2 Sheets—Sheet 1

N. WIARD.

Ordnance.

No 39,604.

Patented Aug. 18, 1863.

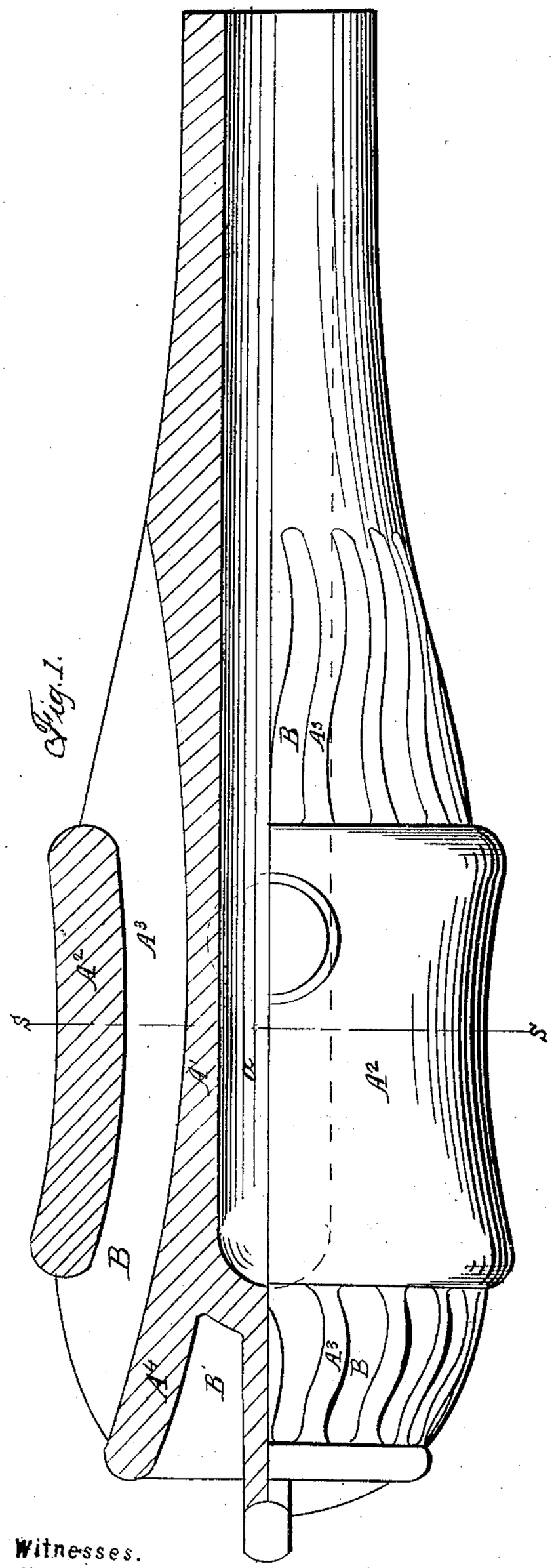

Fig. 1.

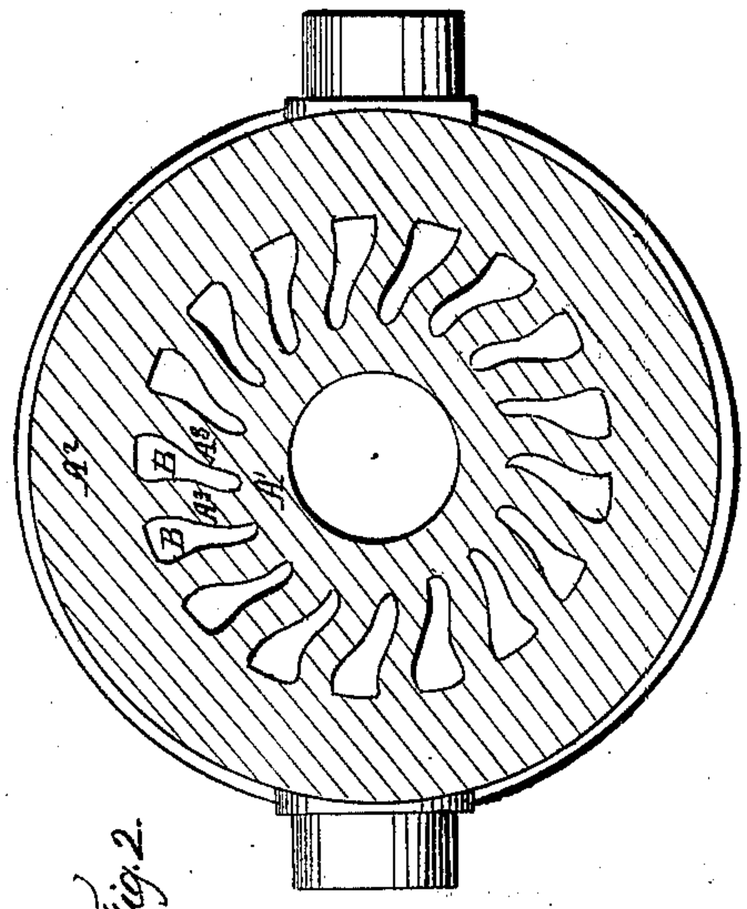

Fig. 2.

Fig 3

Witnesses,

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2 Sheets—Sheet 2

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Fig. 7

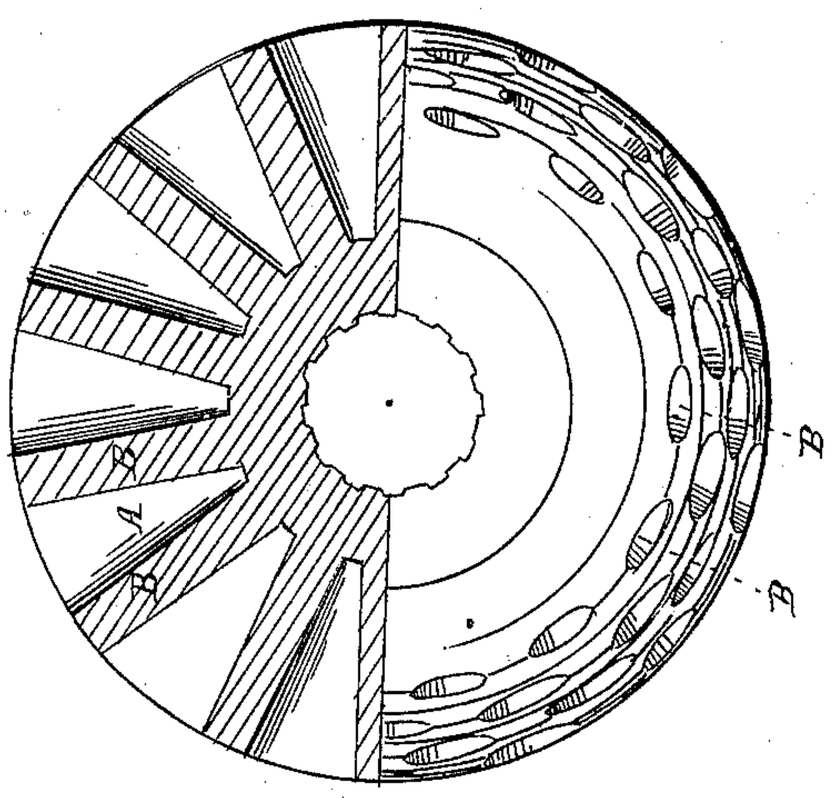


Fig. 5

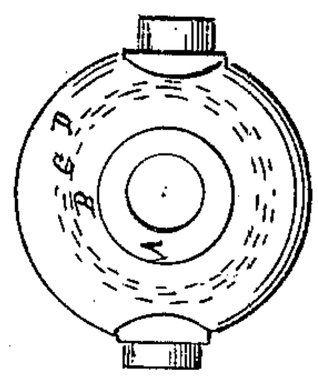


Fig. 6

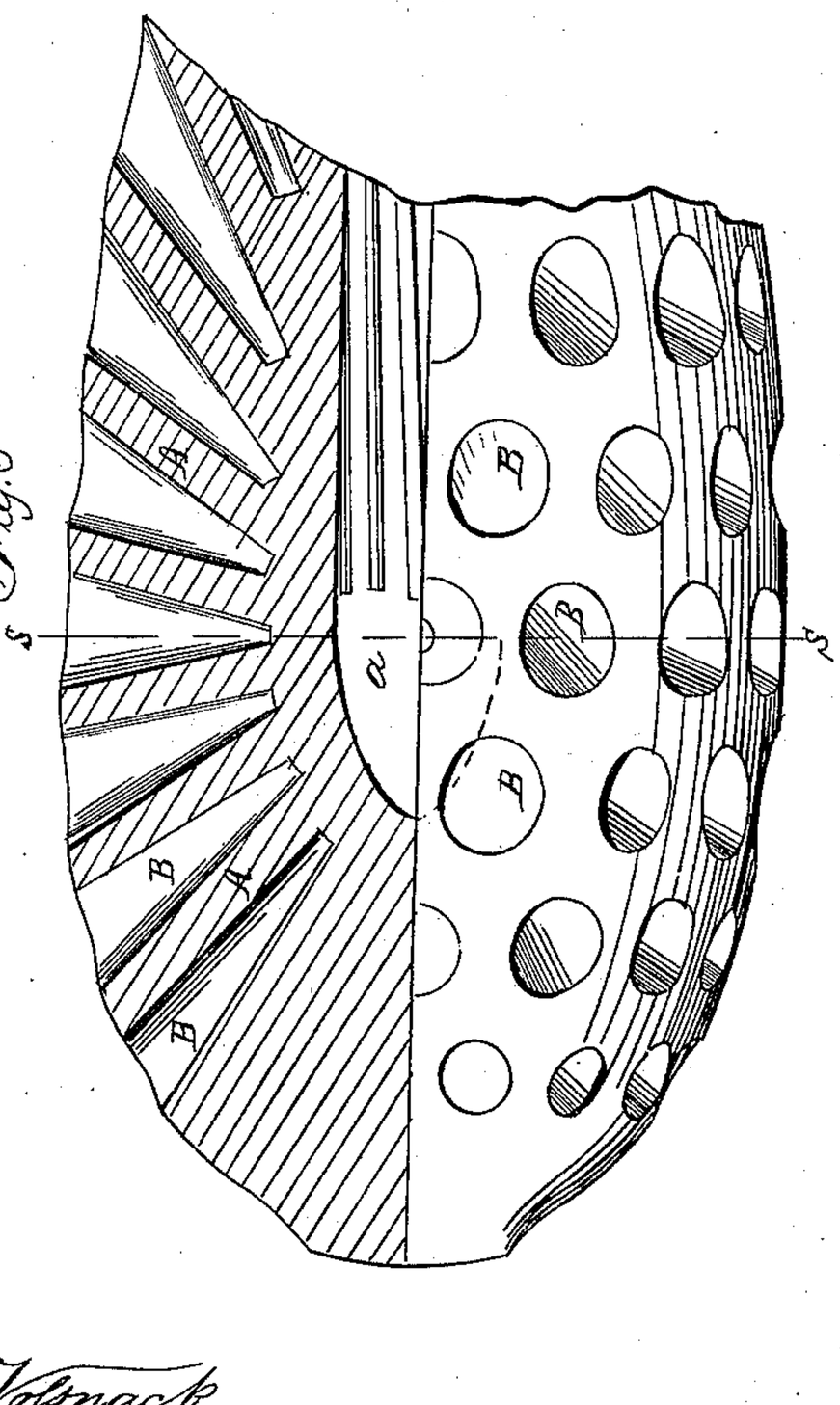
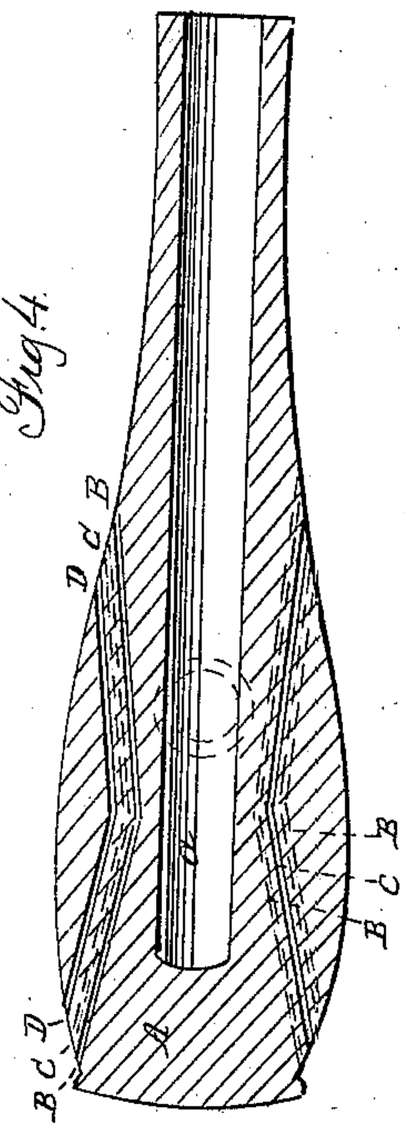


Fig. 4.



Witnesses:

Emil Vossnack

W H Hendrickson

Inventor.

Norman Wiard

UNITED STATES PATENT OFFICE.

NORMAN WIARD, OF NEW YORK, N. Y.

IMPROVEMENT IN THE CONSTRUCTION OF ORDNANCE.

Specification forming part of Letters Patent No. **39,604**, dated August 18, 1863.

To all whom it may concern:

Be it known that I, NORMAN WIARD, of the city of New York, in the county and State of New York, have invented a certain new and useful Improvement in Ordnance; and I do hereby declare that the following is a full and exact description of the construction and operation of the same, sufficiently in detail to afford to those skilled in the arts to which the several features of the invention are most nearly allied a clear idea of the novelty or novelties therein.

The accompanying drawings form a portion of this specification.

Figure 1 represents a cast-iron gun cored according to my invention. The upper side of this figure is a longitudinal central section. The lower side of this figure is a side elevation. Fig. 2 is a cross-section of the same on the line S S in Fig. 1. Fig. 3 is a rear elevation of the same. Fig. 4 represents a forged or cast gun bored according to my invention. Fig. 5 is a front view of the same. Fig. 6 represents another mode of boring which I propose to adopt in carrying out my invention. The upper half is a longitudinal central section. The lower half is a side elevation. Fig. 7—the upper half of this figure is a cross-section on line S S in Fig. 6. The lower half of this figure is a front elevation of the same gun.

Similar letters of reference indicate like parts in all the figures.

My gun is cast with cores, or is otherwise so constructed of a single metal that a series of cavities exist in the thickest portion of the gun. These cavities are so arranged that the gun may be heated on its interior by rapid firing, and may be also subjected to the great mechanical force due to the firing of heavy charges, and may be in both conditions at the same moment without as severe strain on the gun or any part thereof as in guns of the ordinary construction. I prefer to employ cast-iron as a material, using such mixtures thereof as shall from time to time be found by trial to be best adapted for the purpose; but mixtures of iron which are impracticable in the ordinary forms of guns may be used in this with some success by reason of the provision in this invention for the unequal expansion of the metal.

Bronze and any other metal used in gun-making may be employed in making guns according to this invention.

I believe my invention is particularly well adapted to the use of cast-steel and of the several varieties of hard and strong metal known as "puddled steel," "semi-steel," &c.

I have had experience in the fabrication of guns, and the invention described and claimed in this specification is one of several which I have made to overcome the difficulties met with in the attempt to produce large guns of semi-steel. I have made small guns (less than twenty-pounders) of semi-steel, and they have endured every kind of test to which they have been subjected, and have been very successful in the field, but on attempting to fabricate fifty-pounders of the same metal I found they burst with ordinary charges when fired rapidly, and, in short, that I could not make a successful fifty-pounder of such material in the ordinary form and construction of guns. I ascribe my failure to succeed to the unequal heating and consequent unequal expansion and violent strain on the metal, there being no provision for adequate elasticity in the metal to allow of such unequal expansion. In my present invention there is such provision. This provision exists in the disposition of the metal in the thick part of the gun, the holes in the thick part being so arranged that the metal about and between the holes is more elastic than usual, or rather allows, by the same quality and extent and elasticity which such metal ordinarily possesses, a greater elasticity in the gun as an entire gun. It must of course be understood that the holes may be produced by either coring or drilling, but that coring is preferable for various reasons when the gun is to be cast. In making guns of wrought-iron, puddled steel, or the like, and in changing cast-iron or bronze guns which have been already made in the old way so as to contain my present invention the holes may be produced by boring.

To enable others skilled in the art to make and use my invention, I will proceed to describe the construction of one of my guns by the aid of the drawings and of the letters of reference marked thereon.

Figs. 1, 2, and 3: In these figures the metal of the gun is denoted by A, with various appended numbers to designate different parts

of such metal. The bore of the gun, which is of the ordinary character, either rifled or plain, is designated by *a*. B B B, &c., are cavities produced by the introduction of cores of corresponding form. These cavities extend from a point near the extreme rear to a point forward of the trunnions.

B′ B′ are other cavities cored or molded in the breech in the position represented. A′ is continuous and stout shell, of metal, which bounds the bore *a* in the usual manner. It is sounder and stronger than a corresponding portion of the metal of an ordinary gun, because it is cast thinner and more uniform in character. A^2 is a thick ring of the same metal cast at the same time and in one piece with A′, and standing so related thereto as to embrace the same through the medium of the connections represented. A^3 are the connections between A′ and A^2, cast at the same time and in one piece with each. A^4 represents the portion of metal between the cored cavities B and the other several cavities B′. A^5 are the connections across the ring or circular metal A^4. The cascabel is cast on the junction or central part of A^5. The trunnions are cast on the thick ring A^2. The mass of A^2 is so great relatively to the mass of the parts within it that it remains fluid a little longer than the parts within it, and consequently, when it cools, exerts a very powerful strain of compression upon the interior parts, A′ and A^3, which are embraced within it. The cores B B are of such form that the webs A^3 are curved, as represented in Fig. 2. This curvature allows them to yield slightly to the compression exerted by the cooling of the ring A^2. This curvature also allows them to yield to a slight extent farther than usual when the interior of the gun or the metal A′ is expanded by the heat due to rapid firing. The form and position of the cavities B also allow the part A′ to expand longitudinally without necessitating a corresponding expansion of the thick ring A^2. If the cores be cooled by any application of water-pipes or the like, as has been recently practiced in cooling cores for the bore of guns, the cooling of the parts A′ and A^3 will be still more rapid; but I do not consider it necessary to do so. If the cavities B and B′ are left open to the free circulation of air when the gun is in use, a portion of the heat which is received and conducted outwardly through A′ will be carried away by the air, and will never affect the temperature of A^3. This may in most cases be an advantage; but whenever it may be deemed advisable to prevent the circulation of air in all or any of the cavities, it may very readily be done by the introduction of any fibrous, earthy, or other suitable non-conducting substance, or by the employment of a mere covering, either permanent or temporary, on the exterior, to cover the mouths of the cavities.

Figs. 4 and 5: These figures represent a gun of a former pattern altered by drilling holes, so as to conform to my invention. In these figures, A (variously indexed, as before) indicates the metal, and *a* the bore, of the gun. B, C, and D indicate, respectively, series of holes bored in the manner and in the positions indicated, B representing an inner series, C an intermediate series, and D an exterior series. Each hole is bored in two distinct and different lines, intersecting each other at a point at the thickest or nearly the thickest part of the gun, one part of each hole being bored from a point forward of such junction, and the other from a point in the rear of such junction, as represented.

Figs. 6 and 7: These represent a gun of an ordinary pattern, differently bored, so as to conform to my invention. A is the metal of the gun, and *a* the bore. B, B, &c., are tapering holes drilled or rimmed by a tool of proper form in the several positions represented. The plans of boring shown in Figs. 4 and 5 and 6 and 7 may obviously be applied to forged guns of all kinds. I propose to manufacture this gun, when it is practicable to do so, by casting it in the manner shown in Figs. 1, 2, and 3, and when, by reason of the impracticability of casting the material, or by reason of the gun having been already cast in the old form I cannot employ such a method of fabrication, I then propose to employ one of the modes of drilling described in Figs. 4 and 5 or 6 and 7, or some other equivalent mode which will have the effect to give the metal the same open condition. The vent of guns cored in the manner represented may be introduced in any convenient position. I prefer the position indicated by the dotted red line in Fig. 2.

The effect of my invention is to produce sounder castings throughout than when the gun is cast in a very great mass, for reasons which are well-known to founders. It also allows the interior metal of the gun to expand by heat both radially and in the direction of the length of the gun without compelling an equal lengthening of the metal on the exterior of the gun, and yet carries the exterior metal, A^2, to contribute its strength to the gun, to avoid the actual rending of the latter by the severe mechanical force of the powder.

Some of the advantages due to certain features of my invention may be separately enumerated as follows:

First. By reason of the fact that the metal of the gun is perforated with holes extending not parallel to the bore or radially thereto, but extending, as represented by B in all the figures, obliquely outward from the point nearest the bore, I accommodate the rapid expansion of the inner metal of the gun, when suddenly heated, by providing a suitable elasticity not alone radially or longitudinally, but in both directions, and am able to present a great surface to the cooling effect of the air.

Second. By reason of the fact that the metal A^3 adapted to communicate force or strain between the metal A′ on the interior, and the metal A^2 or re-enforce on the exterior, stands curved or inclined, as shown in Fig. 2, I pro-

vide a higher degree of elasticity in the radial direction than would otherwise be available, and make the effect when the gun is strained analogous to the well-known example of a cast wheel with curved arms.

Third. By reason of the fact that the re-enforce A^2 acts with a great strain of compression on the elastic webs A^3, whether this compression be due, as in the gun described, to the latter time of the cooling and shrinking of the metal, A^2, or to being manufactured separately of a smaller diameter and shrunk on, the inner metal, A', is more favorably compressed and supported to resist the mechanical force of the burning powder than by any previously-known construction. The superiority is due to the fact that the compressive force exerted on A' may be always very near the maximun when the gun is fired, because it is nearly constant under all conditions. It is but little greater when A' is heated and expanded, because the webs A^3 are correspondingly deflected and resist less directly than when A' is cool and contracted, and the webs A^3 are more nearly radial. The former is the condition after the gun has been fired rapidly, and the latter is the condition when the gun is cold and is discharged for the first time.

Having now fully described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. The within-described arrangement in guns, of the oblique holes B, for the purpose of promoting both the longitudinal and radial expansion of the inner metal, as herein set forth.

2. In connection with such holes B, or with equivalent holes or parts thereof, extending parallel or nearly parallel to the axis, the employment of the oblique or curved connections A^3 between the outer and inner metal of a gun, for the purpose herein set forth.

3. The within-described arrangement and combination of a highly compressive re-enforce, A^2, the elastic webs A^2, and the interior metal, A', of a gun, substantially as and for the purpose herein set forth.

NORMAN WIARD.

Witnesses:
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EMIL VOSSNACK.