(No Model.)

3 Sheets—Sheet 1.

G. B. WEBB.

CANNON.

No. 417,800. Patented Dec. 24, 1889.

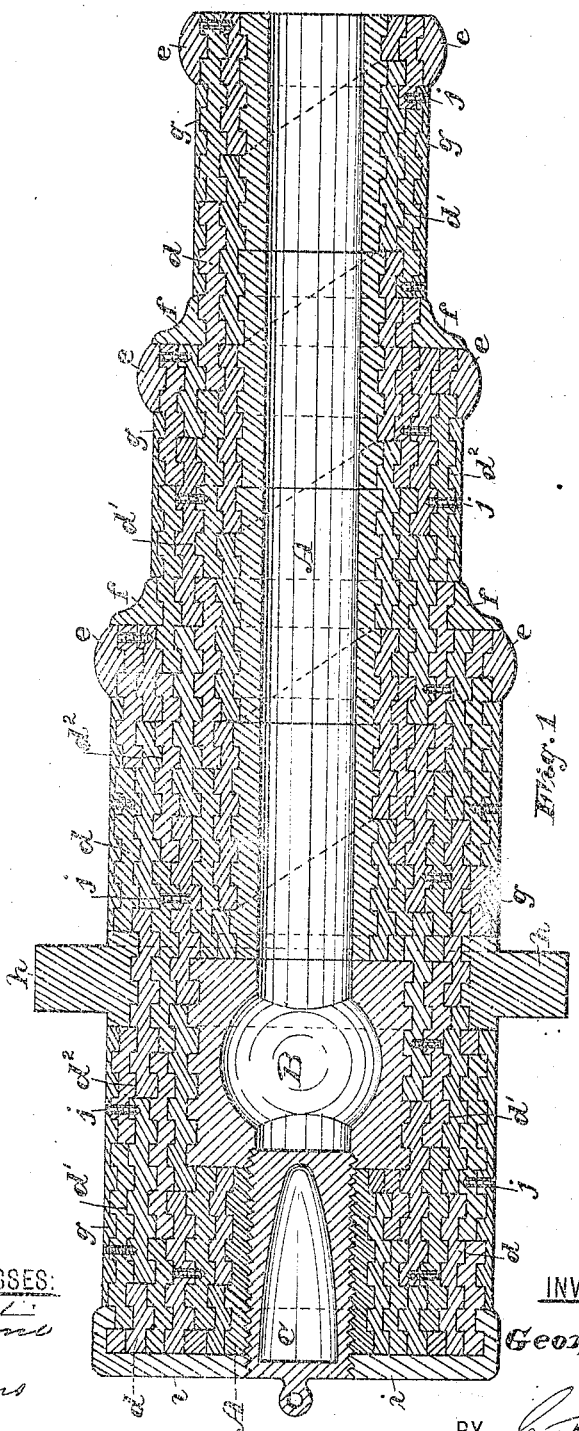

Fig. 1.

WITNESSES:

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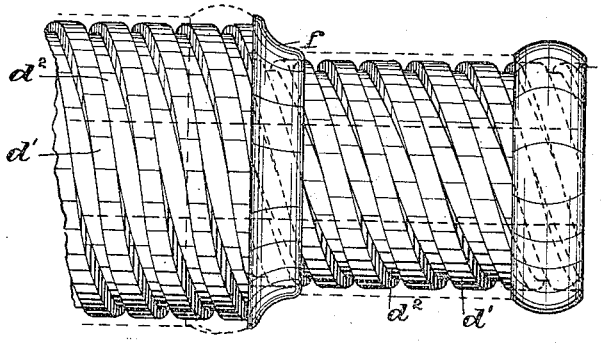

Fig. 2

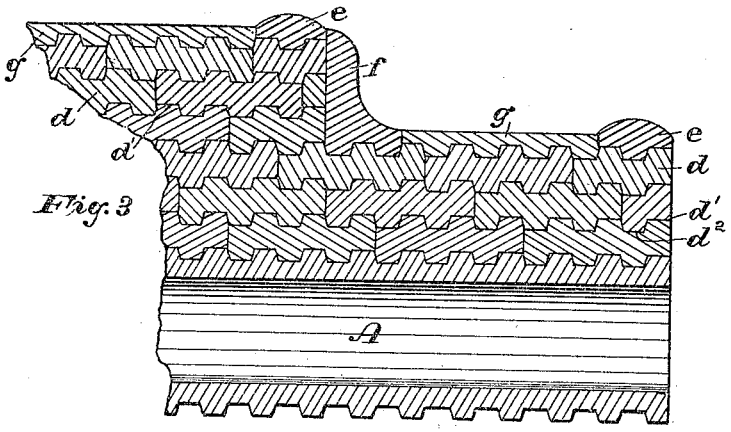

Fig. 3

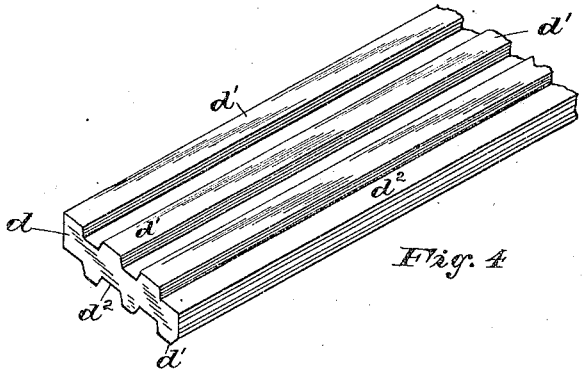

Fig. 4

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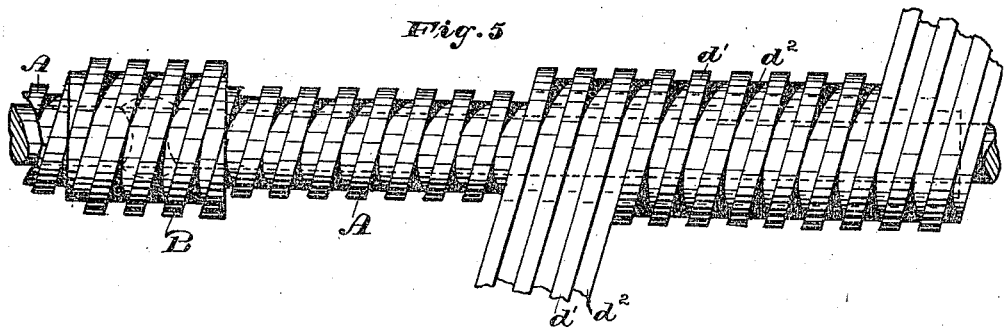
CANNON.

No. 417,800. Patented Dec. 24, 1889.

Fig. 5



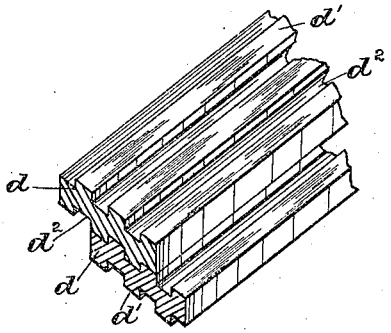


Fig. 6

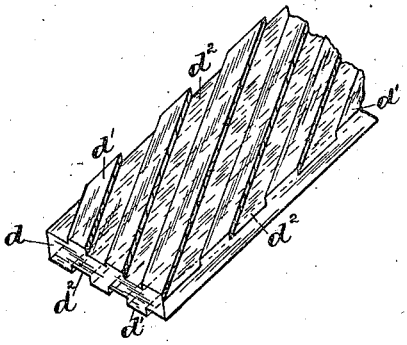


Fig. 7

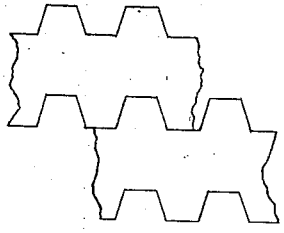
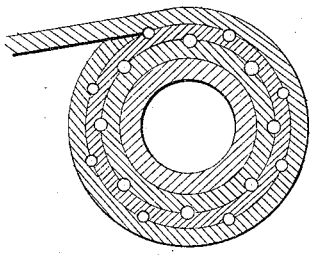


Fig. 8

Fig. 9.



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UNITED STATES PATENT OFFICE.

GEORGE B. WEBB, OF NEWARK, NEW JERSEY.

CANNON.

SPECIFICATION forming part of Letters Patent No. 417,800, dated December 24, 1889.

Application filed March 1, 1887. Serial No. 229,284. (No model.)

To all whom it may concern:

Be it known that I, GEORGE B. WEBB, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvement in Cannon; and I do hereby 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 letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in those cannon which are built up or composed of separate parts united together in distinction from those which are cast and forged in one piece or mass or in large masses.

The general purpose of the invention is to so construct a built-up cannon that it will better withstand the severe strains, both the longitudinal and transverse, to which it is subjected at each explosion. This I accomplish partly by the peculiar form of the individual sections or portions of which my improved built-up cannon is composed, whereby the same are interlocked to withstand the strains unitedly, and partly by the manner in which each of said individual portions is wrapped in the process of manufacture, whereby each of said portions is strained to or nearly to its elastic limit. This manner of construction and the advantages attained thereby will be fully described hereinafter, and the peculiar form of the individual sections of which the cannon is made and their mutual relation in the finished cannon are illustrated in the accompanying drawings, and will be also hereinafter set forth.

In said drawings, in which similar reference-letters are employed to indicate like portions in each of the several views, Figure 1 is a longitudinal section of the cannon, illustrating the construction thereof. Fig. 2 is a side elevation of a portion of the muzzle thereof, the outer encircling plates thereof being removed. Fig. 3 is a sectional view of a portion of the muzzle of the cannon, indicating in detail one method of arranging and constructing the parts thereof. Fig. 4 is a perspective view of a portion of one of the grooved plates used in the form shown in Fig. 3. On Sheet 3, Fig. 5, is a top or plan view illustrating the manner of constructing the gun. Fig. 6 is a similar view of an arrangement of overlapping plates. Fig. 7 is also a perspective view illustrating a form of plate in which the grooves on opposite sides thereof extend in different angles, and Fig. 8 is a diagram indicating the relative proportions of the body of said plates and the grooves and projections thereon. Fig. 9 is a transverse section of a cannon, illustrating holding-shot embedded between the convolutions.

The cannon illustrated in said views is composed of a series of convolutions wrapped or wound one around the other and all arranged concentrically around the core which forms the inner lining or bushing of the bore, the number of convolutions depending upon the strength desired and the size of the gun. Each of said convolutions is composed of a single metallic plate, which is grooved or recessed on both sides thereof, and when wound around the core the grooves and projections on any two contiguous sides of said plates project one into the other, thereby locking the same inseparably together, as is indicated in Figs. 1, 3, 6, and 7. The plates may be of any suitable width and may contain any number of grooves and projections, those indicated in Figs. 1 and 2 having four grooves and projections or elevations, while the plates shown in Figs. 3 and 4 are each provided with three grooves and projections. The wider the plates the less number of joints are made in the cannon between the muzzle and breech, and in consequence the longitudinal strength of the cannon is greatly increased; hence it is considered advantageous to employ plates of as large a width as may be readily handled in winding the convolutions around the core. The grooves in the plates may extend longitudinally along opposite sides of the same and parallel one with the other and with the sides of said plates, as in Fig. 4; or one side of the plate may be provided with longitudinal grooves thus arranged, while on the opposite side the grooves extend across the plates from side to side thereof at any desired angle, as indicated in Fig. 7; or, again, the grooves on both sides of the plate may extend across the same, as in-

dicated on the top of the plate in Fig. 7, at the same or different angles.

When both sides of the plates are provided with longitudinally-extending grooves, they are so arranged in relation to each other that a groove on one side is directly opposite a projection on the other side, so that the thickness and strength of the plate are practically the same at every point. Another advantage of this arrangement is, that the projections and grooves coincide and fall one into the other in winding the concentric convolutions around the core.

The relative dimensions of the grooves and projections to the central body of the plate, as is indicated in the diagram shown in Fig. 8, may be such that the grooves are about one-fourth of the entire thickness of the plate, and in consequence the projections about the same, leaving the half of the thickness of the plate solid in the center. This is the same whether the grooves extend in the same or in different directions. When, however, the width of the plates and the number of the grooves are increased, the depths of said grooves may be more shallow and the body of the plate much thicker relatively.

The core of the cannon, which forms the bore, is composed of a hardened-steel cylinder formed in one piece or section, or, if desirable, for convenience in hardening or tempering, the same may be made in several sections. On the outside of the core are provided grooves similar to those on the plates, as indicated in Figs. 1 and 2.

In the breech of the gun is arranged the powder-chamber, which is preferably of much larger internal diameter than the bore and may be of any suitable internal shape, having openings communicating with the bore of the gun on one side and with the opening in the breech on the opposite side, through which the charge is inserted into the powder-chamber.

The method of constructing the cannon is as follows: The core or sections thereof and the powder-chamber are arranged upon a mandrel in a suitable lathe, and to either end of the said core is fastened one end of the plate which is to form the first convolution or winding, said plate being secured to the core by a screw tapped therein by a clamp or in any suitable manner. The plate being secured, the mandrel and core are then turned in the lathe, and the first convolution is wound around the core at such a pitch or angle as will secure the greatest combined transverse and longitudinal strength. When the powder-chamber is of larger diameter than the core, the first convolution or as many of the convolutions as need be are wound up to the chamber, and are secured and cut off and the winding continued on the opposite side of the said chamber to the end of the breech. In this manner two, three, or as many convolutions as are necessary to provide the desired strength at the muzzle are wound the entire length of the gun from the muzzle to the end of the breech, as in Fig. Then at a point situated at a suitable distance from the muzzle the second group of two or three convolutions is started and continued out to the end of the breech, and at a suitable point on said last-named group of convolutions a third group is started and wound out to the end of the breech, and so on as many groups of as many series as may be desired may be wound until the gun is finished. In this manner the strength of the gun is located where it is most needed—viz., around the breech, where the shock of the discharge and explosion is more strongly felt or is greatest.

In winding on the convolutions the plates are heated to such a temperature as will render them sufficiently pliable, and it may be increased to any degree, according to the shrinkage desired of the same around the core and encircling layers.

In winding the plates or bands the same are strained to or nearly to their elastic limit, so that when the inner convolutions expand under the force of the explosion the outer convolutions do not give way under the outward strain of the inner coils, but hug and re-enforce the same, thereby bearing part of the outward strain of the explosion. Thus each coil acts to re-enforce and to sustain the next inner coil, so that while the innermost coil or convolutions more directly receive the force of the explosion the strain thereof is distributed between all of the concentric convolutions. In other words, the convolutions are wrapped in such a manner that when the inner coil is thrust outward and strained to its elastic limit each succeeding coil is also strained or expanded to such a degree that every one of the concentric coils reaches its elastic limit at the same time. This feature is one of great importance, as one of the most common causes of the bursting of large solid guns especially is the unequal expansion and contraction of the parts thereof.

In winding the concentric convolutions or wrappings around one another they are so applied that each succeeding convolution covers the joint in the next preceding convolution. This construction gives very great transverse strength to the gun, since the joint formed by the winding of the plates which extend spirally around the gun is covered its entire length by the next convolution. The longitudinal strength of the gun is also increased by this construction, as a projection on each of the overlying plates catches in a recess in each of the underlying plates on that side of the joint away from the muzzle, so that the tendency of the spreading of the joint is resisted by the projections on the overlapping plates on each side of the joint, as is illustrated in Figs. 1 and 3.

In winding the plates but one tooth or projection is caused to overlap the joint in the next preceding plate or convolution, thus

bringing the joints in the convolutions stepwise from the core out to or toward the periphery of the gun, and by thus arranging them so that they lie out of a radial line from the core very great strength is attained.

In wrapping the plates around the core, instead of applying but one plate, two plates, as arranged in Fig. 6, may be wrapped at the same time. The advantage of this is that any tendency of the first convolution to creep or unwind is counteracted by the encircling convolution, which locks and holds the first convolution in place.

In applying the form of plate illustrated in Fig. 7 the first convolution is wound around the core in the ordinary manner, and when in place around the core the grooves and projections in the outer surface, which extend from side to side of the plate, are brought into such relation that they form a continuous line of elevations and depressions extending spirally around the gun in an opposite direction to the grooves and recesses on the under side of the plate, so that the second convolution is wound around the first convolution in the opposite direction from that in which the first convolution is wound around the core. Thus each succeeding wrapping is wound alternately from right to left and from left to right, securing thereby an arrangement of parts which is productive of great strength.

To prevent the creeping of the several convolutions, hardened-steel shot may be placed in the grooves during the winding process, and as the winding continues are embedded in the heated plates, and thus unite them firmly at that point, substantially as indicated in Fig. 9.

The grooves in the plates may be so cut as to have vertical and parallel sides, as in Figs. 1 and 6, or said sides may be inclined outwardly, as in Figs. 3, 4, and 7, and the plates may be of steel, iron, bronze, or any suitable material or metal.

As each succeeding convolution in winding is strained to the elastic limit and is heated, it compresses each inner convolution, and thus tends to restore them to their normal elastic state.

In the drawings, A indicates the core, B the powder-chamber, and C the breech-pin, which closes the entrance to the powder-chamber and is screwed into the core, and is preferably made hollow to lighten the weight and enable the same to be easily handled. Around the core are the concentric convolutions formed by the spirally-wound plates *d*, provided with projections d' and grooves d^2. Around the end of the muzzle and the beginning of each group of convolutions are rings *e*, which are shrunk on or otherwise fastened, and which may be smooth on the inner surface or may be grooved to fit on the outer grooved convolution. Against each of said groups of wrappings or convolutions are moldings *f*, which strengthen the parts and present a more finished appearance.

g g are the outer plates which cover the grooved under plates.

The trunnions *h* are shrunk or swaged on the gun, and may be grooved or smooth on the under side, as desired.

The breech-plate *i* projects over the end of the breech into the grooves, as shown in Fig. 1, and is thereby held firmly in place.

Throughout the convolutions small headless screws *j* may be distributed to secure the parts together.

If desirable, the core of the cannon may extend entirely through the bore without the inserted powder-chamber, thus forming the bore of the gun similar to that of an ordinary cannon; but the manner of constructing my improved cannon admits of the insertion of a powder-chamber of any size or shape desired, and, as the form of construction of the gun greatly increases its strength, hence the dimensions of the powder-chamber and the size of the charge may be correspondingly increased, and also the efficiency of the gun. The relation and position of the joints depend upon the number of projections and grooves in the plates—as, for instance, if each plate has three of each, there will be four convolutions before the joints will fall in the same radial line; if four of each, four convolutions will intervene before the joints coincide; hence plates of considerable width will be found more advantageous than narrow plates. While the grooved or corrugated plates are considered preferable because of the strength gained by the engaging grooves and projections, yet smooth plates bound or secured together by bolts or screws, as indicated in Fig. 1, may be used, wound spirally around the core, and a gun of considerable strength secured.

By reference to Fig. 1 it will be seen that the trunnion-ring is let into the body of the gun with the concentric rings or plates abutting against the same on each side thereof. By thus securing the rings the effect of the recoil upon the trunnions is greatly moderated.

I may extend the powder-chamber out to the end of the breech, if desirable, and screw the breech-pin into the same instead of into the core-sections; also, the core itself may be dispensed with and the inner convolution form the bore of the gun, the plates in this case being wound directly upon the mandrel. In lieu of winding the plates in a heated state, they may be wound cold by the use of proper machinery and power.

With respect to the metal used in either the core or in the outer convolutions it will be understood that it may vary.

Having thus described my invention, what I claim is—

1. A cannon provided with a series of spirally and concentrically wound plates, a sectional core, and a powder-chamber of larger external and internal diameter than the core inserted in between the sections of said core, for the purposes set forth.

2. A cannon provided with a series of spirally and concentrically wound plates having grooves and projections on opposite sides thereof, the grooves and projections on each plate receiving and fitting into the projections and grooves on the next preceding and succeeding plates, for the purposes set forth.

3. A cannon provided with a series of spirally and concentrically wound plates having grooves and projections on opposite sides thereof, and a core having grooves and projections on the periphery thereof adapted to receive the projections and fit into the grooves of the next convolution, for the purposes set forth.

4. A cannon provided with a series of spirally and concentrically wound plates having grooves and projections on opposite sides thereof, and a core having spirally-formed grooves and projections on the periphery thereof to receive the projections and grooves on the next convolution, and composed of tubular sections abutting one against the other, for the purposes set forth.

5. A cannon having a series of spirally and concentrically wound plates with hardened shot or locking-pieces inserted between the said wound plates, for the purposes set forth.

6 A cannon having a series of spirally and concentrically wound plates provided with grooves and projections on opposite sides thereof, the grooves and projections on each plate engaging the projections and grooves on the adjoining plates, some of said grooves and projections extending spirally through the cannon in one direction, and others of said grooves and projections extending spirally through the cannon in an opposite direction, for the purposes set forth.

7. A cannon composed of plates wound concentrically and spirally around a tubular core and having grooves and projections on both inner and outer faces, whereby the successive coils are locked together, said plates being strained relatively, whereby when expanded said plates reach their elastic limit simultaneously.

In testimony that I claim the invention set forth above I have hereunto set my hand this 24th day of February, 1887.

GEORGE B. WEBB.

Witnesses:
FREDK. F. CAMPBELL,
FREDK. C. FRAENTZEL.