(No Model.)

J. F. ALLEN.

PROCESS OF CASTING ORDNANCE.

No. 375,791. Patented Jan. 3, 1888.

FIG. 1.

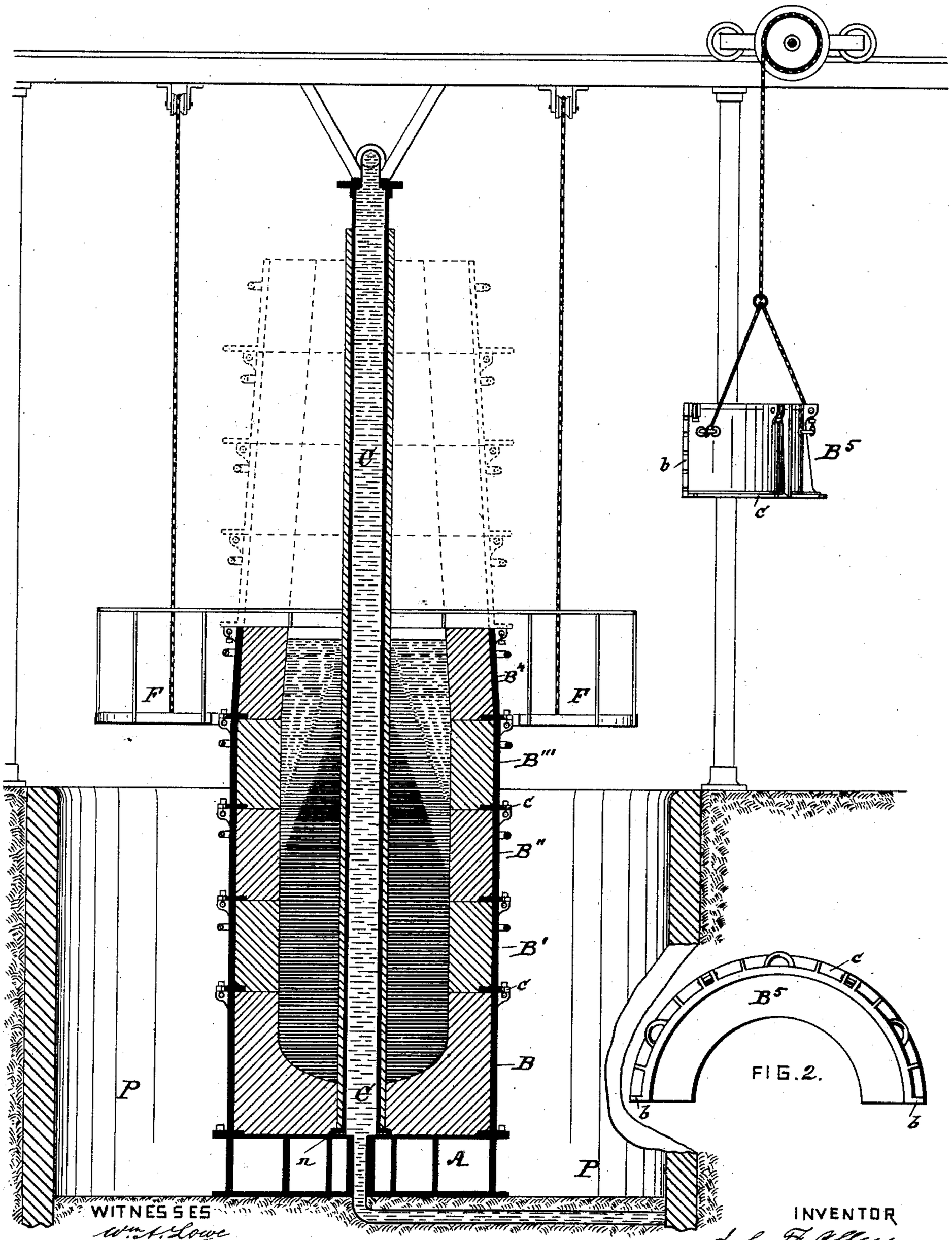

FIG. 2.

WITNESSES
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PROCESS OF CASTING ORDNANCE.

SPECIFICATION forming part of Letters Patent No. 375,791, dated January 3, 1888.

Application filed April 30, 1887. Serial No. 236,659. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. ALLEN, a citizen of the United States, residing in the city and county of New York, State of New York, have invented certain new and useful Improvements in the Method of Casting Heavy Cannons, of which the following is a specification.

Heretofore large cannons have been cast by first constructing the entire mold before it was filled with molten metal. Through the center of such mold an iron tube was supported, covered with suitable refractory material to form a core, and through this core a circulation of water was maintained for the purpose of cooling from the center, causing thereby a shrinkage of the outer circumference upon the center, so that the central portion would be under compression while the outer portion would be under tensile strain. This condition, so much desired, (if obtainable,) would greatly strengthen the gun at the moment of the explosion of a charge; but unfortunately it cannot be obtained when the gun is cast as a whole, as the outer circumference solidifies and forms an arch, from which the center portion shrinks away both diametrically and lengthwise, leaving the gun, when cold, in the weakest possible condition to sustain an explosive charge.

My improved method of casting guns consists of casting a portion of its length at a time whereby the condition so much desired can be more readily obtained, and then, while the metal is kept fluid, joining another section of the flask upon the lower flask and casting another portion of the gun, and so on until the whole length of the gun is obtained. By this new method the shrinkage of the outer circumference is upon the central portion, as the metal on the outer circumference can be kept in a fluid state until the central portion solidifies in the form of a cone out to it, and the fluid metal may be alloyed and agitated and all the gases held in occlusion may be forced out, thereby leaving the metal solid and crystallized in the best possible manner for strength.

By my improved method of casting, guns may be made of steel equal in strength and endurance to the best built-up guns of the best makers at a much reduced cost.

In the accompanying drawings, Figure 1 represents a vertical section of the mold, partly in dotted lines, for casting a gun in accordance with my improvement, showing one-half of a flask suspended ready to be attached to the lower flask. Fig. 2 is a top view of half a flask.

The lower platform, A, rests in the bottom of the pit P, and upon this is placed the lower flask, B, of the mold, as well as the central core, C, which is surrounded by a coating of loam or other refractory material, *w*. The inner surface of the fire-brick lining of this flask B, having been thoroughly heated, is then ready to receive the molten metal, which may be poured into it from any suitable ladle until it is nearly full. Should this metal forming the gun be steel containing a fraction of one per cent. of carbon, it may be fluxed in the usual manner by covering the surface with a layer of pulverized bauxite (an ore of aluminium) for the purpose of lowering the melting-point and preventing the radiation of the heat from the surface of the molten metal. The metal may now be agitated mechanically. As the metal is poured into the lowermost flask, B, that part of the metal which comes in contact with the water-tube C will solidify or crystallize quicker than the remaining metal. Thus the crystallized part of the metal will not form a horizontal upper surface, but the surface will be of conical form, being highest at the center and lowest at the circumference, where the metal is warmest.

During the operation of pouring and agitating the metal in the lowermost flask the next flask, B′, which has been previously lined with refractory material, is heated ready to be put in place, and is then put in place and filled in the same manner as the preceding one. A stream of water or air is of course constantly circulated through the core-tube C. The crystallized metal will now again solidify in the form of a cone around the central core, and as the metal is cooler in the bottom of the flask than on top it will crystallize in oblique layers parallel to its surface from the bottom up. In this way the metal in the second flask will in its crystallized form represent a cone with a concave base that will overlap the apex of the cone next below, and thus the two cones will be joined not by horizontal lines, but by being

set one over the other. Each succeeding flask B^2 B^3, &c., is joined to the one next below in the same manner, and thus the cannon, when completed, is composed of metal that has crystallized in the form of overlapping oblique or conical layers.

The advantage of this process is that the metal will be in condition to withstand vibration much better than if crystallized in the usual form.

The whole structure is surrounded by a circular staging, F, capable of being easily raised or lowered to facilitate the screwing or fastening together of the flasks B B', &c., which are made in two parts fastened together by vertical flanges *b* and fastened to the lower flask by bolts passing through its lower flange, *c*. To expedite the fastening together of the flask I prefer to arrange the bolts to remain fast on one part of the flask capable of turning on swivel-heads, as shown in the drawings.

What I claim is—

The process of casting ordnance which consists in first casting a portion of the piece; second, centrally cooling that portion; third, casting another portion onto the first portion and then centrally cooling that portion, and, fourth, if desired, in like manner casting and then successively cooling successive portions for the purpose of crystallizing the portions in oblique and conical overlapping layers, as set forth.

JOHN F. ALLEN.

Witnesses:
HENRY E. ROEDER,
F. v. BRIESEN.