(No Model.)

E. WHEELER.

MANUFACTURE OF STRUCTURAL INGOTS.

No. 370,436. Patented Sept. 27, 1887.

Fig: 1.

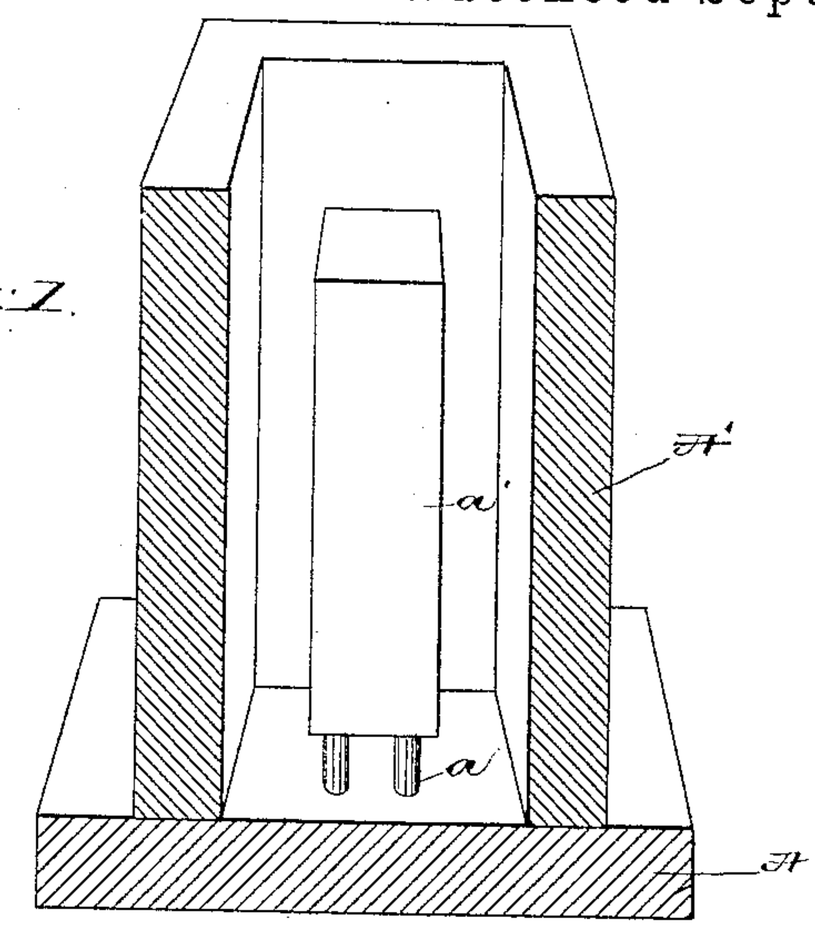


Fig: 6.

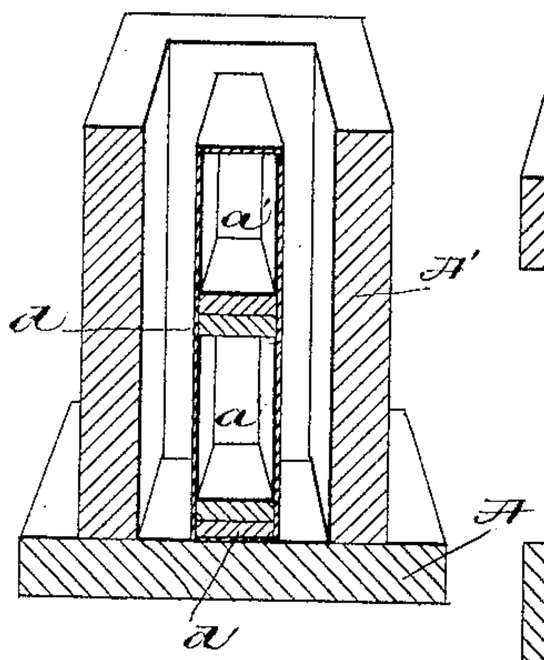


Fig: 2.

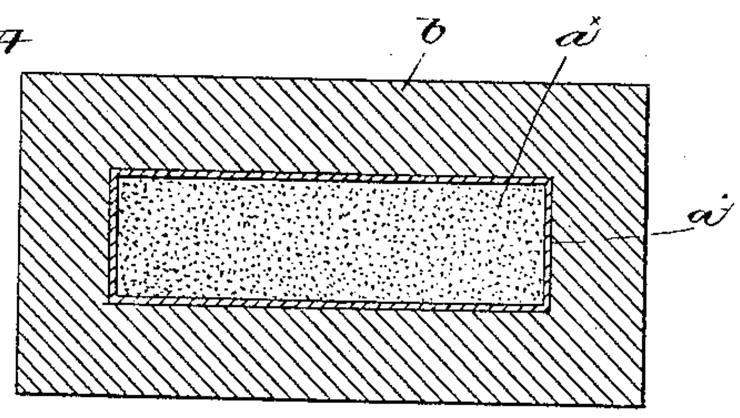


Fig: 5

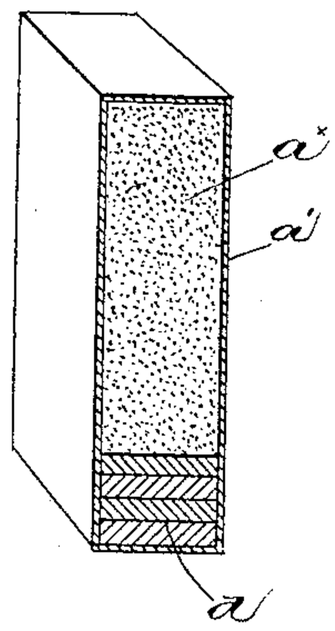


Fig: 4.

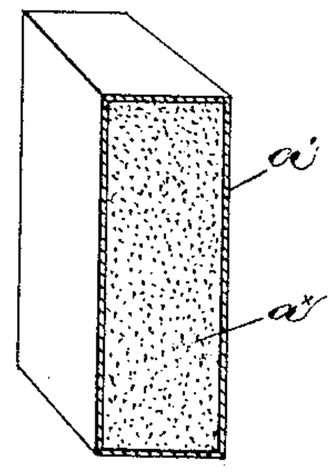


Fig: 3.

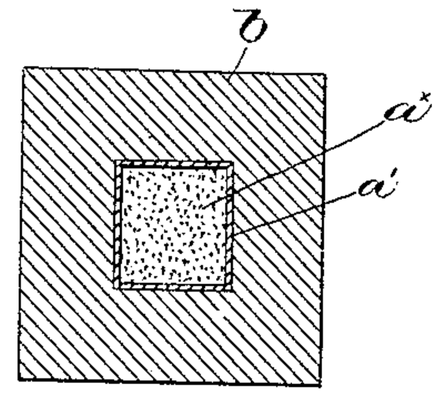
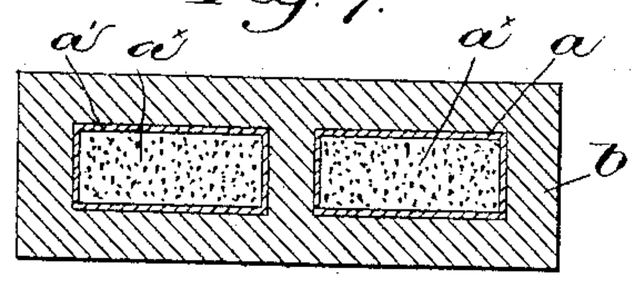


Fig: 7.



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UNITED STATES PATENT OFFICE.

ELBRIDGE WHEELER, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO HIMSELF, WARE B. GAY, AND GEORGE W. GOGIN, TRUSTEES, ALL OF SAME PLACE.

MANUFACTURE OF STRUCTURAL INGOTS.

SPECIFICATION forming part of Letters Patent No. 370,436, dated September 27, 1887.

Application filed February 4, 1886. Serial No. 190,871. (No model.)

To all whom it may concern:

Be it known that I, ELBRIDGE WHEELER, of Boston, county of Suffolk, and State of Massachusetts, have invented an Improvement in Metal Structure, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention has for its object the production of a cast-metal ductile ingot containing or surrounding one or more non-metallic or silicious cores, which are left in the said ingot while the same is reduced by rolling or hammering or in other usual manner to produce a metal structure, which, when finished, yet contains within it the said core, it having been elongated with the ductile metal or having changed its shape to conform to the shape assumed by the metal in reducing to the shape of the structure or finished article. For the best results the non-metallic or silicious core will be contained in a case or jacket, and the ductile cast metal poured into the mold containing the said case or jacket will be made to surround the said core and flow in the mold beyond the ends of the non-metallic substance of the core.

If desired, the ends of the core may be supplemented or extended by means of slabs or pieces of scrap metal, which will be incorporated with the cast metal to aid in the formation of solid ends for the ingot, the solid ends extending across the ends of the non-metallic core.

In my experiments to improve the construction and at the same time reduce the weight and the cost of metal ingots capable of being extended by reduction, either by rolling or hammering or by compression, which is a species of hammering, I have discovered that steel or other ductile metal may be cast in a mold about and so as to envelop one or more non-metallic cores of refractory material, the product being a cored ingot which may be elongated or drawn in any usual manner.

My experiments have demonstrated that a filled tube, bar, axle, railway-rail, shaft, column, &c., produced from the cored yet ductile ingot may be made to withstand not only greater heat and pressure than a hollow or solid tube, bar, &c., but also resist in a high degree compression and transverse and torsional strains, the non-metallic core absorbing concussive and vibratory strains and preventing oxidation at the inside of the structure, as is common in cast-iron columns cast hollow by usual coring, which is afterward removed.

In practice the non-metallic core, composed for the best results of non-fusible sand, will itself be contained in a jacket or casing, which, for the best results, will be composed of sheet metal, but which may be of other material capable of retaining the core in proper position in the mold while the ductile metal is being cast about it. The casing or jacket and its contained core will be placed within a mold of the shape which it is desired that the ingot should assume when completed.

To enable the ductile cast metal to entirely surround the casing or jacket, one end thereof will be set in the mold upon supports of sufficient size and strength to sustain the weight of the core; or the core may be suspended within the mold.

The ingot formed by pouring the ductile metal into the mold to envelop the casing or jacket and its core, and leave a cored ingot having its ends closed by ductile metal, may then be reduced in usual manner, preferably by passing said cored ingot between rolls suitably shaped to produce the desired article, or it may be reduced by hammering or by compression.

During the reduction of the cored ingot, as described, the non-metallic or silicious core changes its shape to conform to that shape given to the ingot by the rolls or hammer.

Figure 1 is a sectional elevation of a mold containing my improved core, the latter being placed therein to produce a ductile ingot in accordance with my invention; Fig. 2, a longitudinal section of a ductile ingot produced in Fig. 1 in accordance with my invention; Fig. 3, a cross-section thereof. Fig. 4 shows in section a jacketed core; Fig. 5, a modification, to be referred to; Fig. 6, a vertical section, on a reduced scale, of a mold containing two cores; and Fig. 7, a longitudinal section of a ductile ingot produced by casting ductile metal into the mold, Fig. 6.

Referring to the drawings, A represents a base to support or form a part of a mold, A′, with which to practice my invention, the said

mold being herein shown as rectangular in shape, but which may be of any other usual or desired configuration, said mold being composed of iron or any other suitable or usual material.

Within the mold A′, as shown in Fig. 1, is placed a core of non-metallic or silicious refractory material, $a^{\times}$, which, for the best results, is contained within a jacket or casing, a', supported, as shown in Fig. 1, upon pins a, in order that the ductile metal poured into the mold may pass beyond the lower end of the core, the top of the core being below the top of the mold, so that the ductile metal poured into the mold may rise therein above the top of the core.

If the walls of the ingot on opposite sides of the core are to be of equal thickness, the core will be placed in the center of the mold A′, and the ductile molten metal, either steel or iron, or any other metal which can be worked or reduced by rolling or hammering—such as brass, copper, &c.—will be poured into the said mold, the pouring being continued until the metal preferably completely envelops the said core, so as to leave solid metal ends, as shown in section, Fig. 2.

I wish it to be understood that I do not limit the scope of my invention to any particular mode or manner of supporting or suspending the core within the mold in order that the ingot may contain solid metal at the ends of the core.

The rectangular ingot herein shown, composed of ductile metal, b, and a core of non-metallic or silicious material, as $a^{\times}$, may, after undergoing the usual process of reheating, be reduced to any desired shape by rolling, or by hammering, or by compression, in usual manner.

During the process of reduction the non-metallic or silicious or friable core will elongate and automatically change its shape to conform to the configuration of the metal surrounding the said core.

When it is desired to produce by casting a ductile ingot from which to roll axles and similar objects having solid sections distributed throughout the length thereof, a second core will be supported upon or above the top of the first or bottom core, as shown in Fig. 6, and the metal will be poured into the mold until it envelops both cores, the number of cores employed being limited only by the size of the mold.

Instead of using the supporting-pins a, which, for the best results, are of metal, so as to become a part of the solid end of the ductile ingot, I may place at the end of the casing or jacket a' pieces of ductile iron or steel, or scrap-iron plates or slabs, as d, one such series of plates or slabs d being shown in Fig. 4 and two sets in Fig. 6, where one core is set upon the other.

I do not desire to limit my invention to the production of an ingot for the manufacture of only the articles herein mentioned, as it is evident that other articles—such as marine armor-plate—may be produced from a ductile ingot having one or more non-metallic cores and produced in accordance with my invention.

In Fig. 7 I have shown in section an ingot composed of ductile cast metal surrounding and enveloping two non-metallic or silicious cores.

I am aware that a box-pile containing a non-metallic or silicious core has been heated and rolled, such a pile being shown and described in other applications filed by me, Serial Nos. 189,429, 189,430, and 189,431.

I claim—

1. That improvement in the art or method of producing a metal structure having an interior space which comprehends placing in a mold a non-metallic or silicious core of a shape to correspond with the shape and extent of the space to be left in the ingot, and then pouring into the said mold a malleable metal, the said metal surrounding the sides of the said core and passing beyond its ends to aid in furnishing solid metallic ends for the said ductile ingot beyond the end of the core, and thereafter, when at proper heat and with the said core yet in place, reducing the said ingot by rolling or in other usual manner, the non-metallic core changing or conforming in shape to the shape given to the ingot, substantially as described.

2. That improvement in the art or method of producing a metal structure having an interior space which comprehends placing in a mold a non-metallic or silicious core surrounded by a jacket of a shape to correspond with the shape and extent of the space to be left in the ingot to be produced, then pouring into the said mold a malleable metal to surround and pass beyond the ends of the non-metallic portion of the core and aid in furnishing solid metallic ends for the said ductile ingot beyond the end of the core, and thereafter, when at proper heat and with the said core yet in place, reducing the said ingot by rolling or in other usual manner, the non-metallic core changing or conforming in shape to the shape given to the ingot, substantially as described.

3. An improved article of manufacture consisting of a malleable cast-metal ingot composed of a non-metallic or silicious core or cores surrounded by a malleable or ductile metal which envelops the sides and projects beyond the ends of the said core, substantially as and for the purposes described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ELBRIDGE WHEELER.

Witnesses:

KATHERINE H. WHEELER,

E. M. RAYMOND.