaning the rifle's bore, the wiper is screwed onto the ramrod without the guide sleeve, and used with a thick, dry linen cloth as necessary for cleaning the rifling.

119. A cloth should be placed on the crown of the barrel so the ramrod does not touch and wear away the rifling at the bore.

Ramrod Guide.

When using implements on the ramrod, it is safest to prepare a two inch long cylindrical sleeve of cloth or leather ahead of time which is inserted into the bore and held there, with the rest of the gun in the left hand. This ramrod guide is put onto the ramrod, against the head, before threading on the wiper and wrapping the cloth. It remains on the ramrod until use of the implements are completed.

The parts of the crown and bore covered by the guide cannot be forgotten, and must be cleaned once it is removed.

Wooden Cleaning Rods.

Wooden cleaning rods should be used whenever practicable – especially in garrison.

They are preferred because they do not damage the rifling and are easier to use.

This rod is a long, wooden stick of somewhat smaller diameter of the rifle bore with multiple slots on one or both ends, like those on the iron wiper, to hold the wrapped cleaning cloths.

120. The slots on the wiper and wooden cleaning rods should cleaned each time the cleaning cloths are replaced, so as to prevent spreading grime from the muzzle to the breech.

After cleaning, use the same rod to lightly coat the bore twice using a greased flannel cloth.

121. It is very important to clean and grease rifles stored in magazines.

§19.

Cleaning the Barrel after Firing.

122. After firing, the rifle must be cleaned and oiled. The barrel remains mounted in the stock and hammer cocked away from the nipple.

123. To wash out the barrel, close nipple ignition hole with the index finger of one hand and fill the bore with warm water to the level of the rear sight. Then close the bore with the palm of the other hand and swing and shake the rifle with both ends closed until the water drains completely clear.

After the water is clear, fully drain the barrel with the muzzle down and then wipe it completely dry.

124. The procedure to dry the bore is covered in the Nos. 118-120. Moist linen rags should be switched with dry ones.

Pumping the wiper or cleaning rod must be done quickly to produce a powerful airflow and promote drying. This procedure must be continued while the barrel is warm and until the linen rag is completely dry.

125. Quickly wiping the barrel while it is warm forces considerable air pressure through the flash and the touch-holes that is sufficient to dry both completely.

126. Once the drying procedure is done, the greased flannel rag is used as previously discussed, and musket cleaning is complete.

§20.

Cleaning after the gun was exposed to persistent rain.

127. After exposure to persistent rain, wipe, dry and treat the bore just as described in Nos. 124-126.

128. Then disassemble the rifle as described in No. 97 and very carefully clean and oil beneath the barrel along with the furniture on the stock and the ramrod.

During this cleaning, the stock should dry without sun or heat, then the barrel channel wiped with the grease cloth and the entire stock coated with olive oil.

129. After everything is treated, the rifle is reassembled.

Section VI.
Inspections.

§21.

By the men.

130. A well-trained soldier will be able to quickly and accurately detect and report key problems with the rifle.

131. He must, therefore, examine his gun before each use, namely that 1. The gun is unloaded, 2. The ignition channel is clear, 3. The sights are not askew, 4. The lock is operating properly and 5. The trigger pull is light enough.

Barrel and Touch hole.

132. To inspect the barrel and ignition channel, put the hammer at the half-cock, and with the mouth over the muzzle draw air. The free and unhindered flow of air through the bore indicates there is no problem. If on the other hand, there is a noticeable obstacle or resistance, and a quick cleaning with a pick or feather does not correct it, the sergeant should be notified that something needs to be done.

Rear Sight.

133. The correct position of the rear sight can be easily recognized. When it is out of place, the deficiency must be reported immediately. The correct position of the rear sight is so important that the greatest caution and supervision is necessary. The sighting notches provide the sight picture and must always be kept thoroughly clean, as even small particles can block the aim. It is best to hold the edges of the sight when wiping with a cloth.

Lock.

134. A clean and unrestricted lock does not bind when the hammer is slowly cocked from the rest position to full cock or when discharged slowly with the thumb counter-balancing the tension by putting pressure on the hammer tail. The hammer has to fall without the least resistance and the spring tension must not vary.

When cocking, the sear makes a crisp snapping sound as it falls into the notches. Rough hammer movement, uneven or weak spring tension, or hammer wobble on the square end of the tumbler arbor needs to be repaired.

Trigger Tension.

135. Finally, trigger tension is tested by moving it slightly back and forth with two fingers in the three positions of the hammer. There should be no swaying and either no or only slight binding of the trigger on its axis (the screw in the trigger assembly). This should be reported to remedy the situation.

This type of testing the lock and trigger tolerances is called timing.

§22.

By the Sergeant.

136. The sergeant is required and obligated to lead his team by example in maintenance and knowledge of its weapons, and to rigorously supervise them in following all the rules.

137. His knowledge of the lock construction must be especially accurate because, as previously mentioned, he and he alone is entrusted with the mainspring vise.

138. Besides the tests of the rifle already mentioned, one might like to examine the interior of the bore further.

139. For this examination, he must be provided with a Cleanliness Rod and Inspection Plate.

Cleanliness Rod.

140. The Cleanliness Rod is similar in shape to the wooden mop stick, and is used wrapped with a clean linen wiping cloth to check the cleanliness and dryness of the inside of the barrel.

Mirrored Inspection Disc.

141. The Mirror Inspection Disc is a shiny polished steel plate the diameter of the bullet which is lowered into the bore to the breech, and acts like a mirror to illuminate the rifling in the bore.

It is used by holding the rifle up to the light so the beams reflect back into the eye, and the entire bore is lit showing any damages (such as scaling, pits, unnatural prominences, etc.) and even uncleanness.

Understandably, these types of bore defects will be obvious.

142. The sergeant uses these aids frequently to examine the bores, especially when cleaning is performed before and after target shooting, or a rifle is taken out of storage.

Rifles temporarily stored in magazines undergo this inspection, in addition to cleaning the bores and applying fresh lubrication.

143. The sergeant especially must acquire the skills needed to check that the lock timing on the rifles he supervises is always in perfect condition, and to know and be able to show his team correct procedures when they are unsure or overlooked.

144. It is also understood that he must acquire a certain degree of confidence and skill using the screwdriver and main spring vise so he can dismantle the lock when needed.

Nipple Replacement.

145. When a man has a defective nipple, he reports it so it can be repaired. In emergencies however, if no officer is present and he is convinced the nipple is no longer serviceable or the escaping pressure is so powerful that hammer blows back, he may replace it himself with the reserve nipple. Replaced nipples must be checked to insure they are completely tightened.

§23.

Inspections by the Company Officer.

146. Each officer must be a secondary source of the knowledge, care and assessment of weapons, serve as a role model and teacher for their skillful use and marksmanship, and be able to successfully train their unit on the needed practical rules, finer points and related concepts.

147. He therefore has to use the greatest care in the training of his unit and the monitoring their weapons.

148. The rifles are inspected by him before and after each prolonged use. This inspection goes into far more detail than the men's and non-commissioned officers' encompassed. It usually covers the following Points:

149. 1. Inspection of cleanliness and lubrication of all external metal parts, the stock, Bayonets and all accessories and other aids.

2. General external visual inspection, whether on barrel, ignition hole, together with the nipple, front and rear sights; the stock, especially on the ramrod channel through the barrel bands and around the lock opening; the ramrod and the condition of its threads; and that mounted bayonets are neither too loose nor tight, and have no thin walls on their sockets or locking rings.

3. Inspection of the bore using the Mirrored Inspection Disc.

4. Examination of the lock timing and trigger tension.

Further Inspection.

150. For further inspection, he performs the following steps:

The rifle with its hammer down, is propped up on left hip so it is facing away at an oblique angle, with the palm of the left hand down on top of the hammer

The index finger of the left hand pulls the trigger all the way back and simultaneously

The right hand on the trigger guard with its thumb on the hammer tail. He now

feels for any defects in the lock gear and hammer assembly by pulling the trigger repeatedly and slowly moving the hammer back and forth.

151. A rough, heavy or hard lock mechanism has either an internal or external problem.

Inside it may either need oil, or the sear spring could be rubbing on the plate, or the tumbler could be binding (i.e., the tumbler no free rotational movement between the plate and bridle), or finally, the Lock could be too tight and is rubbing against the wood.

Outside, the hammer could be rubbing on the end of bridle screws or a lower lock screw that's protruding too far.

152. The mainspring must provide strong and uniform tension.

153. After this test, the officer proceeds to investigate the trigger tension and lock timing. That is, the hammer is slowly moved to both notches on the tumbler with the sear tip making a crisp sound when freely falling into the positions. The trigger should move freely into both notches as discussed. A broken or defective sear spring, the bridle screws drawn too tight, not having enough oil, or binding against the wood can be detected by this test.

Simultaneously with this test, the amount of play of the hammer on tumbler arbor square is measured by moving it a trifle while cocked.

154. Now inspect the trigger blade: it should not bind or wobble, and should have the same amount of movement on its pivot point both resting and cocked,

155. And finally: the trigger pull should be neither too light nor too heavy with the sear coming from it's from its notch smoothly.

If the spring tension, tolerances, timing and trigger blade motion are correct, the lock is in good working order.

Overview

of the

Main Defects Which Occur in the Various Inspections.

Inspection.	**Deficiency***	**Remedy.**
Inspection by the men. 1. Whether the barrel is unobstructed, and 2. The nipple touch hole is clear, checked by sucking air through the muzzle.	Either the ignition channel or nipple hole is clogged.	Air is drawn with the mouth on the muzzle – Clear the barrel with the ramrod and, if necessary, touch hole with a pick and cleaning feather.
3. Whether the rear sight is askew.	A problem is indicated by a misalignment of the chisel marks on the rear sight and the barrel.	Should be reported to and corrected by a sergeant even if only slightly moved.
4. Whether the lock operates smoothly and is properly timed.	1. Rough, hard or uneven hammer movement - where even a creak is sometimes heard. 2. Wobbling or slack movement of the hammer on the tumbler. 3. Weak tension from a broken or weakened sear spring. 4. No crisp sound when the sear drops into the tumbler notches.	Must be reported.
5. Whether the trigger blade in all three positions of the hammer has proper movement. (Cocking Continued)	1. The trigger blade binds when pulled. 2 The trigger moves up and down.	Must be reported,

* Any broken component part should be reported as a defect, even if not listed.

Inspection.	**Deficiency.**	**Remedy.**
6. Whether there is obvious damage to the barrel, stock, ramrod, bayonet and furniture.	- - -	Must be reported
Inspection by the Sergeant of his unit's rifles. The six items discussed at the team level are:		
7. The cleanliness and proper lubrication of all metal parts and the stock – all accessories, cleaning tools and accoutrements in good condition.	- - -	Re-inspection after the prescribed cleaning and oiling.
8. The barrel bore is illuminated with the mirrored inspection disc and the inspection rod (i.e., Pußstockes) applied.	1. Uncleanliness, especially in the powder chamber [Fall]. 2. Rust stains. 3. Scratches, and 4. Bubble-like elevations (Dents), made by violent impacts from outside the barrel.	Re-cleaning Must be reported.
Inspection of rifles by the Company Officer		
1. With Sergeant to point 7. 2. General inspection, whether any noticeable damage occur, namely on: Barrel	 1. Dents inside the bore, produced by violent impacts. 2. Rear sight easily moved or damaged. 3. Font sight blade edges worn, or otherwise damaged. 4 Nipple, loose in the thread, or very extended (views and space needle as aids) , or 5 The muzzle damaged.	ibid Must be reported.

Stock	1. Split or missing wood, especially along the ramrod channel causes barrel jump and near the lock over-tightened tang screws.	Must be reported.
Ramrod	1. Bent shaft, 2. Spoiled thread, or 3. Break beginning near the cup.	
Bayonet	1. A break starting along the blade, 2. Bent neck, whereby the blade is tilted, 3. Dented socket, at one of the mouth or on the open cutout (in the groove), 4. Tight or loose locking ring and screw wear, or 5. The bayonet cannot be completely seated, but clasp on the upper barrel is loose.	
3. Lighting the bore with the mirrored inspection discs.	Points 1-4 with the subordinate officer.	Must be reported.
	5. Dark black or gray iron splinters, 6. Black appearing deep locations, such as small holes and pits, 7. Obvious bending of the barrel, sometimes detected by direct light rays rather than reflected light.	Must be reported.
4. Examination of the lock and trigger assembly by swapping margins.	The following defects cannot be rectified with a quick oiling and shall be reported to remedy the situation.	
Problem: 1. Mainspring operates freely and hammer can be cocked, but Mainspring brings the hammer down slowly when trigger is pulled.	Defect: 1. Tight mainspring tension with weak hammer impact.	Cause of the Defect: Mainspring either broken or too weak (disassemble lock).

	2. Rough and hard hammer transition	1. Friction on the back of the hammer disc from bridle screw extending too far from the lock plate. (Disassemble lock).
		2. Lack of oiling or accumulated grime, 3. The lock parts are binding on the wood inside the lock cavity, indicated by wear marks on the wood and indentations. These sites are usually: a) where the long arm on the main spring engages horn of the tumbler, b) where tumbler is positioned, c) where the sear and bridle is positioned, d) where the sear rod pin end rubs on the wood of the rear wall of the lock cavity, e) where the side of the sear binds against the inside of the lock plate, 4. the wear disc of the tumbler is too low or missing altogether, or the bridle screws clamp the tumbler,
	3. Bumpy Hammer Movement.	1. The end of the main spring does not rest evenly on the tumbler horn. 2. The tumbler horn surface is wavy rather than flat, causing the main spring to bounce as it moves across it. 3. The main spring is too long, and presses against the tumbler wear disc.
	4. Uneven Hammer Movement.	Sear and bridle screws are not completely tightened, causing wobble along the axis of the tumbler and hammer rotation.
	5. Hammer wobbles on the square end of the tumbler.	The hammer screw is removed, and the hammer is pressed and back and forth to clearly reveal slack between the hammer shaft and the four sides of the hammer hole.
2. Sear arm and spring are weak	The sear barely falls into the tumbler notches with a dull or nearly inaudible sound.	1. Increased friction caused by lack of oiling or accumulated grime, 2. The sear is too long or the end of sear arm binds against the wood,

The sear tip falls into the notches with a distinctive snap and the hammer wiggles in both notches.	(Lock take-down)	3. The trigger has little play while against sear arm, and consequently cannot budge during its movement. It may be binding against the wood in the lock cavity. 4. The sear spring is too weak, or its short arm too long, not pressing on forearm of the sear, but merely rotating on the sear screws and exerts little or no tension.
Hammer does not lock in the full cock notch when drawn back.	The hammer cannot fully cock due to a lack of oil.	1. The mainspring horn is at full tension but wedged on the lock plate bolster, so it cannot be cocked. 2. The long arm of the mainspring, and especially the horn, is stuck on and movement inhibited by the lock plate bolster.
Little or no trigger-play in full and half cock.	1. The trigger is either stuck or difficult to move back and forth.	1. The upper part of the trigger blade is too close to the sear arm. 2. The upper part of the trigger blade is clamped in the cutout of the trigger housing. 3. It is too tight at the rotation points, and therefore has no free movement, which could be caused by accumulated grime, rust or lack of oil.
	2. Uneven gait or tottering movement of the trigger blade in the trigger assembly at the trigger screw.	Enlargement or elongation of the trigger-screw hole, causing a stutter when squeezing the trigger on the dismounted trigger assembly.
Lock operates slowly when released.	1. The lock is difficult to operate.	1. Lack of lubrication. 2. Too deep, crooked or non-square cuts on the tumbler or sear. 3. Incorrect spring tensions, namely sear spring too strong, and main spring too weak. 4. No trigger-play.
	2. Lock releases too easily.	1. Full cock notch too shallow. 2. Sear spring too weak.
	3. Lock releases from the half-cock.	1. Broken half-cock notch. 2. Blunted or broken sear end.

Section VII

Powder Strength, Ball Effectiveness, Trajectory, the Need for Establishing the Sight Picture, Rear Sight and Front Sight Blade.

§24.

157. The force that drives the bullet from the barrel to the intended target is generated by the ignition of the gunpowder.

Ignited gunpowder is transformed into two products quite different from each other: fouling and gas.

The gas is the product used as a propelling force during the ignition - partly evaporating as smoke, but also partly remaining as residue on the barrel walls referred to by the term “fouling”.

158. Gunpowder is made from a blend of 80 parts of saltpeter, 12 sulfur and 14 charcoal that is thoroughly pulverized, mixed, granulated and then polished.

The saltpeter is a compound of two substances, while sulfur and charcoal are basic ingredients.

To generate the gas, one of the products in the gunpowder’s saltpeter is transformed during the ignition of the charcoal while the other is being ripped from the sulfur, which also forms a residue. The sulfur is a mediator, so to speak, during the burning that transforms the powder into the two completely new products of gas and fouling.

159. The powder residue or fouling, is unfortunately an unavoidable by-product of gun powder combustion. It hardens and adheres to the bore walls, gradually accumulating, drying and becoming fixed at high temperatures, and can only

be removed by very careful softening and washing with water.

Consequently, if the fouling does not stay soft in the bore from the lubrication, partly from the cartridge case just fired and from the one just loaded, the continued accumulation of fouling from additional shooting will eventually reach the point where a cartridge can no longer be loaded into the chamber.

160. If the gunpowder is ignited (i.e., converted into the two known products), it produces gas occupying a much larger volume than the powder charge. Typically, every 1.13 grains (1 Gran) powder produces nearly 1.03 cubic inches (1 Zoll) of gas and a .56 grains (.5 Gran) of fouling. Using this rule the gas volume of our gunpowder charge can be assumed to be between 51.6 and 62.2 cubic inches (50 and 60 cubic Zoll), but the heat of ignition increases it far more, and because it is compressed into such a small space behind the ball, it exerts a intense high pressure yielding a muzzle velocity of over 1037 feet (1000 Fuß) per second.

161. This kind of gas is highly resilient, and when confined in a small space wants to expand to its natural volume, like a forcibly compressed coil spring. In this effort to reach its natural volume, the struggle between the artificial and the natural compression, now manifests itself by exerting pressure on all sides, with the greatest pressure to expand while in the smaller, more compressed space.

Therefore, if the walls of the confined space are not strong enough to contain the compressed gas within them, it will break through them at the weakest part, violently expanding to its natural volume.

This is the standing principle for each powder ignition.

162. When blasting, with either a whole or partial explosive charge, the intention is to form a breakthrough point.

When shooting on the other hand, the barrel walls and the rear closure - the guns breechplug - does not yield, applying all the pressure from the powder charge onto the projectile as the breakthrough point, driving it violently away from the gasses and out of the barrel.

The more effective the bore, the more hermetically the bullet adheres to the rifling, sealing the gas from escaping so the entire process is concentrated behind it while travelling through the barrel.

163. The bullet must travel smoothly and consistently through the bore and its accelerating speed should be disturbed or inhibited as little as possible. The inside of the barrel should be smooth and unadulterated like a mirror. It is critical that the sides of the lands and grooves not form sharp angles and edges, and the bore has no cracks, pits, rough spots, rust or other impurities in it.

164. Understandably, to shoot a heavier or lighter projectile at closer or further distances, it requires a larger or smaller powder charge and the strength of the barrel must be able to contain the pressure of the gas so as not to damage the rifle.

165. The gas of an ignited powder charge exerts equal pressure on all sides. The lateral pressure will produce the same sideways movement through a uniform and cylindrical shaped bore in a rifle that is not defective.

However, when the gas pressure breaks out in two directions, it can be quite different.

Two projectiles of equal weights surrounding a powder charge in the middle of a tube open at both ends would both be flung the same distance when fired. However, a difference would show up immediately if the balls used were different or unequal weights.

For the sake of this experiment, assume one projectile is 145 times heavier than the other and so tight in the bore that moves very little when the powder ignites, and the gas pressure only results in the heavy ball firmly stuck in the bore. The pressure exerted against the heavier projectile moves it only slightly, but will drive other lighter projectile out of the barrel.

When the whole gun is together, the firmly mounted breech plug acts like the heavier projectile against the lighter one.

166. The recoil corresponds to the infantry rifle – where the weight of the rifle to that of the projectile, is about 145 to 1 – resulting in a recoil of 59.4 pounds (48 Pfunden).

167. The force of the ignition recoils backward while the driving the projectile forward. How great the recoil depends on the amount of pressure, but this effect is obvious from the aforementioned observations of the nature of the ignited gunpowder in confined spaces.

168. The effect a bullet has when it impacts a target depends on two factors: the projectile speed and its weight.

It is said that bullet momentum equals its speed times its weight. The higher the numbers of these two factors the greater the impact. Logically, a ball weighing 452 grains (400 Gran) travelling at 12445 Feet (1000 Fuß) per second, will penetrate materials significantly deeper than one weighing only 113 Grains (100 Gran) travelling 207 Feet (200 Fuß) per second. Likewise, less penetration will result if the aforementioned bullet weighing 452 Grains (400 Gran) is travelling only 519 Feet (500 Fuß) per second when it hits, instead of 12445 Feet (1000 Fuß) per second.

169. Our Compression bullet, weighing 452 Grains (400 Gran), penetrates 5.2-6.2 Inches (5-6 Zoll) of wood at a distance of 492 Yards (600 Schritten).

170. The velocity at which a bullet leaves the barrel, called the muzzle velocity, decreases during its flight through the atmosphere until it finally stops altogether. This slowing of the bullet speed is attributable to air resistance dragging against the forward movement of the bullet.

The trajectory must be charted for a clearer understanding of this phenomenon, as an illustration of the projectile's material characteristics, while it moves progressively slower and slower through the atmosphere until finally stopping.

So if our compressive ball has traveled about 328 yards (950 Fuß) during the first second of its flight, it will travel less in the second, and even smaller distances during each of the subsequent seconds.

171. A fired bullet, therefore, travels straight along its original path at a decreasing rate of speed until it surrenders all its momentum to the surrounding air and stops.

The moment the bullet leaves the barrel, another force acts on it that detracts from its straight trajectory. This influence disturbing the intended flight is gravity.

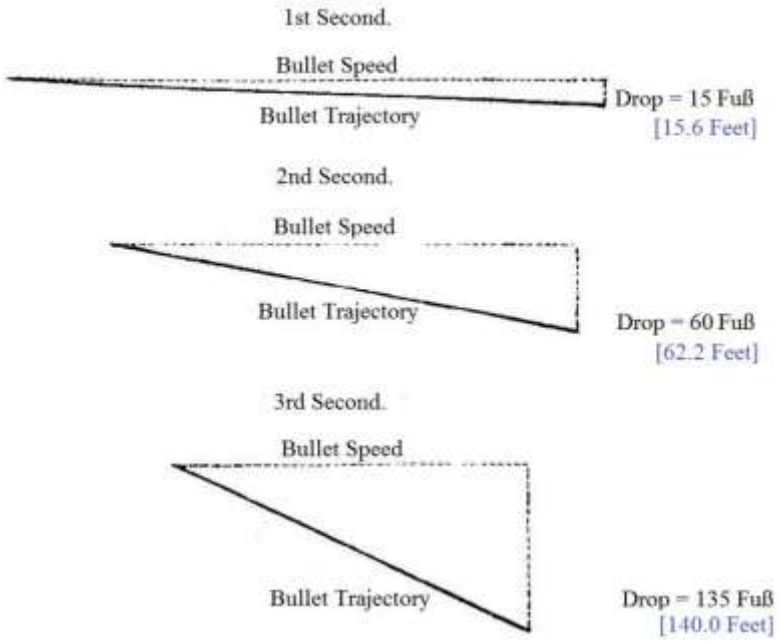
172. Gravity is the well-known phenomenon where all objects drop to earth when released.

173. This falling or sinking always occurs in a vertical line, i.e., in the direction of the center point of our planet. At the same though, its relation to the bullet speed is exactly the opposite while flying through the air. Namely, while bullet velocity decreases with each moment of flight, the speed with which a bullet drops due to gravity progressively increases.

174. The specific laws predicting this increasing rate of fall are known. Each bullet will drop 15.6 feet (15 Fuß) in the first second, 62.2 (60 Fuß) in the second, 140 (135 Fuß) in the third, and 249 feet (240 Fuß) in the fourth. However, these numbers are somewhat counteracted by the effects of air resistance.

175. Thus, to chart a fired bullet and these two forces acting on it, make a horizontal line 950 units long, then from the end point a vertical line 15 units down to show the drop from gravity, and finally a new line between the initial point and end point. This new line between the two main points represent the trajectory of the bullet which travels 328 yards (950 Fuß) horizontally and drops 15.6 feet (15 Fuß) vertically during the first second of its flight.

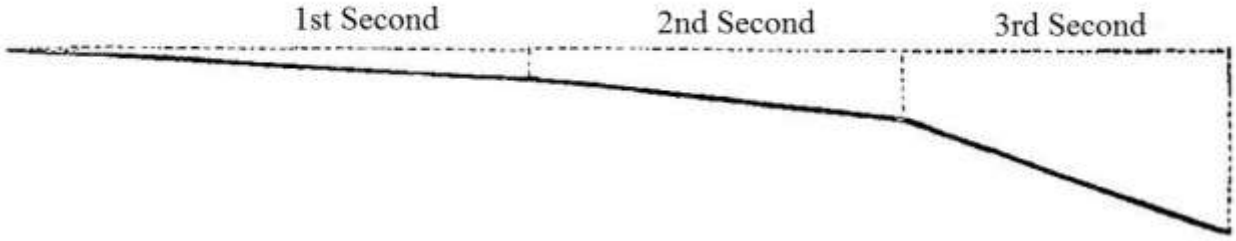
Fig. 31.



Continuing to chart the subsequent seconds using the same method for flight, in which the speed decreases but the drop increases to the 4, 9 16 and 25 units, results in a line that increasingly dips downward.

Now, these figures are charted, and the trajectory over a period of several seconds can be seen.

Fig. 32.



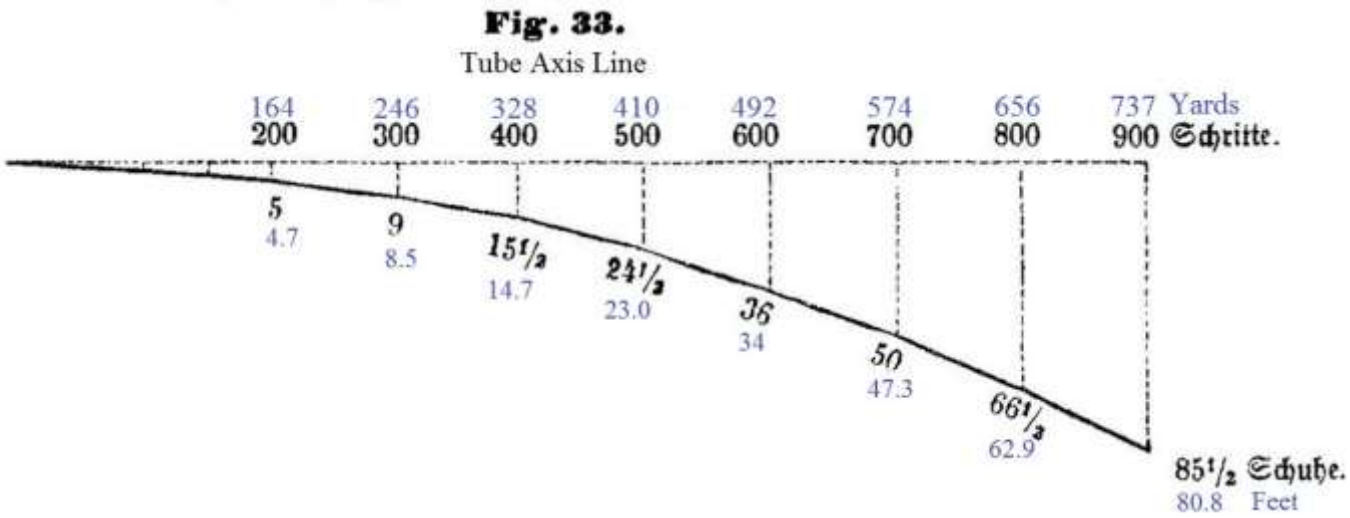
176. The trajectory of the flight path is thus determined by three factors, namely: the pressure of the gas from the burning powder, the resistance of the air, and gravity. Combining the first two together give projectile speed, and the third demonstrates the effects of the phenomenon of gravity.

So we can say that the trajectory is a curved line whose shape is determined by the effects of decreasing bullet speed and increasing drop rate.

177. Clearly from the foregoing, horizontal bullet speed will decrease until it eventually stops, and only gravity affects the vertical flight path. Naturally, the bullet will eventually fall to the ground if it has not already done so, as it can fall no further.

178. The following plots her trajectory, showing the approximate drop at intervals along a 737 yard (900 Schritten) distance at the assumed bullet velocity.

Fig. 33.



179. If the barrel is constructed so its outside is exactly parallel to the bore, the vertical line of sight would be parallel to the tube axis, or soul line, and would evidently run to x.

At a 246 yard (300 Schritte) target distance, the above figure shows the bullet will impact 8.5 feet (9 fuß) below the tube axis, or soul line, rather than on the object in the line of sight.

Therefore, it is absolutely necessary for engaging targets at various distances that the muzzle of the barrel be elevated the appropriate amounts to hit the targets.

Figures 34 and 35 vividly illustrate the appropriate elevations needed for each distance. The respective amounts of elevation above the horizontal line-of-sight for striking targets can be seen.

Fig. 34.

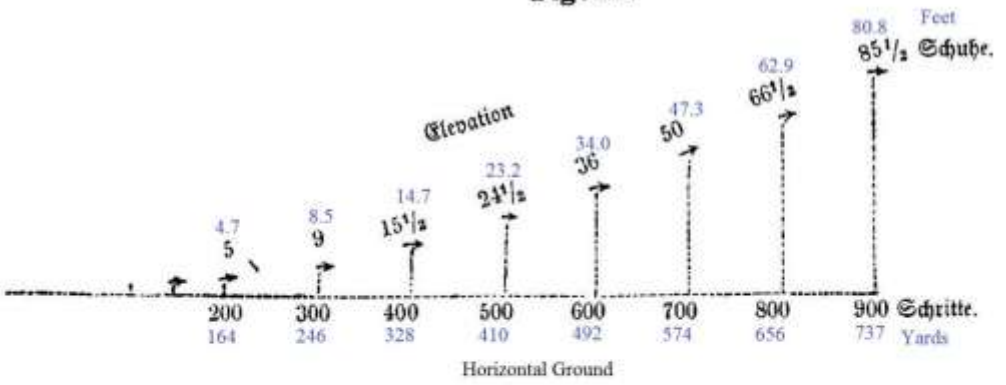
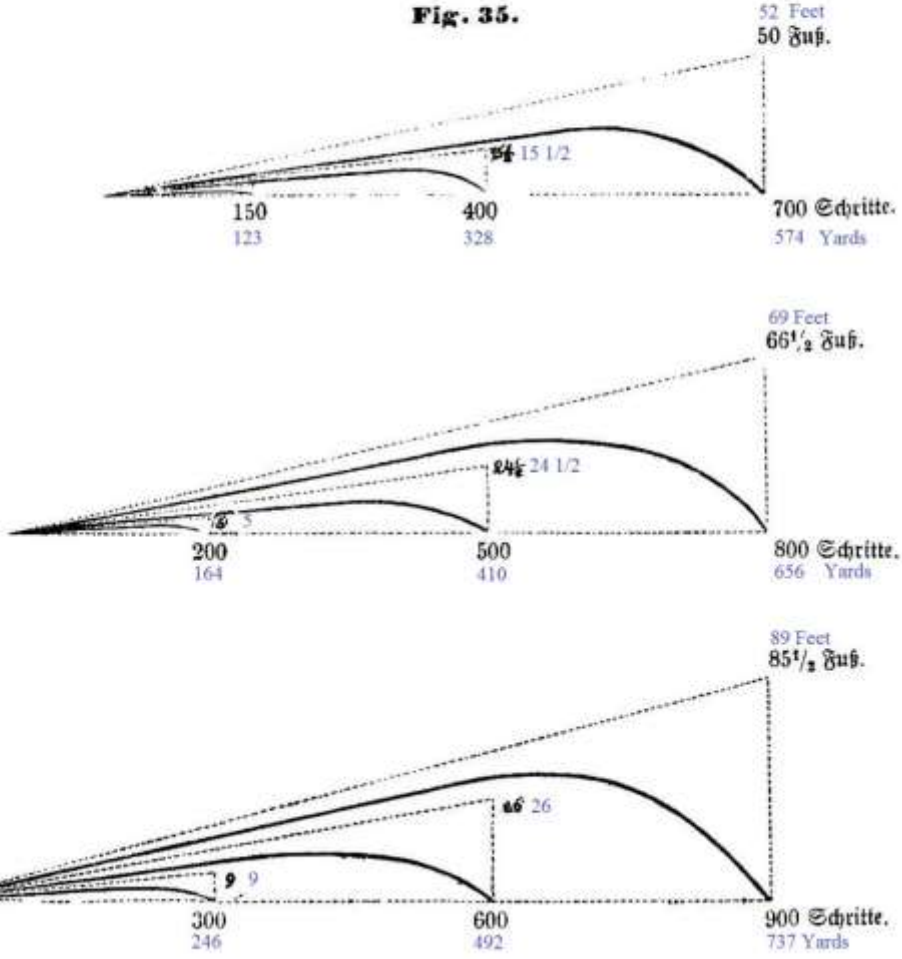


Fig. 35.



With the measurement of the bullet drop from the barrel axis line at the appropriate target range, one can graph the trajectory, arcing at three fifths its distance.

	Yards	Schritt					
At	164	200	Strike	Distance	10.4	to 12.4 inches	(10 to 12 Zoll)
“	246	300	“	“	1.6	to 2.1 feet	(1 ½ to 2 Fuß)
“	328	400	“	“	3.1	to 4.1 feet	(3 to 4 Fuß)
“	410	500	“	“	5.1	to 6.2 feet	(5 to 6 Fuß)
“	492	600	“	“	8.3	to 10.34 feet	(8 to 10 Fuß)
“	737	900	“	“	18.7	to 20.7 feet	(18 to 20 Fuß)

If the infantry rifle is fired with the barrel oriented horizontally 5.18 feet (5 Fuß) above flat ground, the bullet strikes the ground 164 yards (200 Schritten) away.

180. Understandably, it would be impractical if the gun sights were parallel to the tube axis. For aiming and shooting, as a rule, rifles should be issued sighted in for a 5.2 inch (5 Zoll) drop at 164 yards (200 Schritte), 9.3 inches (9 Zoll) at 246 (300 Schritte), 16 inches (15.5 Zoll) at 328 (400 Schritte), etc., up to 88.7 inches (85.5 Zoll) at 737 yards (900 Schritte).

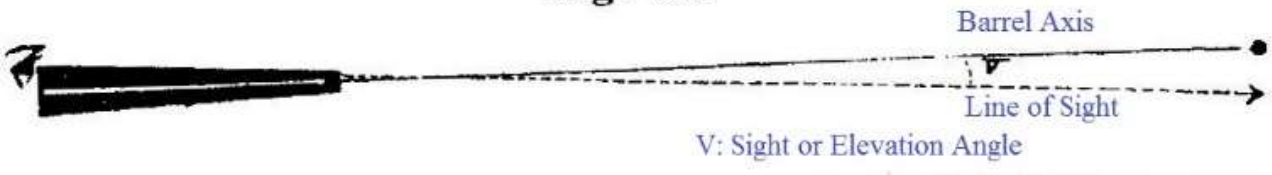
Targets further away are beyond the maximum range of the sights.

181. The solution to this very difficult and almost impractical problem is to raise the aiming line beyond the limits of the rear sight notch along the barrel axis a proportional amount to obtain the required elevation.

The outside of the barrel is not cylindrically-shaped like its bore; the breech is thicker than the muzzle. The shape of the barrel is therefore not exactly cylindrical, but in the form of a cone whose base is the breech and muzzle is the top.

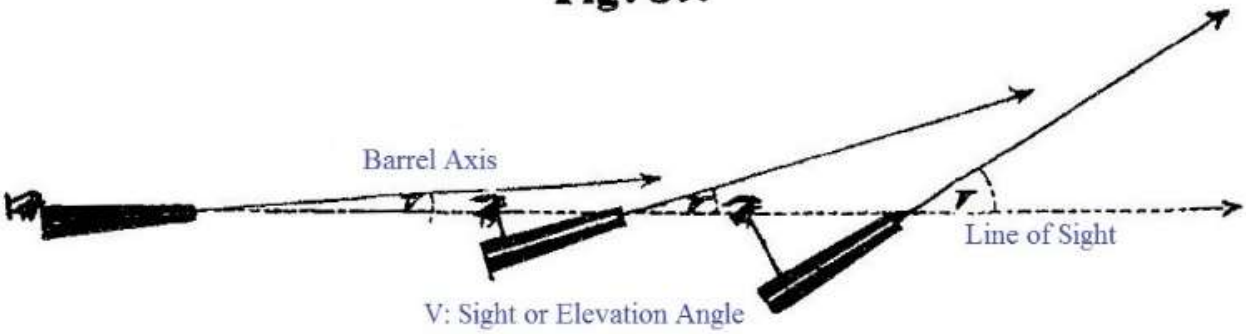
The angle that the barrel axis makes with the sight line is called the sight angle, which is also called the angle of elevation if the sight line is horizontal, indicating the elevation of the tube axis over the horizon.

Fig. 36.



182. Clearly the more the rear sight is raised above the axis of the tube, the higher the front sight rises, which increases the barrels angle of elevation. The front sight is fixed above the barrel at a constant height, and raising to meet the rear sight will increase the sight angle.

Fig. 37.



Thus the way to increase the angle of sight is to elevate the rear sight, increasing the height difference between the front and rear sights as much as needed when aiming, to compensate for the bullet drop from the tube axis line along the trajectory.

183. The front sight, which is the second alignment point seen by the eye through the rear sight reticle when aiming directly at a target, is positioned directly atop the barrel. The higher it is mounted on the barrel, the closer it parallels the direction of the tube axis line.

The front sight is usually .612 inch (7 linien and 1 Punct) above the tube axis line in contrast to the rear sight reticle which is an additional .338 inch (3 Linien and 11 Puncte) higher. Consequently, the bullet crosses the line of sight at 3.787 feet (4 Schuhen and 11 Linien) in front of the muzzle when shooting.

Therefore, the most elevation is produced when the front sight is high in the rear sight reticle and conversely, the least elevation when it is positioned lowest in the reticle.

184. When finding the correct sight picture for all distances with a rifle, it must use the same powder charge and projectile weight cannot vary, because any deviations will cause a change in the point of impact.

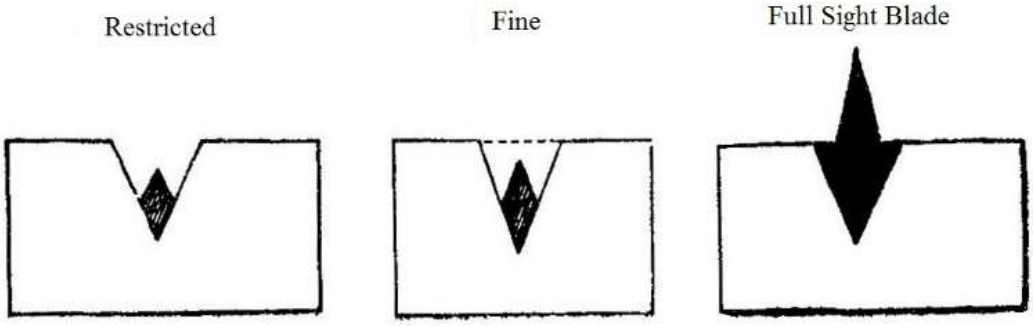
185. The infantry rifle's front sight is not adjustable and is fixed on the barrel near the muzzle. For ranges beyond 246 yards (300 Schritten), the long distance rear sight has a leaf with three notches cut into it, each of which is used for two different ranges by moving the front sight higher or lower in the notch as described above.

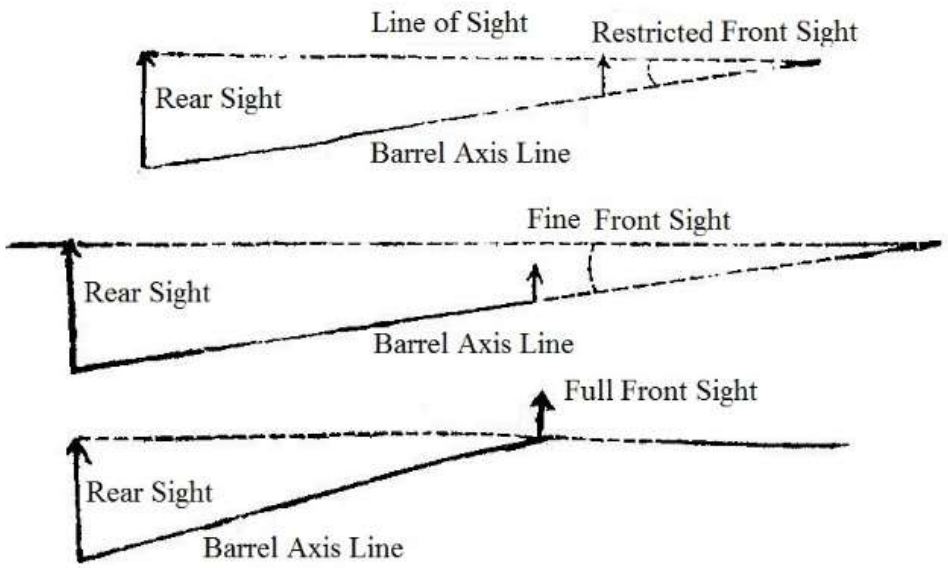
Use as much of the front sight blade as needed. Less blade if you are shooting high and more if shooting low. When the front sight blade is placed low in the notch, you can raise it as much as thought necessary until it fills the entire notch. Also, when shooting too high you would lower the sight blade in the notch to lower the barrel elevation and reduce the range.

When aiming with the full front sight the barrel is more elevated and higher points of impact result, however, if a shot misses or is lost, using less front sight or a lower notch may be precisely what is needed.

Fig. 38.

Sight Pictures with

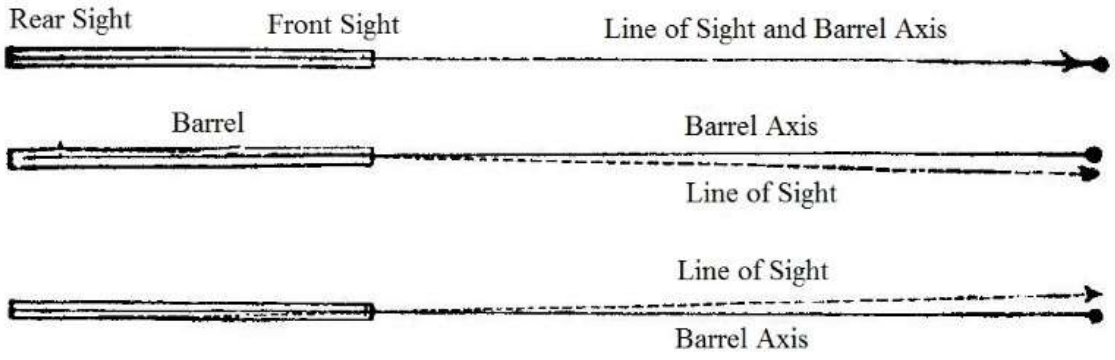




Incidentally, the second most common reason shots miss, when aiming through the same sight, is targeting the abdomen with a fine sight alignment rather than aiming at the head with a full sight alignment.

186. Ultimately, regarding accurate shooting, it is an absolute necessity that the line of sight through the horizontal plane – must align exactly parallel with the barrel's axis. Figure 38 clearly shows a view of alignment from above the barrel.

Fig. 39.



` Displacement of the rear sight reticle to the left of the barrel axis line results in deviations to the right, and conversely, a displacement to the right results in deviations to the left.

Therefore, when sighting in the rifle to shoot straight, the direction the rear sight must be moved is counter to direction of the deviation.

187. Finally summarizing all the observations and theories, we see:

1. The momentum of a bullet is measured by its weight multiplied by its velocity.
2. Bullet speed decreases with every moment in the trajectory.
3. The amount of drop, on the other hand, increases with each moment the bullet is in the air.
4. Faster bullets reach greater distances in shorter periods of time. A bullet with a slower velocity fired at the same range drops more because it takes longer to reach that distance. The larger the drop, the more the breech needs to be depressed - so the faster the bullet velocity the smaller the amount of compensation is needed.
5. The force of a bullets impact is the result of both the projectile weight and its velocity, so you can obtain the same impact with a light projectile travelling at a faster speed as a heavy projectile moving slowly.

Clearly, a military rifle that shoots a faster, lighter bullet - and therefore has a lower trajectory - is preferable to one that has the same effect but shoots a slower, heavier bullet with a higher trajectory.

Appendix

1. Standard operating procedure for the treatment of infantry weapons requires that the hammer (page 17) will rest against the nipple whenever the rifle is stored or unloaded. Whenever it is unloaded, or during peace-time marches, the muzzle will be sealed with the tompion.

2. Per the current Regulation Circular of the Army High Command dated 25 January, 1856, Section 2, No. 28, the rifle accessories and equipment are packed as follows:

a) In the large compartment of the cartridge pouch store:

The combination tool.

b) In the small compartment of the same:

1. The mirrored metal disc.

2. The wiper, worm, ball-screw with its guide-sleeve, along with the spare nipple wrapped in a linen cloth,

3. The oil bottles wrapped in the cloth and grease in a double-folded piece of cloth,

4. The tompion.

c) Under the cartridge pouch lid:

Two nipple picks with chain fasteners in two leather sleeves.

d) In the knapsack:

The remaining items.

3. Directory

Of the required equipment, tools and other supplies belonging with arms.

Equipment:

For each rifle:
- A wiper, together with its spacer iron.
- A Combination tool – screwdriver, ramrod pulling pin and nipple wrench.
- A spare nipple
- Two nipple picks.

For some members of the unit:
- A ball-screw, together with its guide sleeve.

Cleaning Supplies

For each gun:
- Linen cloths.
- Two cloths - 5.2”x3.1” (5x3 Zoll) impregnated with clean grease.
- A canvas or flannel (fat lobes) 9.3”x3.1”(9x3 Zoll} saturated with oil.
- A rifle brush.
- Some small feathers.
- A glass bottle with pure olive oil (wrapped in the fitting sleeve described at No. 119).

Aids:

For each rifle:
- A Tompion.
- An exercise cartridge to practice loading [See No. 69]
- A lead bullet
- A lead Guard bullet. [See No. 85]

For some members of the unit:
- Wooden mop sticks.

For the Sergeant:
- A mainspring vise
- A wooden cleaning rod
- A polished steel inspection mirror.

Dimension Comparison Table
4. Dimenſionen-Vergleichungs-Tabelle.

Infantry Long Arms

Description Benanntlich	Chamber - liner Kammer-büchſe	Infanterie-Gewehr Old with smoothbore altartiges mit glattem Laufe M1842 Augustin Musket	 new with rifled barrel neuartiges mit gezogenem Laufe M1854 Lorenz
Länge des Gewehrs mit aufgepflanztem Bajonnet . . . . . Length of the Rifle with fixed Bayonet	67.087 inches 5 Schuh 10 Zoll	68.059 inches 6 Schuh	63.975 inches 5 Schuh 7 Zoll
Gewicht des Gewehres ohne Bajonnet . . . Weight of the Rifle without Bayonet	$7\frac{28}{32}$ Pfund 9.744 Pounds	8 Pfund 9.899 Pounds	$7\frac{30}{32}$ Pfund 9.435 Pounds
Lauflänge . . . . . Barrel Length	32 Zoll 33.186 inches	41 Zoll 42.520 inches	36 Zoll 37.335 inches
Kaliberweite . . . . . Caliber Size	8 Linien 3 Puncte .71298 inches	8 Linien .69138 inches	6 Linien 4 Puncte .54734 inches
Zug- und Felderanzahl Number of Lans and Grooves	12	—	4
Breitenverhältniſſe der Züge zu den Feldern . Width ratio of the Lans to the Grooves	12:12	—	4:4
Zugtiefe . . . . Rifling depth	$1\frac{1}{2}$ Punct .01080 inches	—	1 Punct .00720 inches
Droll in Umdrehungen . Twist of Rifling	$\frac{30}{60}$ 30/60	—	$\frac{35}{80} = 0{,}44$ 35/80 = 0.44
Länge des Falls . . Length of the Chamber	5—6 Zoll 5.185375 to 6.22245 inches	—	5—6 Zoll 5.185375 to 6.22245 inches
Größte Fallerweiterung Largest Case Expansion	1 Punct .00720 inches	—	1 Punct .00720 inches

Infantry Long Arms

Description Benanntlich	Chamber - Kammer-liner büchse	Infanterie-Gewehr Old with smoothbore altartiges mit glattem Laufe M1842 Augustin Musket	 new with rifled barrel neuartiges mit gezogenem Laufe M1854 Lorenz
Zündlochweite . . . . Touch-hole width	6 Puncte .04321 inch	6 Puncte .04321 inch	6 Puncte .04321 inch
Rückstoß nach Pfunden . Recoil in Pounds	55 68.1 Pounds	65 80.4 Pounds	48 59.4 Pounds
Pulverladungsgewicht . Powder Charge Weight	55 Gran 62.15 Grains	120 Gran 135.6 Grains	55 Gran 62.15 Grains
Projectilgewicht . . . Projectile Weight	580 Gran 655.4 Grains	330 Gran 372.9 Grains	400 Gran 452.0 Grains
Kugeldurchmesser(am Cylinder) . . . . . . Bullet Diameter	.69858 inch 8 Linien 1 Punct	.62657 inch 7 Linien 3 Puncte	.54014 inch 6 Linien 3 Puncte
Kugelspielraum im Laufe Bullet clearance in Barrel	2 Puncte .0144 inch	9 Puncte .06481 inch	1^{IV} und wird durch das Papier u. Fett ausgefüllt .0072 inch and is filled with paper and lube
Weiteste Zieldistanz . Maximum Range	600 Schritte 491.6 Yards	300 Schritte 245.8 Yards	900 Schritte 737.5 Yards
60 Stück Patronen wiegen . . . . . . Weight of 60 Cartridges	$5\frac{3}{6}\frac{7}{4}$ Pfund 6.9 Pounds	$3\frac{3}{4}$ Pfund 4.64 Pounds	4 Pfund 4.94 Pounds
Die Kugel schlägt auf 600 Schritte Zolle Holz durch . . . . Bullet penetration into Wood at 491.7 Yards	2.1 - 3.1 inches 2—3	—	5.2 - 6.2 inches 5—6

12 Punkt = 1 Linie
12 Linie = 1 Zoll
12 Zoll = 1 Fuß
1 Fuß = 12.449 inches
1 Schuh = 11.3432844 inches
1 Schritt = 29.5 inches
1 Gran = 1.13 Grains