

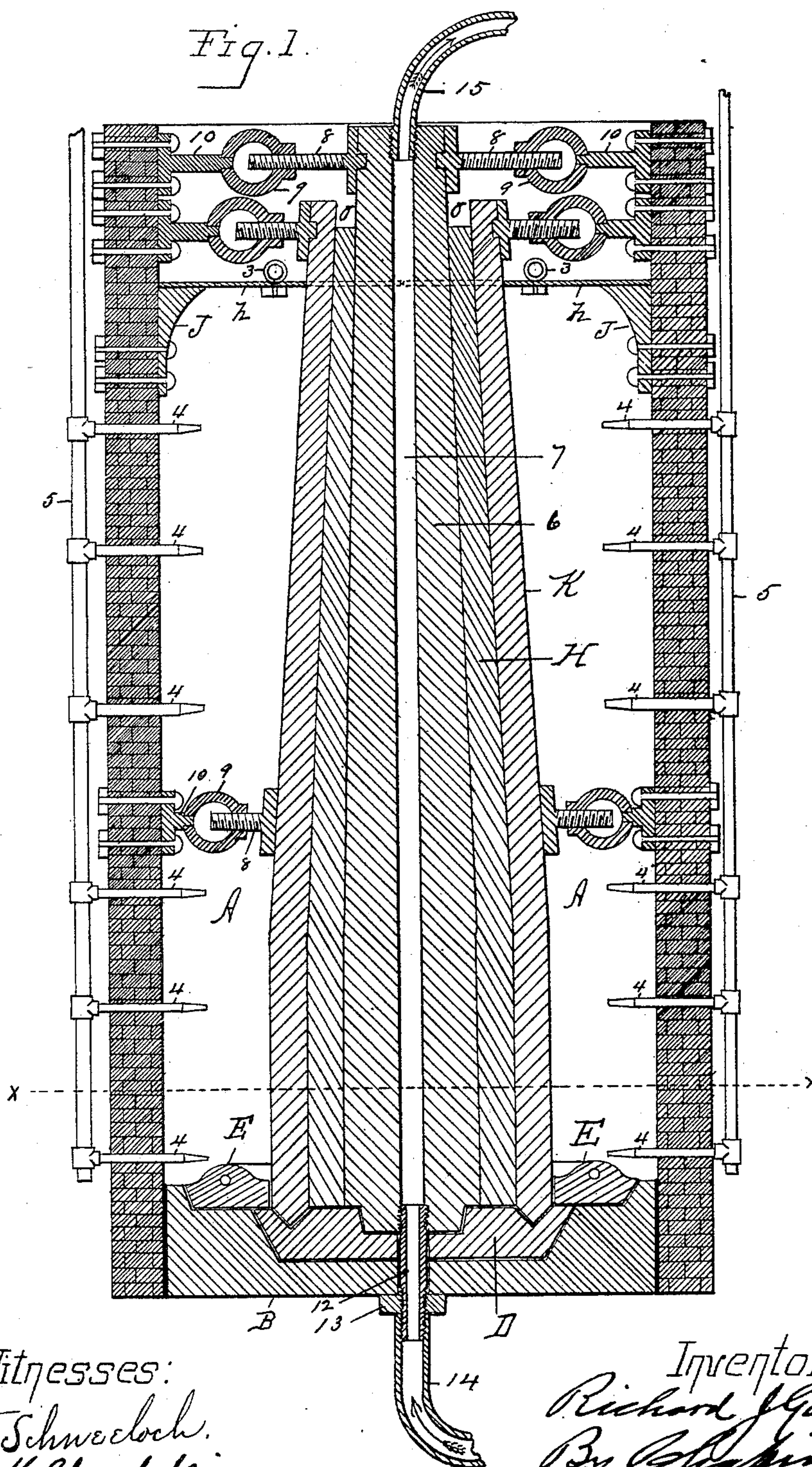
(No Model.)

3 Sheets—Sheet 1.

R. J. GATLING.
ART OF MAKING ORDNANCE.

No. 453,833.

Patented June 9, 1891.



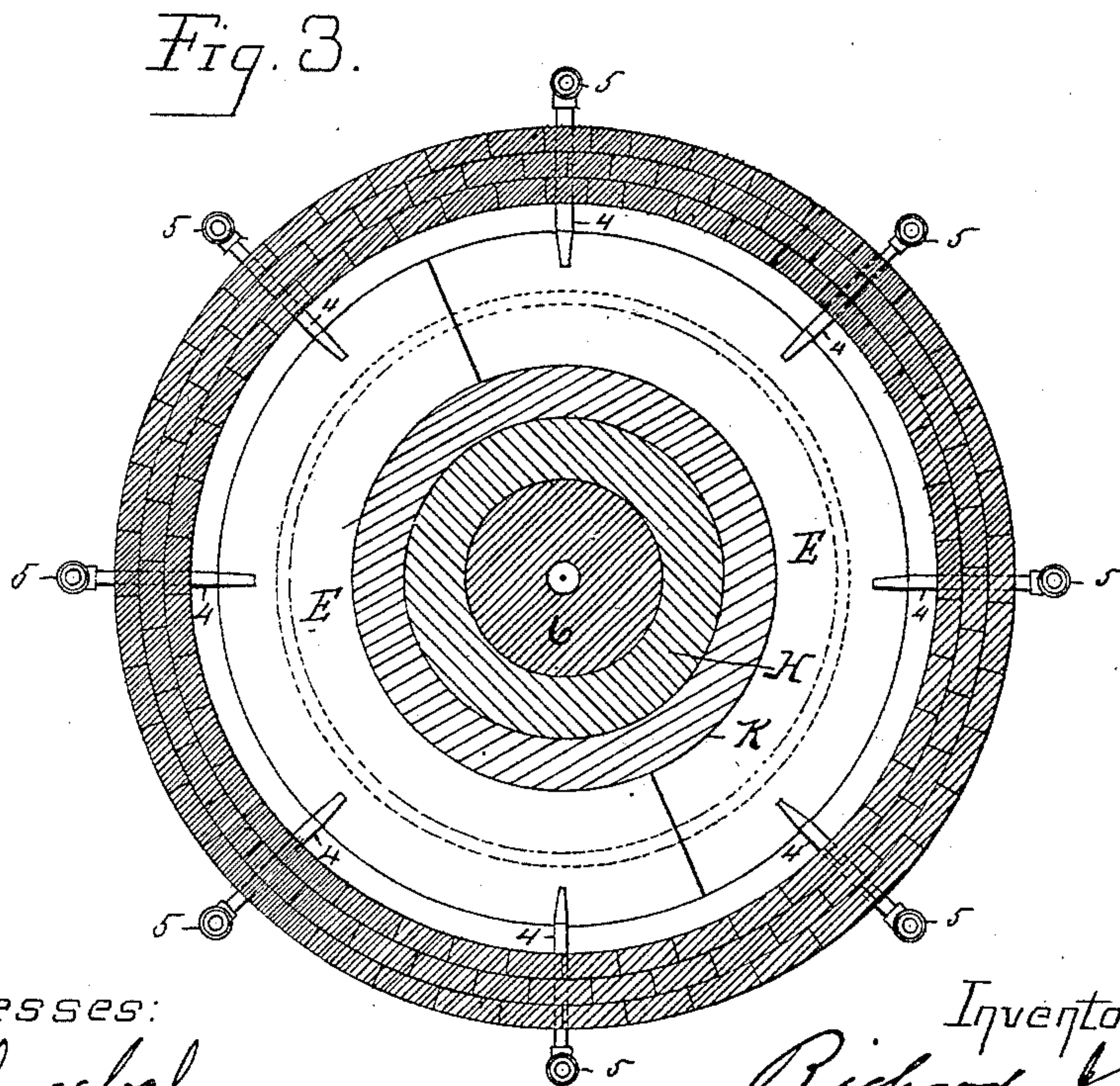
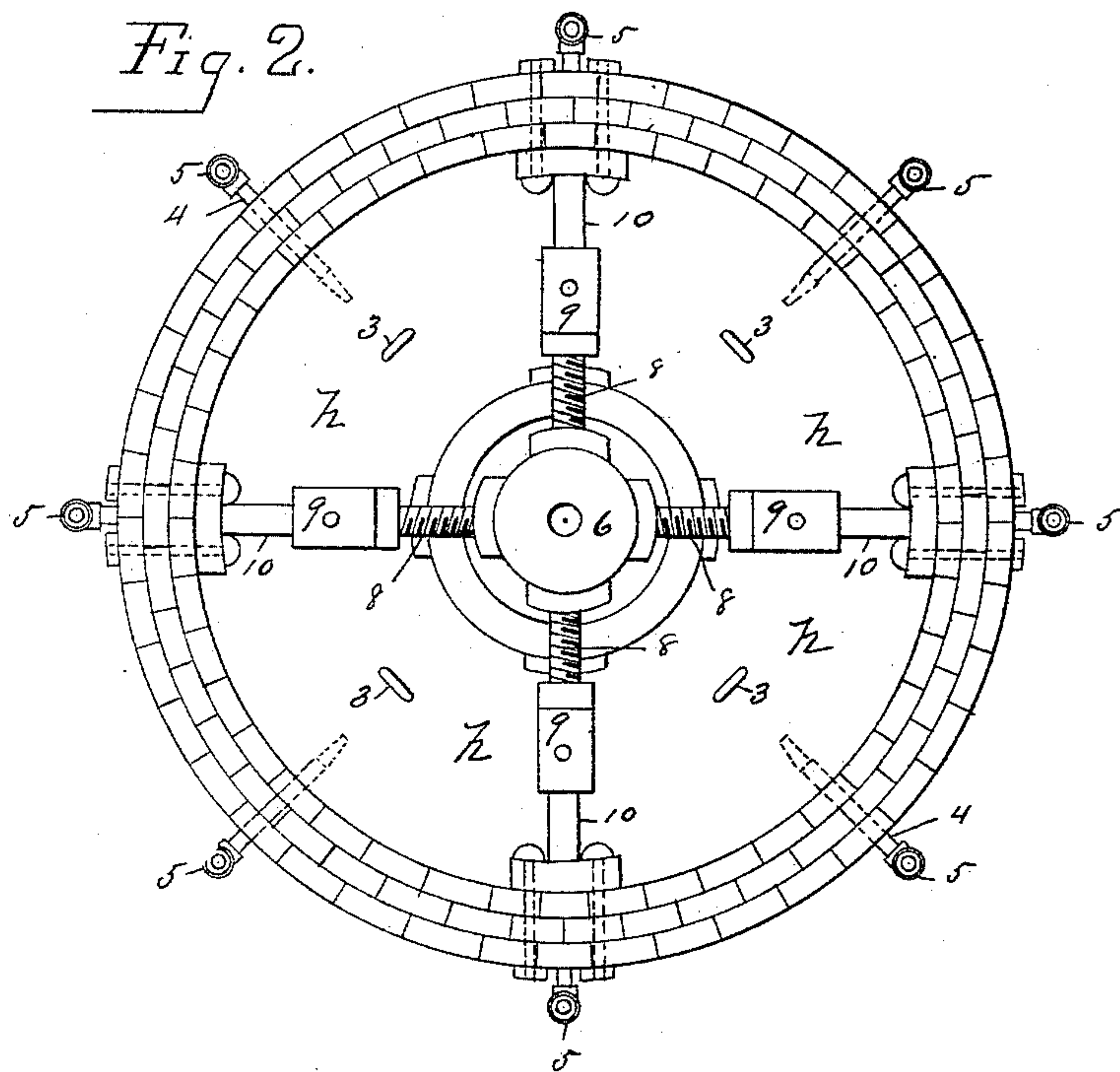
(No Model.)

3 Sheets—Sheet 2.

R. J. GATLING.
ART OF MAKING ORDNANCE.

No. 453,833.

Patented June 9, 1891.



Witnesses:
F. Schweeloch.
G. W. Chamberlain

Inventor,
Richard J. Gatling
By *Chapman*
Att'y

(No Model.)

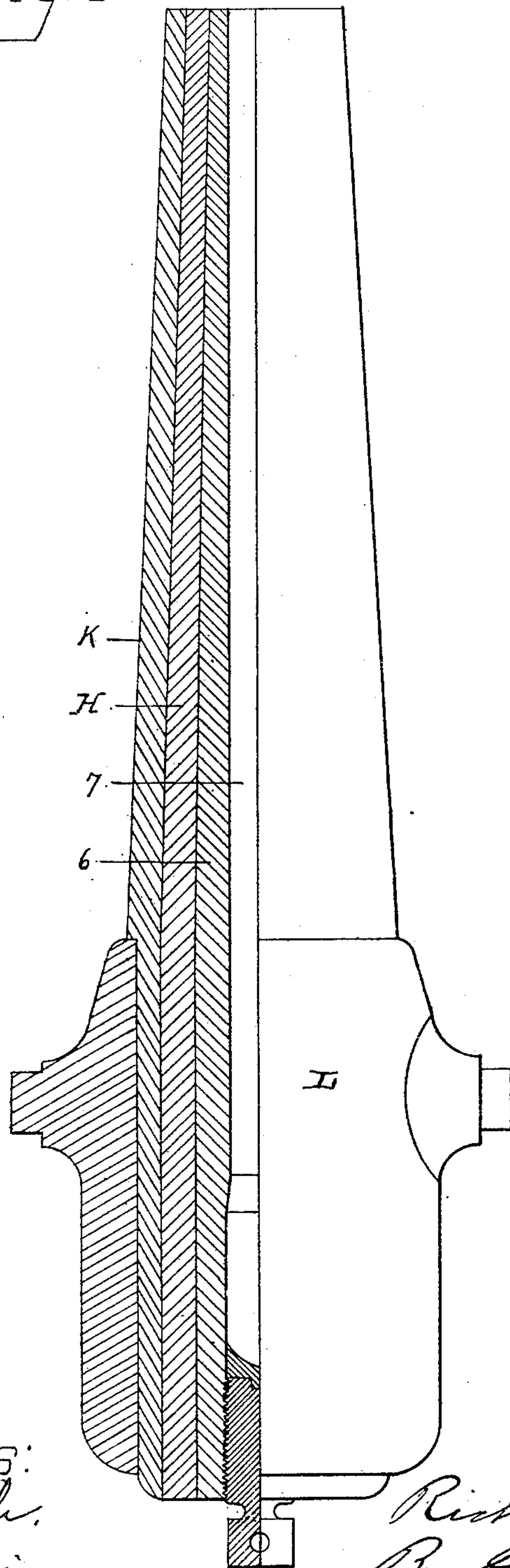
3 Sheets—Sheet 3.

R. J. GATLING.
ART OF MAKING ORDNANCE.

No. 453,833.

Patented June 9, 1891.

Fig. 4.



Witnesses:
F. S. Schroeder.
G. H. Chamberlain.

Inventor,
Richard J. Gatling
By *Chapman* Atty.

UNITED STATES PATENT OFFICE.

RICHARD J. GATLING, OF HARTFORD, CONNECTICUT.

ART OF MAKING ORDNANCE.

SPECIFICATION forming part of Letters Patent No. 453,833, dated June 9, 1891.

Application filed August 19, 1890. Serial No. 362,455. (No model.)

To all whom it may concern:

Be it known that I, RICHARD J. GATLING, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented new and useful Improvements in the Art of Making Ordnance, of which the following is a specification.

This invention relates to an improved method of producing heavy ordnance, the object being to provide improved means for producing large guns, whereby their power to resist the effects of long-continued firing is greatly increased and the cost of producing the same is materially reduced. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 illustrates in vertical section a pit which is adapted to be used in the partial casting of a gun and for carrying out my improved method of constructing the same, this figure illustrating in longitudinal section in said pit the parts of a gun in the positions which they occupy relatively after said parts shall have been united by casting the final portion thereof. Fig. 2 is a plan view of said pit. Fig. 3 is a transverse section of the pit about on line $x x$, Fig. 1. Fig. 4 is a side elevation of the completed gun, partly in longitudinal section.

Heretofore heavy guns have been cast solid or made of forged steel, upon what is known as the "built-up principle." Large guns when cast solid are left invariably under tensions from unequal heating and cooling, which tensions often cause ruptures of such guns in firing. The weakness of "built-up" guns grows out of the fact that they are made out of many pieces, having many transverse joints, and the metal parts not being homogeneous are often left under unequal strains, which are detrimental to the life-time of such guns.

The object of my invention is to provide a method for casting guns which obviates all of the above-named inconveniences, and, as above referred to, results in the production of a gun of greatly-increased endurance as compared with those heretofore made. In other words, in constructing a high-power gun the strain should, if possible, be so distributed that when the powder-pressure acts each portion should offer the same resistance radially

and longitudinally to the strain. These results my system accomplishes.

A in the drawings indicates a circular pit of such depth as the length of the gun to be cast therein requires, having walls of masonry, and preferably a bottom B of iron, cast in proper form to receive a centering-block D, also of iron, and having a recess in its upper side to receive the principal part of a metallic steadying-ring E, which is made in two equal sections for convenience in placing in the pit. The pit A may be constructed in the earth in or near any suitable foundry, and in practice a convenient underground passage is made, whereby access may be had to the central portion of the under side of the pit for the purpose of connecting a pipe thereto, hereinafter described, and of disconnecting the same therefrom. Said casting-pit is provided with a shield or cover h of iron, made preferably in half or quarter sections, as indicated in Fig. 1, for convenience in placing it in and removing it from the pit, and said cover rests on suitable brackets J, attached to the inner wall of the pit. Said cover h is provided with eyebolts 3, to which hoisting-chains may be attached.

The pit A is adapted to be heated to a high temperature preparatory to making the final casting which completes the founding of the gun, and to effect said heating of the pit a series of gas-burners 4 is arranged around the interior of the pit-wall, which burners are suitably connected to gas-conducting pipes 5 and project through said wall, as shown.

The complete gun-casting, which is shown in section in Fig. 1, consists of a central core portion 6, which is cast or wrought of suitable metal with a central bore 7 therein, and is lowered into the pit, its lower end resting upon the centering-block D, and having such an engagement therewith that it is maintained in a central position within the walls of the pit. The upper end of the core portion 6 of the gun is supported by the braces 8 and screw-operating rings 9, whereby the upper end of said core is accurately adjusted to a central position between the walls of the pit. The said rings 9 turn freely on the horizontal projecting studs 10, which are firmly bolted to the pit-walls, as shown. Flanges are formed near

the inner extremities of said braces 8, which bear against the surface of the core 6, and said extremities enter recesses in the surface of said core, whereby the braces are prevented from becoming displaced. The said bore 7 in the core 6 is of any convenient size to admit of the passage therethrough of air or water, as below described, and is adapted to be enlarged by boring or finished to the proper caliber for the finished gun. The said complete gun-casting also consists of a cylindrical metallic shell K, cast preferably or wrought of suitable steel, which is then lowered into the pit in the position shown in Fig. 1, its lower end resting upon said centering-block D and surrounded and backed up by the steadying-ring E, and the upper end of said shell K is supported within the walls of the pit by braces, screw-operating rings, and studs similar to those supporting the upper end of the core-piece 6, and the middle portion of said shell is supported against lateral deflection by similar devices, as shown. The said complete gun-casting consists, furthermore, of an intermediate metallic body H, preferably of steel, which is poured in a molten condition into the space *o*, between the shell K and the gun-tube 6, after the latter shall have been put in position one within the other, as above described. After the said tube 6 or center-piece of the gun shall have been placed in position in the pit, as above described, a tube 12 is passed through the bottom B of the pit and through the centering-block D, and is screwed or otherwise securely connected into the lower end of the bore 7 of said center-piece, and a nut 13 is screwed onto the lower end of said tube 12 and against the under side of the pit-bottom B, said tube, with its nut 13, tending to bind the pit-bottom and the center-piece 6 more closely one to the other.

For the purpose of providing means for cooling the center-piece 6 of the gun from its bore outward gradually and steadily after the final pouring of the intermediate portion H of the gun, whereby cooling fractures in proximity to said bore are obviated, a pipe 14 is connected to the lower end of said tube 12, which is adapted to conduct cold water or air through said bore for the purpose aforesaid, and said water or air after passing through said bore escapes therefrom by a pipe 15, connected with the upper end of the center-piece 6, as shown in Fig. 1. After the aforesaid center-piece 6 and the said shell K shall have been secured in place in the pit, as described, and before the intermediate portion H of the gun shall have been poured

therebetween, as described, the cover *h* is put in place within the pit and the gas-burners 4 are lighted, thereby heating the interior of the pit very hot, and finally bringing the said outer shell K to or nearly to a red-hot condition, whereby it is sensibly expanded, and also the core-piece 6 is heated to a considerable degree, but of course to a lesser degree than the shell K. While the said shell and core-piece are in said heated condition, the molten metal which is to compose the intermediate portion H of the gun is poured into the space between said two parts, completely and solidly filling the same with molten metal. The gun so formed is then allowed to cool—the exterior portion thereof by exposure to the air and the core portion 6 by the passage of cold water or air through the bore 7 thereof, as aforesaid—and in the process of cooling the exterior shell K becomes rigidly shrunk upon the parts within it. After the gun-casting so formed shall have become cool the above-described lateral braces are removed, and the casting is taken from the pit and bored and finished in the usual way, (said tube 12 and the pipes 14 and 15 having been first removed,) and, if desired, a trunnion-band L may be secured thereto in the usual manner, as shown in Fig. 4—that is to say, said trunnion-band, with the trunnions thereon, is made, preferably, by casting the same from steel, then boring it to the proper internal diameter, or one slightly less than that of the part of the gun to which it is to be applied, then heating said band to expand it, and then placing it on the gun. The band then contracts and becomes firmly fixed on the gun.

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

The improved method of making ordnance, which consists in first forming a metallic center-piece for the gun; secondly, providing an outer metallic shell therefor and placing said shell over said center-piece, leaving a space between the latter and said shell and heating the latter to expand it, and finally pouring molten metal intermediately between said shell and center-piece and permitting said outer shell to cool and shrink upon and bind said intermediately-placed metal firmly against said center-piece.

RICHARD J. GATLING.

Witnesses:

G. M. CHAMBERLAIN,
H. A. CHAPIN.