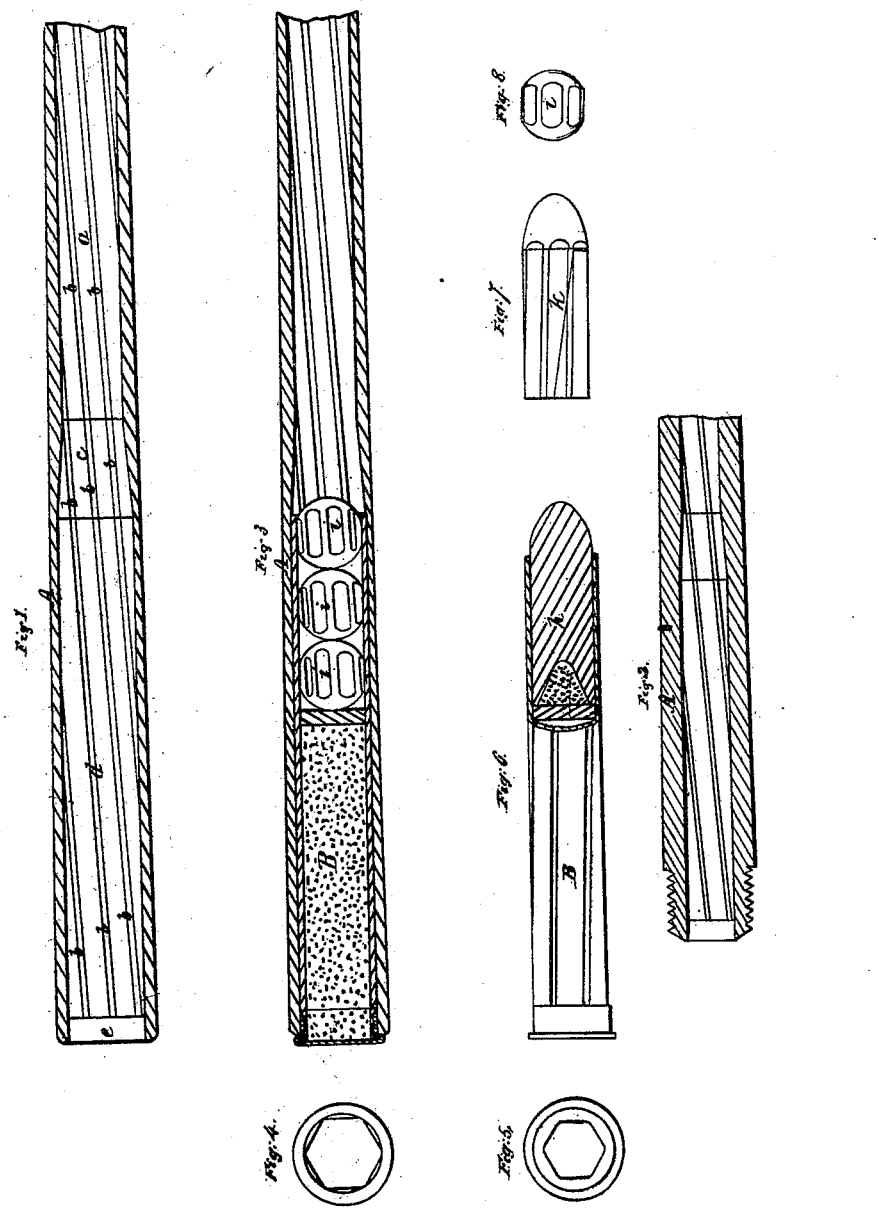
H. BERDAN.

Rifling.

No. 45,898. Patented Jan. 10, 1865.



Witnesses.

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IMPROVEMENT IN RIFLING BREECH-LOADING FIRE-ARMS.

Specification forming part of Letters Patent No. **45,898**, dated January 10, 1865.

To all whom it may concern:

Be it known that I, HIRAM BERDAN, of the city, county, and State of New York, have invented a new and useful Improvement in Breech-Loading Rifled Fire-Arms and Cannon; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable those skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figures 1 and 2 are side sectional elevations of gun-barrels, showing my improvement. Fig. 3 is a side sectional elevation similar to Fig. 1, but showing the cartridge placed within the barrel. Fig. 4 is an elevation of the breech or rear of the barrel shown in Fig. 1. Fig. 5 is an elevation of the muzzle of the same barrel. Fig. 6 is a side elevation, in part sectional, of the cartridge. Figs. 7 and 8 are elevations of balls used in the cartridge.

Similar letters of reference indicate corresponding parts.

This invention relates to an improvement of the counter-bore or cartridge-receiving chamber in the rear end of the barrel.

In the construction of the barrels of the ordinary breech-loading fire-arms the rear portion of the rifled bore terminates in an enlarged smooth cylindrical chamber called the "counter-bore." The ammunition or cartridge is inserted into the counter-bore, which extends from the rear extremity of the barrel up to the junction with it of the grooved or rifled bore. As the counter-bore is larger in diameter than the rifled bore, the front end of the counter-bore is usually contracted into a smooth cylindrical incline or shoulder. In guns of this character it is common to employ what is known as "fixed ammunition"—to wit, a cartridge having a metallic shell loaded with powder and ball. Sometimes, however, a paper cartridge is used. The cartridge is inserted into the counter-bore, the length of which should be such that if an elongated ball is employed the front end of the ball will reach, or nearly reach, the incline and the point of the ball will be directed toward the center of the rifled bore. In ...nal form the balls are cylindrical, and they are necessarily made of larger diameter than the rifled bore of the gun, so that when fired the balls will wholly fill up the rifled grooves. When the enlarged ball is driven forward by the ignition of the powder into the rifled bore the surface of the ball must necessarily be compressed or channeled, so as to exactly fit or correspond to the form of the rifled bore. The resistance of the ball when thus suddenly subjected to compression is enormous. The duration and degree of this resistance will, in balls of a given size, be proportionate to the surface-length of the balls. Another objection to these arms is that the balls must be composed of very soft metal, so that their compression into the rifled bore may be effected with the least resistance. The harder the metal of the balls the greater will be their resistance when they are driven against the incline or shoulder of the counter-bore and compressed into the grooves of the rifled bore.

In muzzle-loading rifled guns it is common to cover the exterior of the ball with a patch, which serves to reduce the resistance of the ball, and also prevents the leading of the bore when soft-metal balls are used; but in the ordinary breech-loading guns it is impossible to employ a patch, because the surface of the ball must be compressed or channeled so as to fit into and fill the rifled grooves. Another objection to the ordinary breech-loading rifled fire-arms is the difficulty of simultaneously firing more than one ball. When we attempt to use more than one ball in such arms the necessary softness of the metal composing the balls is such that by the resistance occasioned by compressing them into the grooves and by the force of the gas arising from the ignition of the powder the balls are upset and forced one into the other, and their distinctive shape is thus lost. They emerge from the gun in the form of a disproportionate plug, and their accuracy of flight is destroyed. In addition to this, by the upsetting and jamming together of the balls the interior of the rifled bore of the gun becomes badly leaded.

The nature of my invention consists in grooving or rifling the interior surface of the charge-chamber or counter-bore with grooves which

correspond to and unite with those of the barrel and have the same twist as the grooves of the barrel.

Referring to the drawings, A represents the barrel of the gun, made, as shown in Fig. 1 or as in Fig. 2, in the usual manner and of the usual materials.

a is the bore of the gun, which is made of sexagonal or other suitable form, with grooves *b*, as shown, which extend or are continued within and parallel with the inner surface of the incline *c* and counter-bore or charge-chamber *d*, substantially as shown. A recess, *e*, at the rear of the counter-bore receives the cylindrical cap of the cartridge B, as shown in Fig. 2.

My improvement is not confined to any particular species of grooving or feathering, nor to any particular degree of twist thereof, nor to any particular size or species of breech-loading guns.

My improvement may be employed in connection with almost every known species of rifled grooving or feathering; and it may be employed in all kinds and in all sizes of breech-loading guns.

In connection with the rifling of the counter-bore, I employ a novel species of fixed ammunition. I make use of a cartridge, B, the shell or case of which is so made or prepared that its exterior will correspond with the shape of the interior of the rifled counter-bore and snugly fit therein. The exterior of the cartridge-case therefore has the same twist as the grooves of the counter-bore. The interior form of the cartridge B also corresponds with its exterior. The interior of the cartridge case corresponds in form and size very closely to that of the rifled bore of the barrel. The cartridge-case thus made receives and holds one or more balls, either rounded or elongated, which have had their surfaces previously prepared to correspond with and exactly fit into the rifled grooves of the bore of the gun. When a cartridge of this kind is inserted into the rifled counter-bore the exterior of the cartridge-case, following the twist of the rifled grooves, will carry and hold the ball or balls in exact line with the rifled grooves of the bore; and when the powder is exploded the prepared balls will pass through the rifled grooves of the bore with comparatively little resistance, having been accurately fitted to the grooves beforehand.

I prepare the balls by using a section of a rifled barrel as a die or mold, through which I force the metal by means of a suitable plunger. The exact fitting of the balls into the rifled grooves of the gun is thus secured. I also prepare the cartridge-shells by using a section of the counter-bore as a die with a plunger of the form and size of the rifled bore.

The exterior of the elongated balls may be covered with patches, as shown at K, before the balls are placed within the cartridge-shells. When the balls are to be thus covered the die by which they are to be prepared must be made smaller than the bore of the gun to allow for the thickness of the patch. When thus covered the possibility of leading the barrel is prevented and the friction of the ball in the barrel is much reduced and much greater accuracy is obtained in consequence of the fact that the surface of the patch is not worn off so fast as the surface of the ball would be if the latter were in direct contact with the grooves of the bore. A better fit between the ball and the bore of the gun is thus maintained.

The shells of the cartridge may be composed of metal or fibrous substance, or both combined; or any other suitable material that can be pressed, cast, or made into the form described may be employed.

In comparison with the ordinary breech-loading guns the use of my improvements presents many important and striking advantages.

Guns made as I have described with a rifled counter-bore will offer but little resistance to the passage of the balls through the rifled gun. The balls, having been hardened and accurately fitted to the rifled grooves beforehand, will undergo no compression or channeling. Hence their range, penetration, and accuracy with a given degree of recoil will far exceed that of the ordinary breech-loading guns.

By the use of my improvements I am enabled to reduce the friction or resistance encountered by the ball in passing through the gun, and I am therefore enabled to use a larger charge of powder or a quicker burning quality of powder without increasing the force of the recoil. The more powder burned the more gas is produced and the greater is the velocity imparted to the ball when the ball leaves the muzzle of the groove. In the use of the ordinary breech-loading fire-arms the resistance of the ball, due to its sudden compression into the rifled grooves, is so great, owing to the nature of the surfaces in contact, that much less velocity is imparted to the balls during its passage through the barrel than is obtained by the use of my improvements. In my gun the ball is not checked by any resistance of compression, but starts with the commencement of ignition, or as soon as sufficient gas-pressure is generated to overcome the inertia of the ball, and the ball is driven with increasing velocity by the increasing volume of gas as ignition proceeds. My improvements thus enable me to make use of a much heavier projectile in proportion to its diameter than is desirable to use in the ordinary breech-loading rifled guns, and thereby I obtain greater momentum for my projectiles with less air-resistance than is practicable in the use of the ordinary breech-loading guns.

My invention greatly facilitates the employment of cartridges containing a series of balls which may be simultaneously discharged. Two kinds of ammunition may be used in connection with my gun—namely, single-ball cartridges, as shown in Fig. 6, for long-range firing, or three-balled cartridges, as shown in Fig. 3, for short-range or volley firing.

All rifled breech-loading fire-arms at present in use, so far as I am informed, are limited to a single ball. When it is attempted to use three balls, for example, in such arms, the sudden force of the gas acting upon the rear ball and the resistance of the forward ball produce a compression or obliteration of the form of the central ball. Indeed, the contact-surfaces of all the balls are destroyed, and they are jammed together in the form of a plug, as before stated. But in my improvement, the balls having been all previously hardened, fitted, and prepared for the rifled bore, when the cartridge is inserted the lands on the balls are placed in line with the grooves of the barrel, and when ignition of the powder takes place the balls pass from the gun with so little resistance that their contact-surfaces of the ball and gun cannot be materially affected.

When the ordinary cylindrical or smooth counter-bore is employed it is obvious that the balls cannot receive previous preparation to fit the grooves of the gun. It is required that the surfaces of the balls used with the smooth counter-bore shall be compressed into the rifled grooves of the barrel of the gun after the powder is ignited.

Another important advantage of my improvement is that by the simple act of introducing the cartridge into the counter-bore several balls may be simultaneously and accurately fitted into position in line with the grooves of the gun, ready for firing. Thus the flight of the balls will be accurate, whether a single heavy ball for long-range firing be used, or two or more lighter balls for short-range or volley firing be employed.

Any degree of scattering or spread of the balls after leaving the gun may be allowed by varying the density of the metal composing the balls, and by altering the tightness of their fit within the bore of the gun.

By the use of my improvements the soldier, when in action, may readily change the character of his amunition to suit the constantly-varying nature of his service—using the long or short range cartridges as circumstances require.

One of the great disadvantages of nearly all fire-arms now used, whether muzzle or breech loaders, is the difficulty of easily regulating the execution of the arm, so as to suit it for short or long range service. Cartridges carrying a single heavy bullet for the longest range of which the gun is capable are now almost invariably employed in all breech-loading rifled fire-arms. By the use of my improvement these balls might be divided into three balls and all of them fired with sufficient power for any distance which it is desirable to shoot in volley-firing, thus trebling the effect of the same weight of ammunition.

My improvements are intended for use in connection with various forms of breech-closing devices; and the cartridges here described may be discharged by a blow of the hammer upon any portion of the shell thereof, or by means of a percussion-cap, as will be readily understood by all gun-makers and persons skilled in the art.

I do not claim broadly the preparation of the projectiles to fit the bore of the gun, nor the employment of such projectiles in guns that have a rifled bore of uniform size extended through the entire length of the barrel.

I do not claim broadly the extension of the rifled grooves to the rear of the charge-chamber, whether in single barrels or in revolving cylinders of fire-arms.

Having thus described my invention, I claim as new and desire to secure by Letters Patent.

The rifling or grooving of the counter-bore of breech-loading fire-arms, substantially as and for the purposes herein shown and described.

HIRAM BERDAN.

Witnesses:
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