W. W. HUBBELL.

Muzzle-Loading Ordnance.

No. 44,194.

Patented Sept 13, 1864.

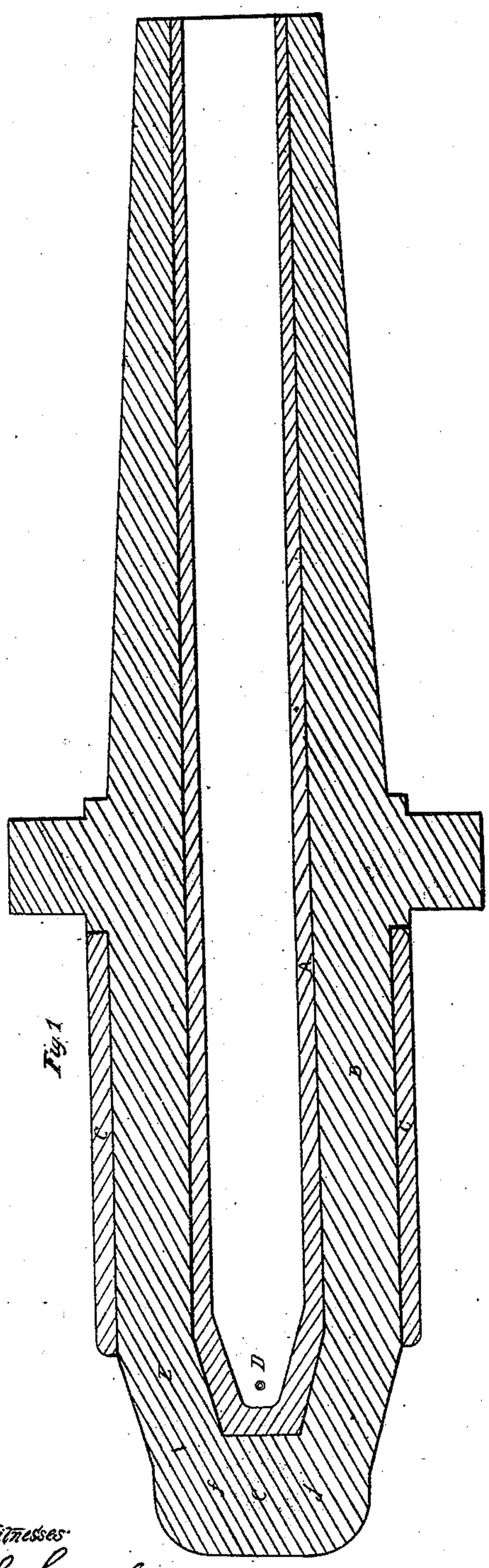

Fig. 1

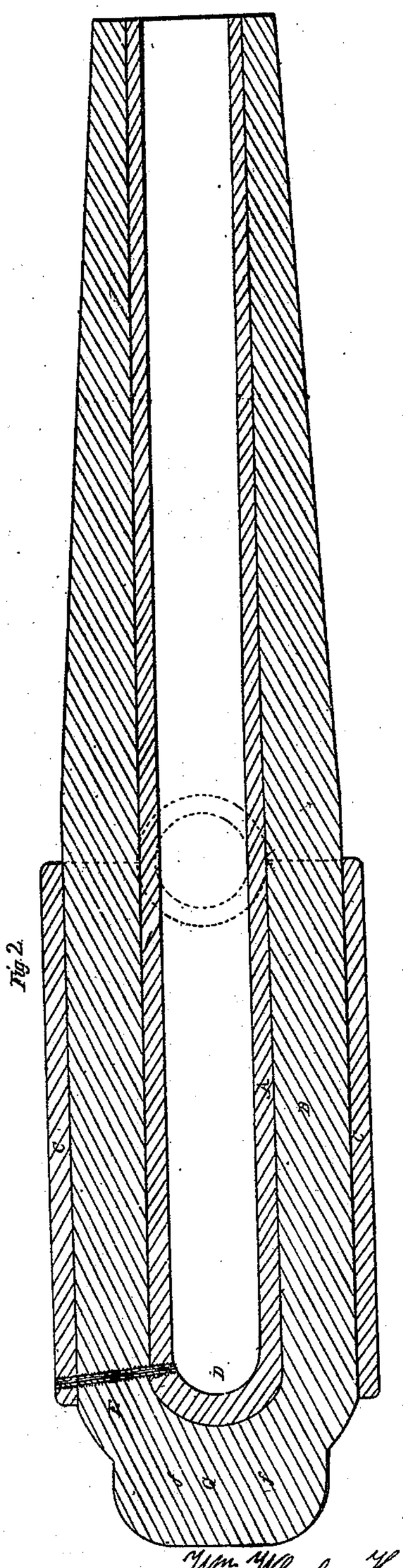

Fig. 2

Witnesses:

S. L. Lyon
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Inventor:

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UNITED STATES PATENT OFFICE.

WILLIAM WHEELER HUBBELL, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN THE CONSTRUCTION OF ORDNANCE.

Specification forming part of Letters Patent No. **44,194**, dated September 13, 1864.

To all whom it may concern:

Be it known that I, WILLIAM WHEELER HUBBELL, of the city of Philadelphia and State of Pennsylvania, attorney at law and scientific engineer, have invented a new and useful Improvement in Ordnance; and I hereby declare the following to be a full, clear, and exact description thereof, reference being had to the annexed drawings, making part hereof, in which—

Figure 1 is a section of the improved gun, and Fig. 2 is a section of the gun with another form of chamber and breech.

The nature of the invention consists in constructing large cannon of such material, form, and proportions as to combine all the advantages of wrought-iron or steel, without its disadvantages, with all the advantages of bronze without its disadvantages. Wrought-iron or steel is superior to form the facing of the breech and bore, because they withstand the effects of the fire better than other metal; but they can only be constructed, with certainty and extreme strength, of a thickness of about four inches, and when thicker, or of large body for an entire large gun, the iron or steel is not only but poorly welded, but granulates rapidly by the vibrations of discharge, and is very liable to burst. On the other hand, bronze or gun metal consisting of about nine parts of copper and one part of tin, or the base of which is copper, makes a strong gun; but it absorbs heat too rapidly for a large gun, and the intense action of fire on a bronze bore soon disintegrates or destroys it by separating the tin and changing its size and form. It, however, has the advantage over iron or steel in malleability, non-liability to granulate or weaken by firing. Its vibrations are not as intense.

My invention retains all the advantage of the iron or steel and all the advantage of the bronze, by which I am enabled to make cannon of twelve and fifteen inches in the caliber, and capable of enduring from sixty to one hundred pounds of powder for a charge, and of driving a shot with unparalled velocity and consequent destructive effect to crush iron-clad vessels or forts. I make a solid breech, D, and barrel A in one piece of wrought-iron, about three or four inches thick of metal at the breech, and tapering slightly outside smaller toward the muzzle. This breech and barrel are welded in any of the well-known methods of forming and welding gun-barrels. It should be made of bars and coils welded by pressure, and when turned uniform around it is suspended vertically in a mold, in a heated state, and the bronze breech E and barrel B are cast around the breech and barrel in a solid body, so that there are no joints for the vibrations or strains to settle upon, but the entire strength of both metals is obtained. Around the bronze, when turned off, I shrink a single sleeve of wrought-iron or steel, C, which clasps the bronze between its inner surface and the outer surface of the breech and barrel, behind the trunnions, in one grip, without any joint for vibrations and strains to settle upon. The bronze, being a malleable metal, takes up the vibrations and protects the outer band from their effects, while the outer band prevents the expansion of the bronze, and the inner iron or steel protects the bronze from excessive fire and disintegration. Thus these metals aid each other, and the extreme strength of iron or steel and bronze are obtained and applied in this gun without any of their disadvantages. The cascabel G should or may be made large and cylindrical and curved off from the centers *f f*, to afford strength and base of resistance to the action of the charges on the base of the breech-chamber.

There are certain proportions or limits of these metals within which these maximum principles and results are most advantageously obtained—namely, for a field-gun three inches in the diameter of the bore, or four inches in the diameter of the bore, the wrought-iron or steel of the bore should be one inch thick at the muzzle and one and a-half inch thick at the breech as far forward as the trunnions, and taper gradually from the trunnions to the muzzle. For a fortification or a naval gun of six inches, or of eight inches in diameter in the bore, the thickness of the wrought-iron or steel of the bore at the muzzle should be two inches, and the thickness at the breech as far forward as the trunnions should be three inches and taper gradually toward the muzzle. For a ten-inch or a twelve-inch gun the thickness of the wrought-iron or steel of the bore at the muzzle should be two and a half inches, and the thickness at the breech be three and a half inches. For a fifteen-inch gun the thickness of the iron or steel of the bore at the muzzle

should be two and a half inches, and the thickness at the breech be three and a half inches. For a twenty-inch gun the iron of the bore may be increased to six inches thick at the breech, and remain two and a-half inches thick at the muzzle. The taper may extend from the breech to the muzzle gradually. The thickness of the bronze at the muzzle for field-guns should be equal to the thickness of the iron of the bore at the muzzle, and for large guns for iron-clads, to protect it from being too easily shattered by shot, the thickness of the bronze at the muzzle may be about twice as thick as the thickness of the iron or steel of the bore at the muzzle. To give requisite strength at the breech to withstand very heavy charges, the thickness of the bronze over and above or in addition to the thickness of the iron or steel of the bore should be sufficient to make up a thickness equal to the measurement or diameter of the bore exclusive of the outer band of iron or steel, and the outer band should be equal in thickness to the thickness of the inner iron of the bore. Thus a fifteen-inch gun would have three and a half inches of thickness of iron bore, eleven and a half inches of bronze, and three and a half inches of an iron band, making eighteen and a half inches of metal thickness at the breech, to stand about eighty pounds of powder for a charge with a shot of about four hundred and fifty pounds weight. In making a rifled gun—say of twelve inches in the bore—to use about eighty pounds of powder with about a five-hundred-pound elongated shot, the same, or eighteen inches, thickness of the metals, should be retained, because it must always be observed that the strain on the gun is mainly due to two causes—namely, the quantity of powder used and the weight or resistance of the projectile—and it is increased by increasing the elevation of the gun and increasing the quickness of the powder.

As a general rule, taking the sizes of guns mentioned for spherical shot, the rifle-gun, to throw the same weight of shot of elongated form, with the same high charges and much greater range, should, although less in diameter of the bore, have the same thickness of metals at the breech as would be used for a smooth-bored gun using a spherical shot of the same weight. A general rule as to the length of the gun should be a length of bore equal to fifteen times its diameter, taking the smooth-bore as the standard, and not reducing the length of the rifle-gun, although its bore is reduced in diameter, to throw a projectile elongated and of the same weight as the spherical shot for the smooth-bored gun of similar length. The proper extreme limits of the thickness of the inner iron or steel of the bore are not less than one inch and not over six inches, the thickness being greatest, as stated, with larger sizes of guns. For light field-guns the entire thickness at the breech should be equal to the diameter of the bore. The outer band need not extend forward entirely to the trunnions, except where very heavy charges are intended to be used, and in case of this iron band extending as far forward as the middle of the trunnions, as shown in the drawings, the trunnions themselves may be of iron welded onto or forged with the band.

I am aware that suggestions have been made to construct guns of cast-iron or bronze and iron or steel, and a flux, without definite form, discrimination, and proportions, kind or construction of gun, (which I do not claim,) leaving the matter in an experimental and undetermined condition, not reduced to this positive form, proportion, use of metals, or discriminated construction and invention of mine, which special metals, form, proportions, and construction are necessary to develop the maximum advantages, and my invention.

The trunnions may be cast of bronze with the gun, or separately attached to it on Dahlgren's plan.

What I claim, therefore, as my invention is—

1. Casting the bronze with solid breech and barrel in a solid body around the solid breech of wrought-iron or steel, and the barrel united in one piece, in the form and proportions set forth, to combine the extreme strength and other advantages of both these metals, as described.

2. Shrinking or securing the one wrought-iron or steel band upon the bronze breech surrounding the solid wrought-iron or steel breech and barrel, so as to clasp the bronze between the wrought-iron or steel of the band and the wrought-iron or steel of the breech and bore most solidly, in combination from the breech to the trunnions, substantially in the manner and for the purpose described.

WM. WHEELER HUBBELL.

Witnesses:

S. LAMB,

J. F. BOUGHTER.