

W. PALLISER.
 Ordnance.

3 Sheets—Sheet 1.

No. 91,864.

Patented June 29, 1869.

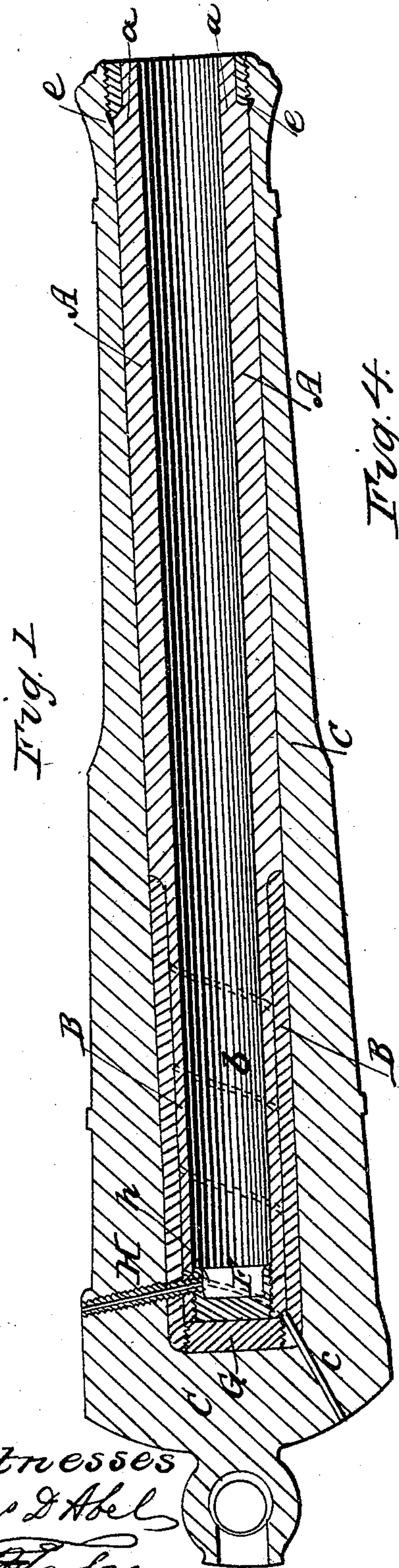
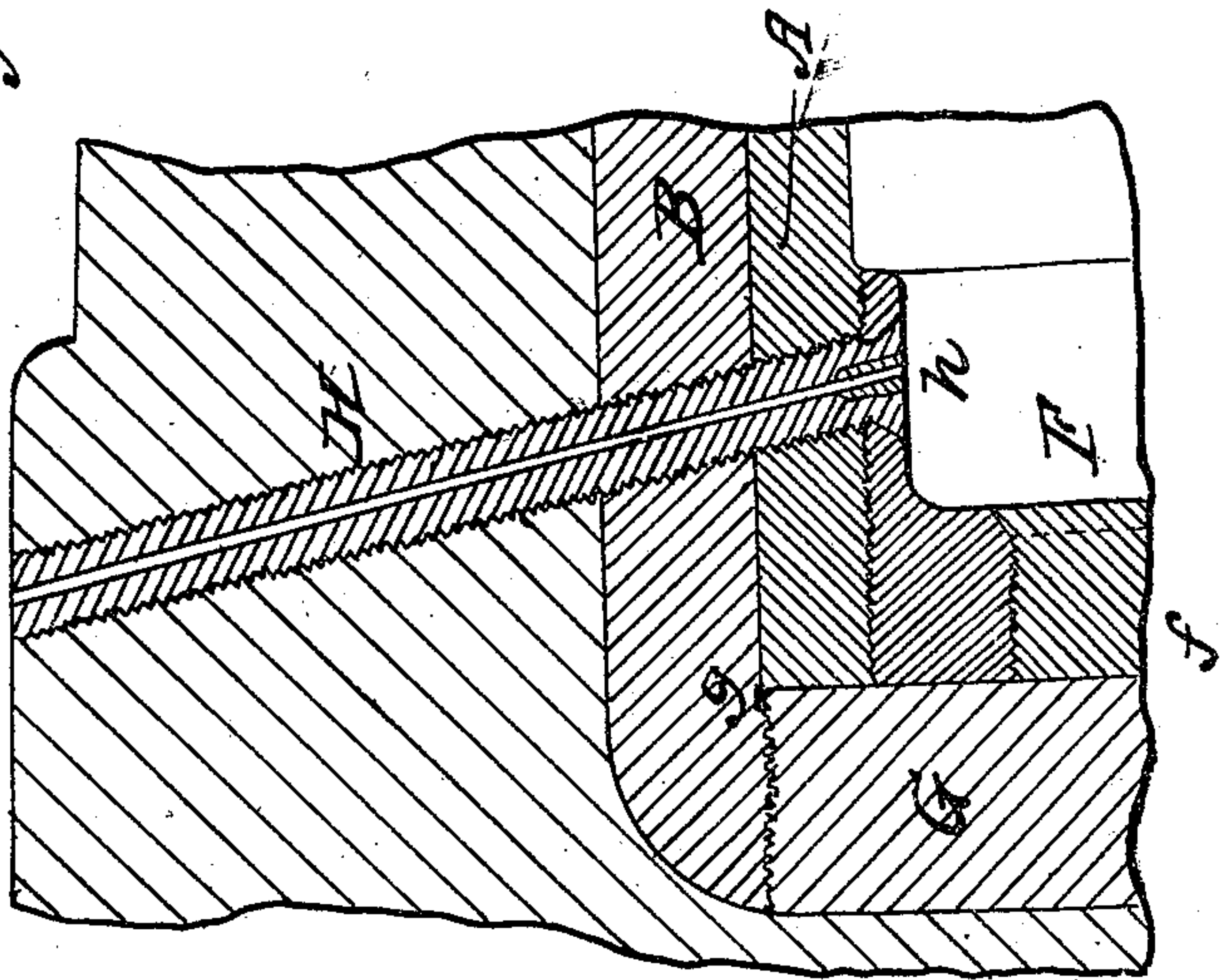


Fig. 4.



witnesses
Chas D Abel
Th Taylor

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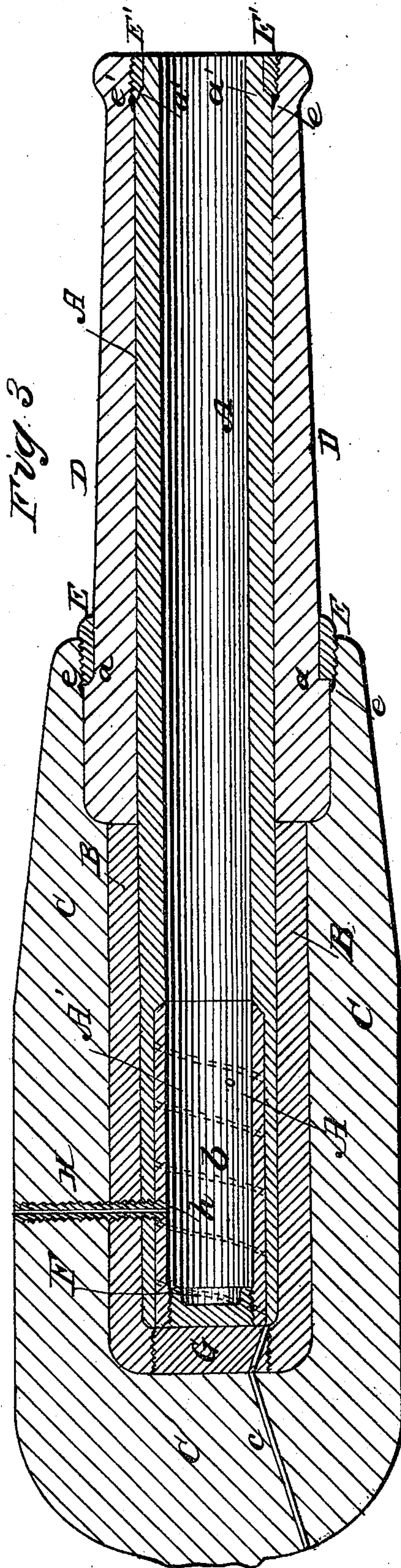
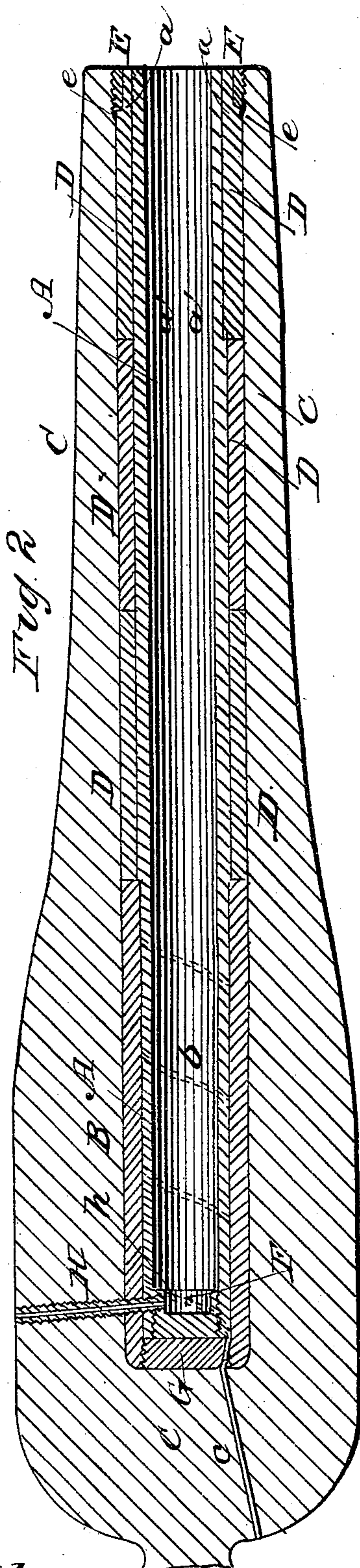
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3 Sheets—Sheet 2.

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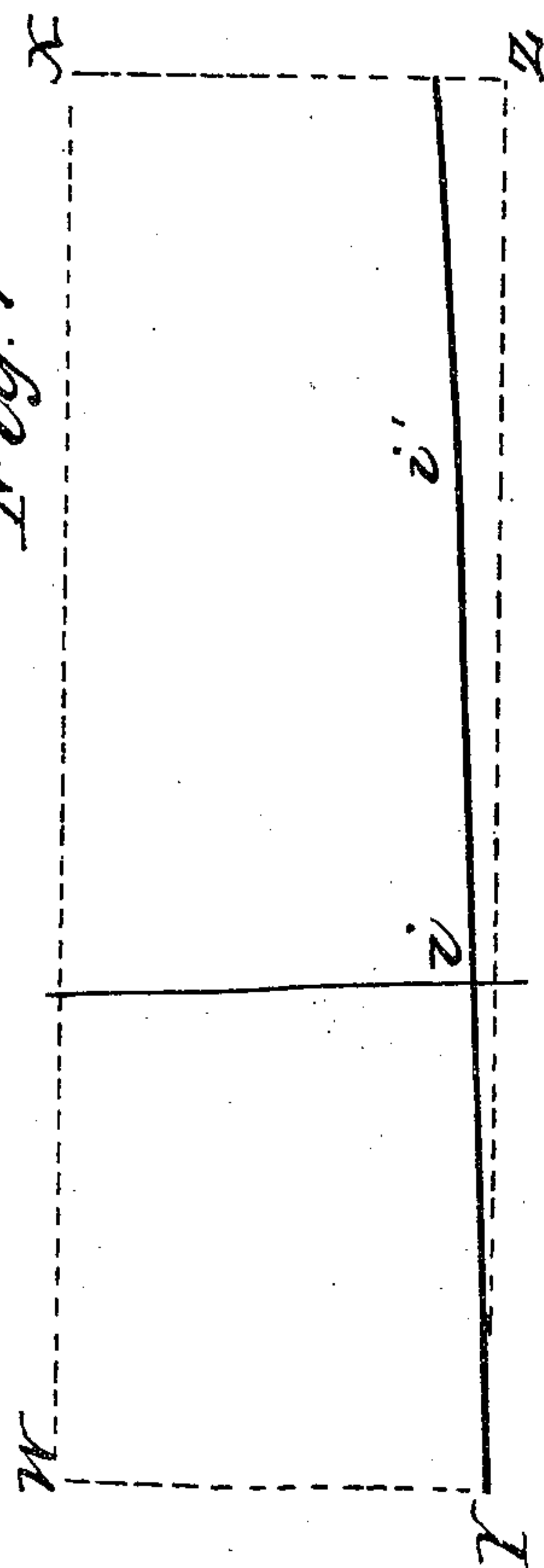
N. PETERS, Photo-Lithographer, Washington, D. C.

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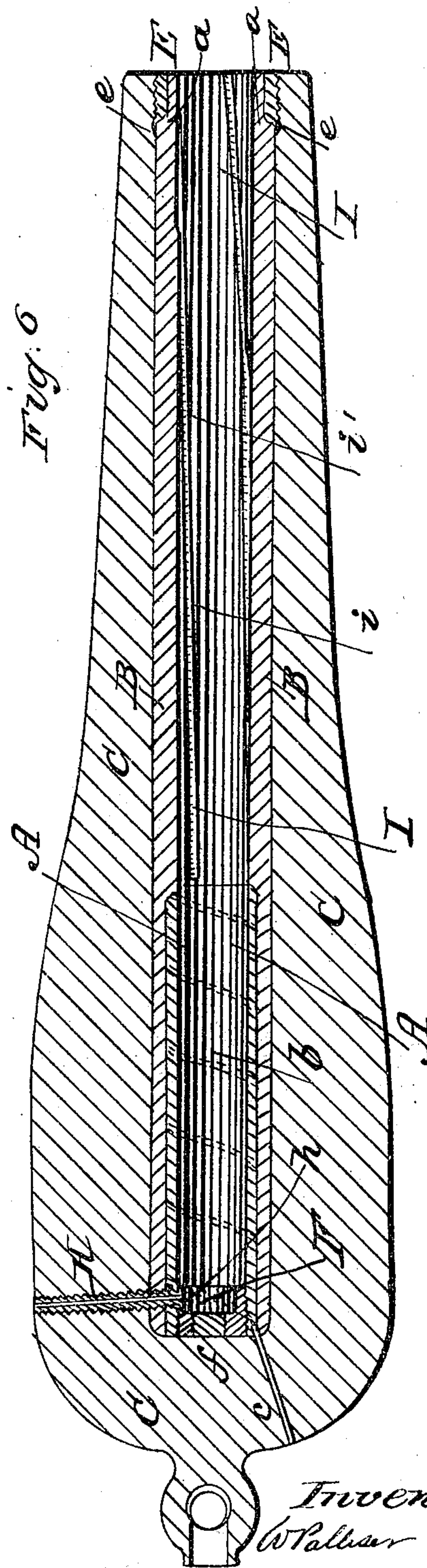
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WILLIAM PALLISER, OF PALL MALL, ENGLAND.

Letters Patent No. 91,864, dated June 29, 1869; patented in England, December 10, 1867.

IMPROVEMENT IN ORDNANCE.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, WILLIAM PALLISER, major unattached, of the Army and Navy Club, Pall Mall, in the county of Middlesex, England, have invented "An Improved System of Strengthening or Converting Cast-Iron Guns;" and I do hereby declare that the following is a full and exact description of the said invention, reference being had to the accompanying drawings, and to the figures and letters marked thereon; that is to say—

My invention relates to an improved system of strengthening or "converting" existing cast-iron guns by the introduction of wrought-iron or steel tubes through the muzzle thereof.

One part of my invention consists in forming the breech-portion of the lining or barrel with two tubes, of which the inner or A tube is comparatively thin, and is constructed either of steel, of such a quality as will stretch, or of coiled wrought-iron, which tube I fit into a seat formed in the outer, or B tube, which extends the entire length of the barrel, and which may also be either of steel or of coiled wrought-iron; or, in another arrangement, I make the A tube of the entire length of the barrel, and I reduce the thickness of the breech-end thereof externally, and I fit the B tube over such reduced end of the A tube.

In large guns, where it is not practicable to make the muzzle-end of the A tube of such a thickness as to be equal in diameter to the combined thickness of the A and B tube at the breech, I increase it up to the required size by fitting upon it pipes or tubes, of cast or wrought-iron, which, in the case of short guns or howitzers, may project, together with the inner barrel, a sufficient distance beyond the muzzle of the gun to make the converted gun of the required length.

The object of making the A tube thin at the breech-end is, that should the barrel split by the action of long-continued firing, which it is liable to do, such split would not extend beyond the A tube, and would, in consequence, only be shallow, and thus the mechanical advantage gained by the internal pressure of the gas, by means of such shallow split, would not be sufficient to burst the thick B tube supported by the cast-iron casing.

It is essential, when the barrel is composed of two tubes throughout, as last described, that a screw-collar, screwed into the muzzle of the gun, should secure the inner tube, as well as the outer one.

Another part of my invention consists in cutting a helical channel of a quick pitch, either round the external surface of the A tube or in the internal surface of the B tube, which channel communicates with an indicator-hole that passes out through the breech-end of the gun.

The object of this arrangement is, that should the A tube split, the gas escaping through such split will

at once find its way through the helical channel to the indicator-hole, and thus give warning to the detachment serving the gun.

Another part of my invention consists in combining, with a bush extending along the entire length of the vent, and held in place by a screw-thread, a platinum lining on the inside of its inner, or lower end.

Another part of my invention has reference to the rifling of such converted guns.

I cause the rifle grooves to terminate at a distance from the breech-end of the bore, equal to about one and a half time the length of the cartridge containing the heaviest battering-charge of powder which the gun is intended to fire, in order to enable the pressure of the gases to be considerably diminished before reaching that part of the barrel which is weakened by the rifle grooves.

These grooves commence with a very slow, uniform (*i. e.*, unaccelerated) twist, such twist being so slow that the pressure of a single stud on the projectile in each groove will not cause any injury to the driving-edge of the grooves.

At a certain distance, which, in most guns, will amount to about two feet from the breech-end of the grooves, the twist becomes accelerated by preference in such a manner that if the bore of the gun were laid out flat, the accelerated portion would form an arc of a circle, to which the unaccelerated portion would be a tangent.

I term this system of rifling "partially accelerated," inasmuch as it is a combination of the uniform and accelerated systems.

It is essential, where the rifling is stopped short, as described, and the projectiles are provided with studs toward their front ends, that the rifling should at first be unaccelerated, since, with heavy charges of powder and long projectiles, as, for instance, double shells, the front studs would otherwise damage the rifling, owing to their coming into contact, at first starting, with the driving-edges of the grooves at a place where the twist has already become accelerated, in which, since the motion of translation of the projectile is at first highly accelerated, the result would be injurious to the groove.

On the accompanying drawings are shown various arrangements for carrying my before-described improved system of converting cast-iron guns into effect.

Figure 1, on Sheet I, shows a longitudinal section of a converted cast-iron gun, O, into which, after it has been bored out to the required extent, is inserted the lining or barrel, composed of the tube A, of steel or coiled wrought-iron, extending the whole length of the bore, the breech-end of which is reduced in thickness, so as to form a comparatively thin tube at that part, as shown, and upon the exterior of which reduced part is fitted the tube B.

Figure 2, Sheet I, shows a modification of this ar-

arrangement for large guns, where the muzzle-end of the A tube, not being made equal in thickness to the combined A and B tube at the breech-end, the muzzle-end of the barrel is built up to the required diameter by means of one or more pipes, D D, of either wrought-iron or of cast-iron, fitted on to the exterior of the A tube, and such cast-iron pipes or tubes may be made to project with the A tube beyond the muzzle of the gun, as shown at fig. 3, which arrangement I should adopt for converting cast-iron howitzers, which are very short, but thick. In this case, the cast-iron D tube described with reference to fig. 2, projects with the barrel a considerable distance beyond the muzzle of the casing C, and thus gives the required length for the bore.

In all of these arrangements, after the barrel is inserted, it is secured in its place by means of the screw-collar E, which screws into a female screw cut in the muzzle of the cast-iron gun C, and in the arrangement at fig. 1, abuts against a shoulder, *a*, formed on the A tube, while in the arrangements, figs. 2 and 3, it abuts against a shoulder, *a*, formed on the tube D', which, in fig. 2, holds the A tube, by abutting, with its inner end, against a shoulder, *a*, formed on the latter, while, in fig. 3, the A tube is held by a second screw-collar, E, screwed into C, and abutting against a shoulder, *a*, on the D tube.

Between the outer surface of the A tube and the inner surface of the B tube, in figs. 1 and 2, is formed the helical channel *b*, which is either cut in the outer surface of the A tube, as shown, or it may be cut in the inner surface of the B tube.

This channel communicates at the breech-end with the indicator-hole *c*, passing through the breech of the gun, so that if the A tube should split at any point, the escaping gas will find its way through the channel *b* to the indicator-hole *c*, and thus give warning to the men serving the gun.

In fig. 3, a short inner tube, A', or "chamber-liner," being fitted into the recessed rear end of A, the channel *b* is cut in the outer surface of the former.

The rear end of the A tube, figs. 1 and 2, and of the tube A', fig. 3, is closed by means of a cup, F, of steel or wrought-iron.

The female screw of the A tube, into which the cup is screwed, is formed in relief upon the tube, for the purpose of preventing the fracture of the tube at the screw-thread by longitudinal strains.

The inner bottom surface of the cup F is flat, the sharp edges of the side being rounded off.

The walls of the cup are, by preference, cylindrical, since, if the cup were conical, with a rounded bottom, which form is commonly known as the "gomer"-chamber, the action of the gas would quickly eat a hole into it.

The end of the B tube has also a relieved female screw, into which is screwed the breech-plug G, so as to press against the end surfaces of the A or A' tubes and cup F.

The bush forming the vent H of the gun, is screwed along its entire length, as shown, and has, at its inner end, a tubular lining, *h*, of platinum, or alloy of platinum, screwed into it with a countersunk head, the inner end of the bush being also, by preference, countersunk by being riveted up in a conical seat after insertion, as shown more clearly in the enlarged section at Figure 4, Sheet II, which also more clearly shows the cup F, and the rounded form of screw-thread which I prefer to employ.

Figure 5, Sheet II, shows an arrangement in which the B tube is made of the entire length of the barrel, instead of the A tube, as in the previous arrangement. It is recessed internally at the breech-end, and into the recessed portion is fitted the thin A tube, the bevelled front end of which is forced against the bevelled shoulder of the B tube, by means of the breech-plug

G screwed into the latter. As the screw-thread cannot in this case be made in relief upon the B tube, a circular groove, *g*, is cut at the bottom of the screw-thread, in order to prevent the rupturing of the gun from longitudinal strains, which might otherwise take place at the last thread of the screw.

A similar groove, *e*, is also formed for the same purpose at the bottom of the female-screw thread cut in the muzzle of the cast-iron gun C in all cases, into which the screw-collar E is screwed for securing the barrel.

H is the vent, with platinum lining, *h*.

F, the cup, closing the A tube.

In this case, the whole vent of the gun is closed by a solid screw-plug, as shown, and the new vent H is made further forward, so as not to pass through the cup F.

This latter is also made of considerably less depth than in the other arrangements; and instead of being forged solid, as in the former cases, it is formed as a ring, with a central screwed plug, *f*, having a countersunk head.

Figure 6, Sheet II, shows the same arrangement of A and B tubes as fig. 5, in which, however, the breech-end of the B tube does not project beyond the A tube, the plug G being dispensed with, and the A tube and cup F brought against the end of the bore of the cast-iron gun.

In all the before-described arrangements, I prefer to introduce the barrel into the gun in the following manner:

I bore a cylindrical hole in the gun or casing, of a slightly larger diameter than that of the barrel, so that the latter may enter it with a loose fit.

The barrel being placed in the gun before the former is bored to the finished size, I then set it up inside the casing, so as to fit tightly into it by firing heavy proof-rounds from the gun, after which I fine-bore the barrel to the required size, thus removing the bulge formed in the powder-chamber by the firing; or, I bore out the cast-iron casing slightly conically for a certain distance at the breech-end, say two or two and a half feet, and the remainder I bore out cylindrically.

The barrel is then turned with a corresponding conical part at the breech-end, so as to fit the conical part of the casing, and with a cylindrical part at the muzzle-end rather too large for the cylindrical part of the casing, after which the cast-iron casing is heated so as to be slightly expanded, and the barrel is then dropped into its place.

My improved system of rifling is shown at fig. 6, and in the diagram at Figure 7.

The rifle grooves I start from a point just beyond the termination of the A tube. They commence with a uniform twist, by preference equal to about one turn in a length of one hundred calibres, proceeding thus to the point *i*, a distance of about four calibres, from which point the twist is accelerated in the form of an arc of a circle, *i i'*, fig. 7, so as, at the muzzle of the gun, to have attained a pitch equal to one turn in forty calibres.

This is seen more clearly in fig. 7, where the lines W X Y Z represent the bore of the gun with one of the rifle grooves I developed on a plane surface.

Having thus described the nature of my invention, and in what manner the same is to be performed, I wish it to be understood that what I claim, is—

1. Constructing the barrels introduced at the muzzles of converted cast-iron guns, of two tubes at the breech-end, of which the inner, or A tube is made comparatively thin, substantially as and for the purposes hereinbefore set forth.

2. Combining, with the inner tube of a double-tubular lining of a converted cast-iron gun, a chamber-lining, A', substantially as described.

3. Constructing the barrels of converted cast-iron

guns with an outer, or B tube, at the breech-end of larger external diameter than the muzzle-end of the inner, or A tube, and placing upon such muzzle-end of the A tube, cylinders of equal diameters with the B tube, substantially as and for the purposes hereinbefore set forth with reference to figs. 2 and 3 on the accompanying drawings.

4. Forming a helical chamber between the inner and outer tubes, at the breech-end of the barrel of converted guns, in communication with an indicator passing through the breech of the gun, substantially as and for the purposes described.

5. In combination with a bush extending along the entire length of the vent, and held in place by a screw-thread, a platinum lining on the inside of its inner, or lower end, substantially as described.

6. The improved system of rifling guns hereinbefore set forth, in which the groove commences at a distance from the breech-end of the bore, proceeds with a very slow, uniform, or unaccelerated twist, to within about two feet, more or less, of the muzzle of the gun, from which point it becomes accelerated, substantially as above described.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses, this 19th day of June, 1868.

W. PALLISER.

Witnesses:

CHAS. D. ABEL,
THOS. TAYLOR.