(No Model.)

J. H. FLAGLER.

MANUFACTURE OF SHAFTS AND ORDNANCE.

No. 364,098. Patented May 31, 1887.

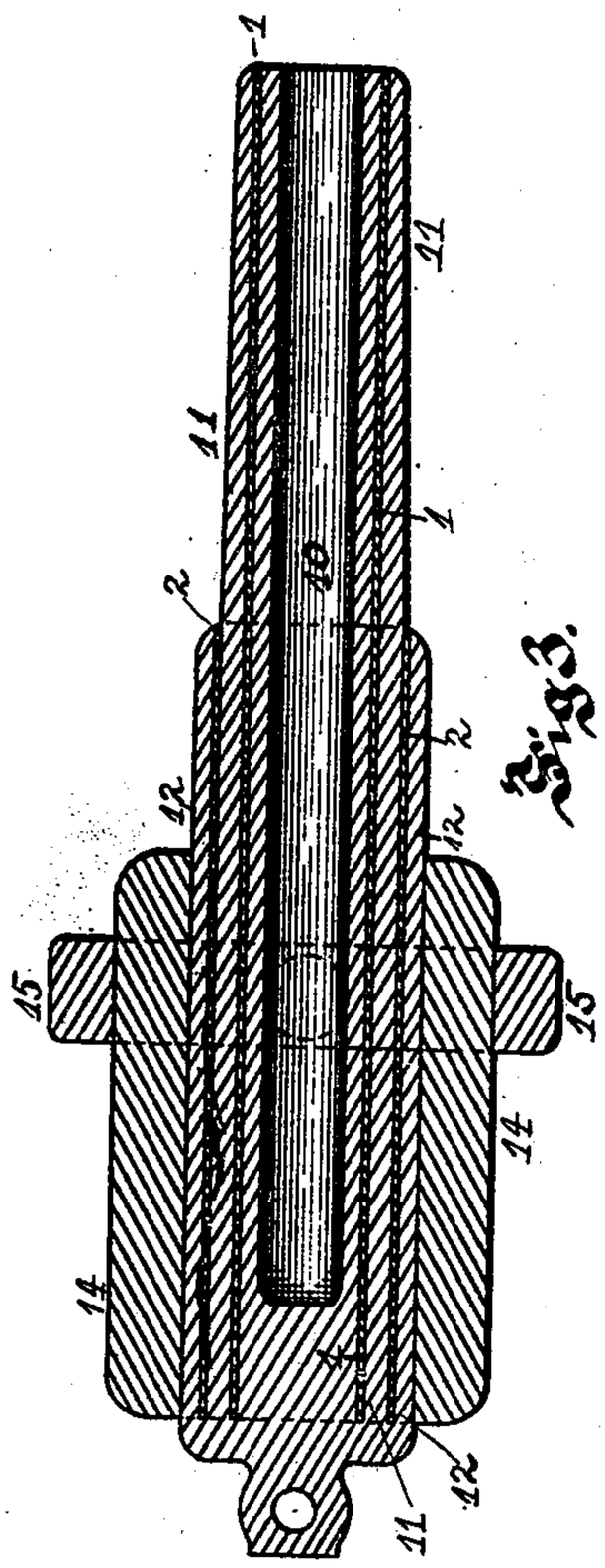

Fig. 1.

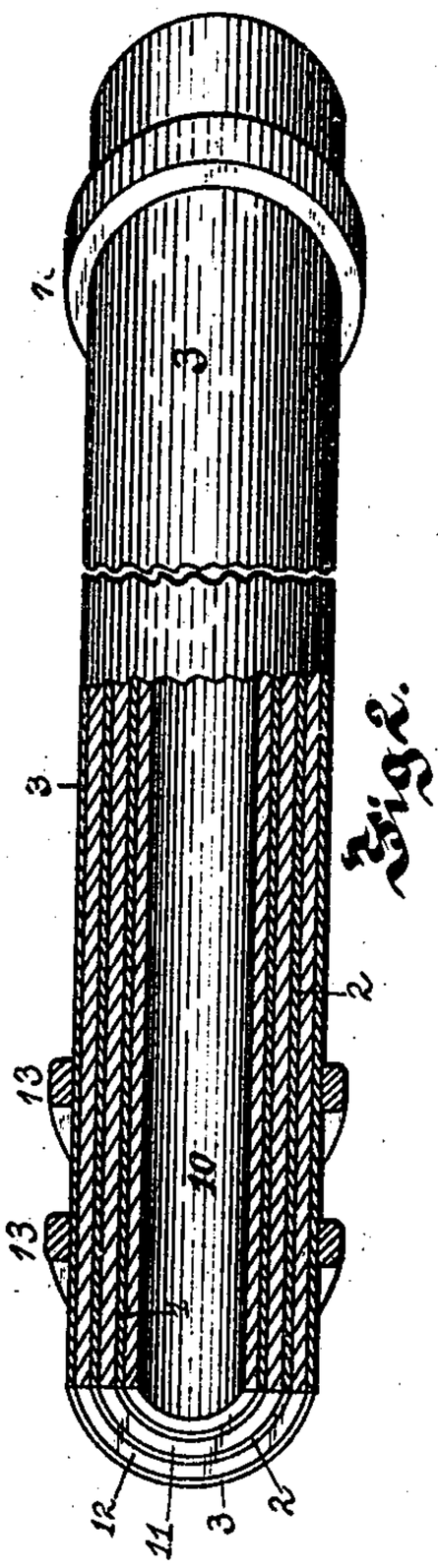

Fig. 2.

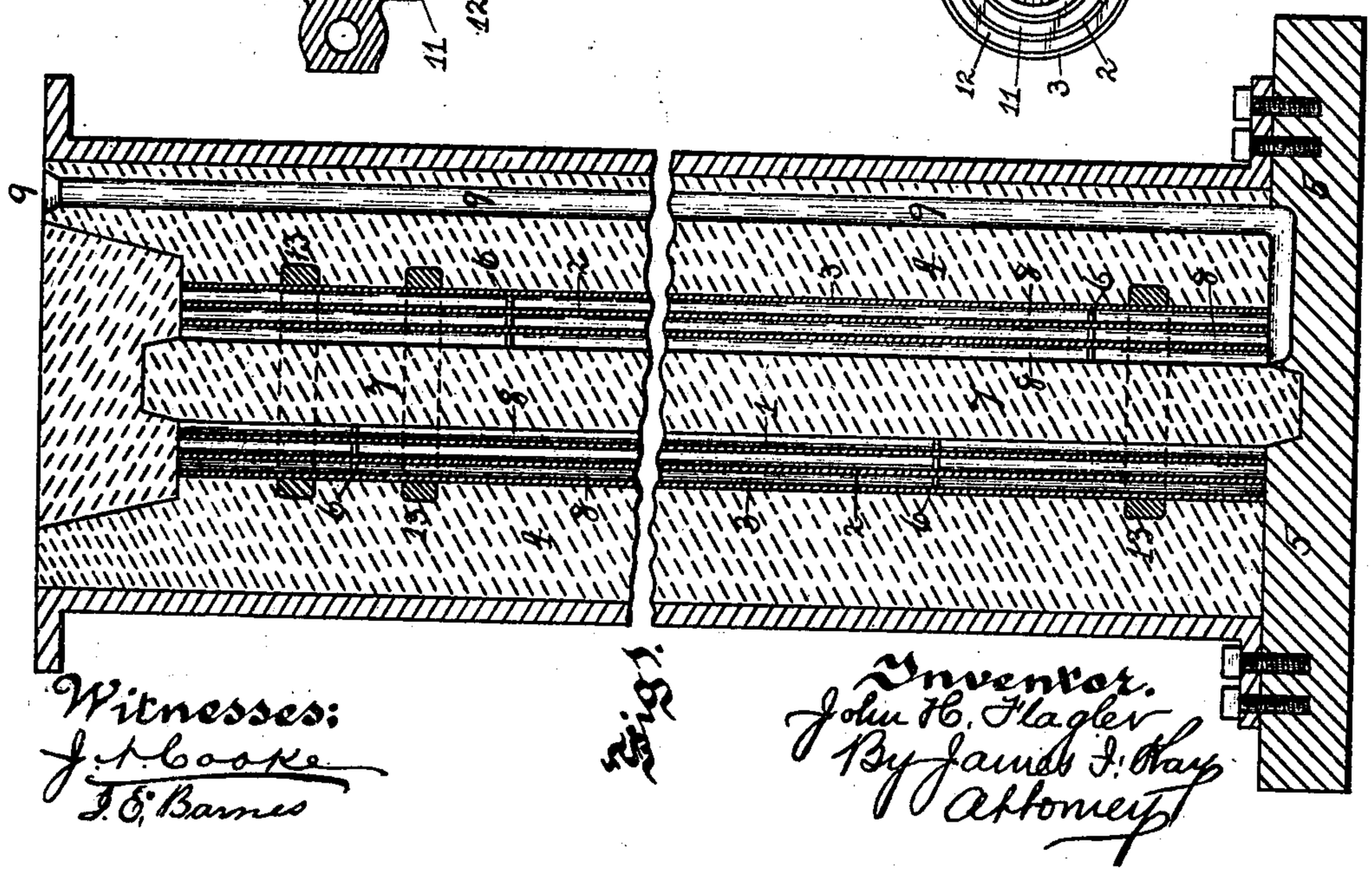

Fig. 3.

Witnesses:
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UNITED STATES PATENT OFFICE.

JOHN H. FLAGLER, OF NEW YORK, N. Y.

MANUFACTURE OF SHAFTS AND ORDNANCE.

SPECIFICATION forming part of Letters Patent No. 364,098, dated May 31, 1887.

Application filed November 1, 1886. Serial No. 217,656. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. FLAGLER, of New York city, in the county of New York and State of New York, have invented a new and useful Improvement in the Manufacture of Shafts and Ordnance; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to the manufacture of heavy shafts for vessels, mills, &c., and heavy ordnance—such as cannons and mortars—its object being to increase the strength of the shafts to enable them to sustain great torsional strain and overcome the breaking of the marine-engine shafts, and to increase the resistance to bursting strain of the ordnance, as will be hereinafter more particularly described.

The heavy marine and mill shafts heretofore employed have been either forged or cast to shape, being formed of wrought metal or cast steel or iron; and experience has proven such shafts extremely liable to fracture, especially in case of slight flaw in the forging of casting, such imperfections being in many cases imperceptible and unavoidable; and, as the shaft is formed of a mass of metal of the same or substantially the same quality, the flaw is liable to gradually increase until it causes the rupture of the shaft.

In the manufacture of ordnance, as heretofore practiced, the most approved manufacture has been to cast an inner shell of cast-steel and to drive over or shrink upon this interior shell rings or sleeves of wrought iron or steel, the number of these rings or sleeves shrunken or driven around the inner shell depending upon the required strength of the gun. The strength of the interior shell so formed is dependent upon the strength of the casting formed; and it is evident that where this casting was not perfect the strength of the gun was materially lessened, the gun in such case depending almost entirely upon the strength of the sleeves or bands surrounding the shell.

My invention has for its object the formation of heavy shafting or ordnance, in which the body of the shaft or of the gun, or interior shell thereof in large ordnance, shall have one or more tubular layers formed of wrought-metal tubing, by which the cast-steel is supported; and it consists, essentially, in a shaft, or gun, or gun-shell formed of one or more layers of wrought-iron or soft-steel tubing, and one or more layers of steel cast within, or within and around the same, the shaft, gun, or gun-shell thus formed having one or more tubular layers of wrought metal therein to support the cast-steel and strengthen the same to enable it to withstand the torsional, bursting, or other strain to which it is subjected. It also consists in the method employed in forming the same.

To enable others skilled in the art to make and use my invention, I will describe the same more fully, referring to the accompanying drawings, in which—

Figure 1 is a longitudinal section of the mold prepared for casting the gun or a heavy shaft in accordance with my invention. Fig. 2 is a view, partly in section, of the shaft formed and interior shell thereof. Fig. 3 is a like view of the finished gun, the gun shown having a band or sleeve shrunken around the shell formed in accordance with my invention.

Like letters of reference indicate like parts in each.

In practicing my invention I form one or more wrought-metal shells, these shells being formed of wrought-iron or soft steel by bending to shape the plate from which the shell is formed, thus forming a tubular skelp and welding together the edges of the same to form a perfect wrought-metal tube of the desired diameter and thickness, this tube being formed in the ordinary manner practiced in the manufacture of wrought-metal tubing, or the tube being drawn by suitable machinery from a solid ingot, and in such case a weldless tube being formed. Where two or more of these wrought-metal shells are employed in the shaft or ordnance to be formed, the diameter of the outer tube or tubes will of course be increased over that of the inner tube, the space between the tubes varying according to the size of shafting or ordnance to be formed and the layer or body of cast-steel to be interposed between the wrought-metal tubes on the finished article.

In the drawings, 1 represents the inner wrought-metal tube, and 2 3 the tube or tubes employed around the same. In forming heavy shafting according to my invention I generally

support these tubes within the mold 4 upon the metal bed-plate 5, any suitable pins or skeleton supports, as at 6, being employed to support the tubes and hold them in proper relative position to each other and the core 7 and the mold 4. In casting ordnance and ordnance-shells the tubes and core can be supported in like manner by any suitable skeleton frames or like devices. One or more pour-gates, 9, may communicate with the spaces 8 between the tubes and the tubes and core or mold; and in case it is found desirable, in order to increase the strength of the finished article, steel of different carbons can be cast between the several tubular layers, separate pouring-gates communicating with each layer. The molten metal thus flows within and around the layers of wrought metal as desired, and as it is raised to a high heat fuses the exterior surface of the tubing and unites therewith, forming a solid union of the several tubular layers of wrought and cast metal composing the shaft or gun.

The shaft shown has the three layers, 1 2 3, of wrought metal and like number of layers, 10 11 12, of cast-steel, the outer layer being formed of wrought metal and the annular shoulders or enlargements 13 necessary on these shafts being formed on the tube 3 before it is placed within the mold. The layers of cast-steel are supported by the tubular layers of wrought metal, and in case of any flaw or other imperfection in the bodies of cast-steel these flaws are prevented from increasing or extending through the shaft by the wrought-metal layers, while the cast-steel layers prevent any like imperfection in the tubular wrought-metal layers from injuring the shaft, the shaft being for these reasons much stronger and capable of sustaining greater torsional strain than the ordinary solid wrought or cast metal shaft, and the shaft being made hollow, if desired, so decreasing its weight.

The gun or gun-shell shown in the drawings, Fig. 3, has the interior lining, 10, of cast-steel within the wrought-metal tube 1, and another layer, 11, of cast-steel, between the wrought-metal tube 1 and the wrought-metal tube 2, this layer 11 extending between the wrought-metal tubes 1 and 2 to the muzzle of the gun, as well as the exterior layer, 12, of cast-steel around the wrought-metal tube 2, the exterior layer extending from the breech part way toward the muzzle to support the gun or gun-shell at the point of greatest strain; and it is evident that the gun or gun-shell so formed possesses much greater strength than the ordinary cast-steel gun or gun-shell heretofore constructed, as the layers of wrought metal within the same greatly increase its power to resist bursting strain, since there is added to the strength of the cast-steel the strength of the wrought metal, which has been greatly increased by the working of the same in the formation of the wrought-metal tubes before the steel is cast within or within and around the same. At the same time the strength of the gun or gun-shell is greatly increased by the shrinking of the cast metal around the wrought-metal shells during the cooling of the gun after casting. In the gun shown the breech portion is further strengthened by the wrought-metal coils or bands 1 4, shrunken around the same, these coils or bands being employed with heavy ordnance and adding to the power of resistance of the gun, as is well known, in the manufacture of such ordnance. In heavy ordnance I also secure the pivot pins or bearings to the gun by shrinking a ring or band having these pivot-bearings formed thereon, as shown at 15. Where, however, these outer bands or coils are not employed, the pivot-bearings may of course be cast with the body of the gun or formed on the outer shell when made of wrought metal. The ordnance formed possesses the combined strength of the wrought-metal gun obtained from the wrought-metal tubing within the same as well as the strength of the cast-metal gun obtained by the layers of cast steel; and even though there may be flaws in the cast-steel the advantages of the wrought-metal tubing therein are obtained, the gun or gun-shell formed possessing great advantages in this particular over the ordinary cast-steel shell heretofore employed.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The herein-described method of forming heavy shafting or ordnance, consisting in casting steel around or within one or more wrought-metal tubes, substantially as and for the purposes set forth.

2. Shafting or ordnance formed of one or more layers of wrought-metal tubing and one or more layers of steel cast around or within the same, substantially as and for the purposes set forth.

3. A gun or gun-shell formed of wrought-metal tubing and an inner lining of steel cast within the same, substantially as and for the purposes set forth.

4. A gun or gun-shell having one or more layers of wrought-metal tubing and layers of steel cast within and around the same, the outer steel layer extending only over the breech portion of the gun, substantially as and for the purposes set forth.

In testimony whereof I, the said JOHN H. FLAGLER, have hereunto set my hand.

JOHN H. FLAGLER.

Witnesses:
AUGUSTUS A. DAME,
R. K. HALDANE.