(No Model.) 2 Sheets—Sheet 1.

C. C. CHAMBERLAIN.

BREECH LOADING ORDNANCE.

No. 381,330. Patented Apr. 17, 1888.

Fig. 1.

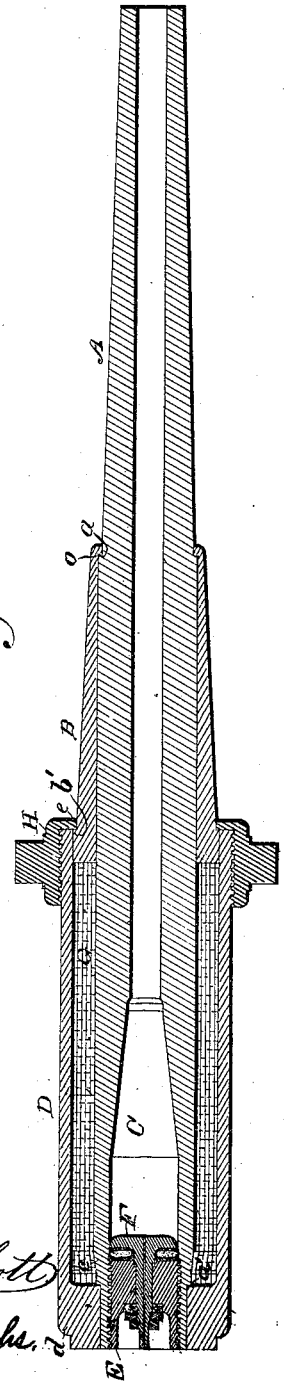
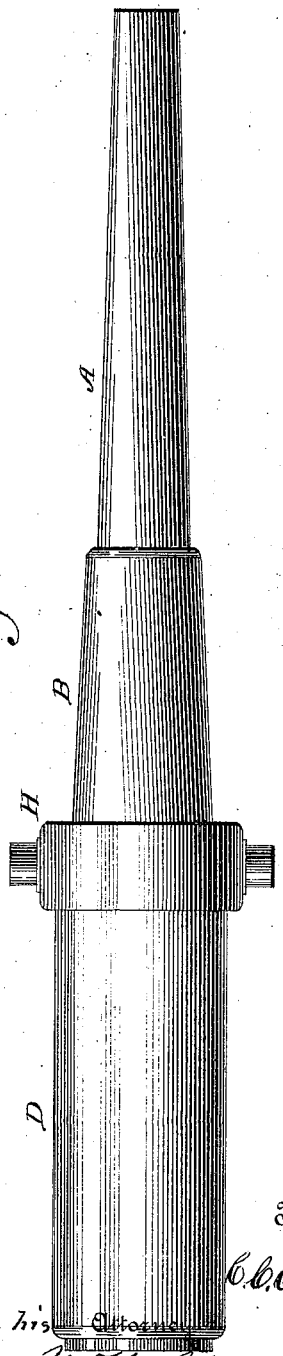


Fig. 2.



Witnesses.

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(No Model.) 2 Sheets—Sheet 2.

C. C. CHAMBERLAIN.

BREECH LOADING ORDNANCE.

No. 381,330. Patented Apr. 17, 1888.

Fig. 3.

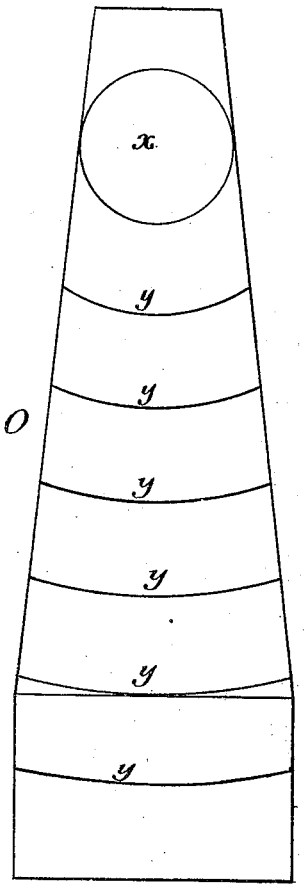
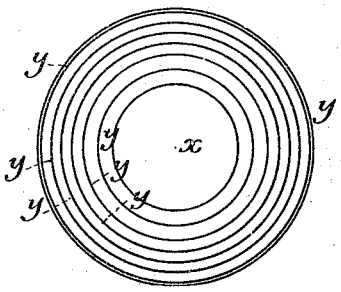


Fig. 4.



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UNITED STATES PATENT OFFICE.

CHARLES C. CHAMBERLAIN, OF MUSKEGON, MICHIGAN.

BREECH-LOADING ORDNANCE.

SPECIFICATION forming part of Letters Patent No. 381,330, dated April 17, 1888.

Application filed December 7, 1887. Serial No. 257,228. (No model.)

To all whom it may concern:

Be it known that I, CHARLES C. CHAMBERLAIN, a citizen of the United States, residing at Muskegon, in the county of Muskegon and State of Michigan, have invented certain new and useful Improvements in Guns; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to an improvement in that class of ordnance usually known as "built-up guns," in which a comparatively light inner tube or barrel is supported against the strains of firing by one or more outer cases or sleeves secured upon the barrel in various ways. In the present instance the barrel is provided with a sleeve that embraces that portion of it between the trunnions and a point on the chase about one-third the distance from the trunnions to the muzzle. In the rear of this chase-sleeve and extending beyond the powder-chamber the barrel is surrounded and supported by coils of wire, preferably of rectangular sections, coiled layer upon layer until this wire support is brought to the same diameter as that of the chase-sleeve. A breech-sleeve is then placed over the wire, extending from the extreme end of the barrel to a point a short distance forward of the rear end of the chase-sleeve. A screw-thread is formed upon the forward end of the breech-sleeve to receive the trunnion-band, which is similarly threaded and provided with an inwardly-projecting flange which, when the band is in position upon the gun, rests against a projection of the chase-sleeve. The powder-chamber of the gun is made in the form of a conic frustum, its small end adjacent to the seat of the projectile, so that when the charge is fired at its forward end the combustion of powder is continually increased in quantity until the base of the cone is reached, thus producing a continuous increase in the acceleration of the shot from the time it leaves its seat until it leaves the gun, the projecting force being developed from that part of the charge contained in the frusto-conical and the following force from that part contained in the cylindrical portion of the powder-chamber.

In the accompanying drawings, which illustrate the construction and arrangement of the several parts of the gun, Figure 1 is a longitudinal horizontal section through the gun, showing the position and relative arrangement of the different parts. Fig. 2 is a top view illustrating the appearance of the gun when complete. Figs. 3 and 4 show diagrams of the powder chamber of the gun, illustrating the action of the charge upon the projectile.

In constructing this gun the first step is to form the barrel A, which for an eight-inch gun would preferably be of steel thirty-nine and one-half calibers in length, with a thickness of metal at the muzzle of about four inches, this thickness gradually increasing until, at a point about two-thirds of the distance from the muzzle to the trunnion, where the chase-sleeve B commences, it has reached about double that thickness. At this point there is a sudden increase in thickness to the full diameter of the barrel, or about twenty-four inches, thus forming the shoulder *a*. This diameter is retained until the rear of the powder-chamber C is reached, from which point to the shoulder *a'* it is slightly tapered. This shoulder *a'* is the abutment against which the solid block forming the rear part of the breech-sleeve D rests.

An important part of the gun is the powder-chamber C, to form which the rear portion of the barrel back of the seat of the projectile is greatly enlarged. This enlargement is formed by a regular taper, which in the distance of thirty-seven inches, or thereabout, from the seat increases the diameter of the chamber to seventeen inches, thus producing a chamber having the form of a conical frustum. From the rear of this conical portion the walls of the chamber extend in parallel lines until the screw-thread formed for the reception of the breech-plug E is reached. This form of chamber furnishes room for a very large charge of powder, and at the same time allows the projectile to be seated well in the rear of the trunnions.

Another advantage consists in the gradually-

increasing power developed as the charge is burned. It being first ignited at its forward end, its action upon the projectile will be to start it slowly; but as the powder burns back the quantity in ignition is continually increased, so that the pressure upon the shot and consequent speed is continually accelerated until it leaves the gun, thus producing a result similar to that sought to be achieved by the so-called multicharge-gun.

The breech-plug E is constructed in the usual manner with exterior segmental screw-threads, which engage with similar threads in the rear end of the barrel. This breech-plug may also be provided with a gas-check, F, constructed, preferably, as shown.

The next step in the manufacture of the gun consists in applying the sleeve B to the chase. This sleeve is preferably of cast-steel, bored to form a snug fit on the barrel A, and provided with an inwardly-projecting flange, *b*, which, when the sleeve is in place, engages with the shoulder *a* of the barrel and prevents the sleeve from moving farther toward the breech of the gun. Its outside is tapered, for a gun of the size heretofore named, from a thickness of about five and a half inches at its rear end to about two and a half at its forward end. It is then slipped on over the muzzle and secured in place upon the barrel by being shrunk or pressed thereon. The wire coil is then placed upon the cylindrical portion of the gun and fills the space G between the barrel and sleeve D. This wire is preferably a drawn steel wire of rectangular cross-section, and may be applied as follows: The gun, being placed in a lathe so that it may be rotated, is provided with a collar or other suitable device for retaining the ends of the coil in position. The wire, mounted upon a suitable reel, has one end attached to the gun, which is then rotated and the wire coiled around it under tension, completely covering its cylindrical part and also the tapered portion *c* between the chase-sleeve and the shoulder *a'*, against which the solid end *d* of the breech-sleeve abuts. When the wire in winding has made one complete layer outside the barrel, another is wound outside of it in a diagonal line, so that the wires of the different layers alternately cross, and the process is continued until the coil of wire has reached a diameter equal to that of the larger end of the chase-sleeve. The end of the wire is then secured, and, if desired, a chip may be taken from its surface to render the coil perfectly straight and cylindrical, and thus prepare it for the reception of the breech-sleeve D.

It will be observed that the barrel has a slight taper at *c*, and that the rear portion of the wire coil embraces this taper, thus giving the same a hold upon the barrel to assist in resisting longitudinal strains.

The walls of the cylindrical portion of the powder-chamber, being much thinner than that part of the barrel in front of said chamber, will expand more under the strains caused by the explosion of the charge than that portion of the barrel through which the projectile passes in its exit from the gun, thus forming an enlargement of the barrel temporarily at the chamber and consequent slight taper toward the muzzle, which taper, in connection with that at the rear of the chamber, causes the wire coil to have a tendency to resist longitudinal strains as well as those tending to expand it radially.

The breech-sleeve D is formed, like the chase-sleeve, preferably of cast-steel, and provided with a heavy inward extension, *d*, at the breech. The body of this sleeve is bored out to form a shrink fit over the wire coil and rear end of the chase-sleeve B, while the extension *d* is bored to fit the rear extremity of the barrel in the same manner, extending along the same until it comes in contact with the shoulder *a'* of said barrel. This sleeve may then be placed on the gun outside the wire coil by pressing it on over the breech, or by heating and shrinking it to its place.

Upon the forward end of the sleeve D is cut a screw-thread, which engages with a similar thread formed in the trunnion-band H. This trunnion-band is also provided with an inwardly-projecting flange, *e*, which, when the band is in place, covers the end of the sleeve D and bears against the shoulder *b'* of the chase-sleeve.

It will be apparent that when the trunnion-band is screwed onto the breech-sleeve the bearing of its flange upon the shoulder *b'* of the chase-sleeve will cause both sleeves to be drawn forcibly against the shoulders *a* and *a'* of the barrel, thus causing said sleeves to assist materially in resisting the longitudinal strains upon the barrel in firing. The whole forms a cheaply-constructed, well-balanced, and effective gun, the form of the powder-chamber allowing very large charges to be fired with safety, as it causes the strains to increase gradually instead of the full force of the charge coming upon the gun suddenly, as in the case with the enlarged powder-chambers now in use.

It will be understood that in the construction of the powder-chamber the taper may, if desired, be carried back farther than shown in Fig. 1 of the drawings, the intention being that the projectile shall have acquired its full velocity by the time that the powder in the conical portion of the chamber has been burned. To more fully illustrate this, a chamber constructed on my plan in accordance with the following formula will give the highest practical efficiency of gunpowder: length of base or cylindrical portion, one and a quarter caliber; diameter of base, two and one-fourth calibers; length of frustum or tapered portion of the chamber, five and one-half calibers. This chamber is designed to burn efficiently more than double the quantity of powder that can be effectively burned in the chamber of any gun now known of equal caliber. To further illustrate the action of the powder upon

the projectile when burned in this chamber, reference is had to the diagrams in Figs. 3 and 4 of the drawings, in which the outline of the chamber is indicated by the line O. *x* indicates the point of first ignition, and the curved lines *y y* the successive ignitions.

A grain of powder in combustion will ignite all others within a radius of six times its own diameter. Therefore if powder the kernels of which are an inch in diameter is used in the chamber of a gun constructed as hereinbefore described, its action would be as follows: When the powder upon the line *y* nearest the point *x* is in a state of combustion, it ignites all between it and the second line *y*, and these successive ignitions continue until the base of the chamber is reached, at which time all the contents of the same will be in a state of combustion. There would be, therefore, eight ignitions before the base of the chamber would be reached, requiring an appreciable lapse of time from the first ignition before all the contents of the chamber would be in a state of active combustion. If the diameters of the kernels be more or less than this, the number of ignitions will be correspondingly increased or diminished. It will therefore be apparent that the projectile will receive a series of impulses increasing in force as the quantity of powder in a state of active combustion increases.

I am aware that guns have been constructed with a conical chamber polygonal in cross section and also with curved outlines, the greatest enlargement in both being immediately adjacent to the breech-plug; but these forms of chamber I do not claim as my invention.

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

1. A gun having its breech-chamber formed with a frusto-conical front section of gradual taper and a shorter cylindrical rear section, these being so proportioned that the projecting force shall be developed from the part of the charge contained in the frusto-conical and the following force from the part contained in the cylindrical section of the breech-chamber, as set forth.

2. The combination of a gun body or core having a diminished tapered portion at its rear, a metallic coil embracing the core and extending forward beyond such taper, and an outer casing engaging the gun-body and closely confining the coil, as set forth.

3. As an improvement in guns, the combination, with the body or core thereof, of breech and chase sleeves engaging the same at their remote sections, such sleeves being respectively screw-threaded and outwardly flanged at their contiguous ends, and a screw-threaded and inwardly-flanged trunnion-band engaging such sleeves and rigidly connecting them when the band is screwed up.

4. The improved gun herein described, comprising the barrel provided with a front and rear shoulder, *a* and *a'*, respectively, the chase-sleeve having in front flange *b* and in rear flange *b'*, the breech-sleeve externally screw-threaded at its forward end and provided with an engaging-flange, *d'*, at its rear end, and the internally-screw-threaded trunnion-band having an inwardly-turned flange, whereby when the trunnion-band is screwed up the flange of the said band is made to engage the shoulder upon the chase-sleeve and firmly draw to it the breech-sleeve, thus tending to unite the two closely together and re-enforce the longitudinal strength of the gun, as set forth.

5. As an improvement in guns, the barrel provided with the enlarged conical powder-chamber, in combination with the breech-sleeve and wire coil embracing the barrel at the rear, the chase-sleeve, and the trunnion-band connecting said sleeves, substantially as specified.

6. The combination of the barrel A, provided with the conical powder-chamber, the wire coil surrounding said barrel, the breech-sleeve inclosing said coil, the chase-sleeve, and trunnion-band, said trunnion-band screwed onto the breech-sleeve and connecting it with the chase-sleeve, all arranged for joint operation, substantially as shown and described.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES C. CHAMBERLAIN.

Witnesses:

W. C. LANGAN,

G. BURROUGHS.