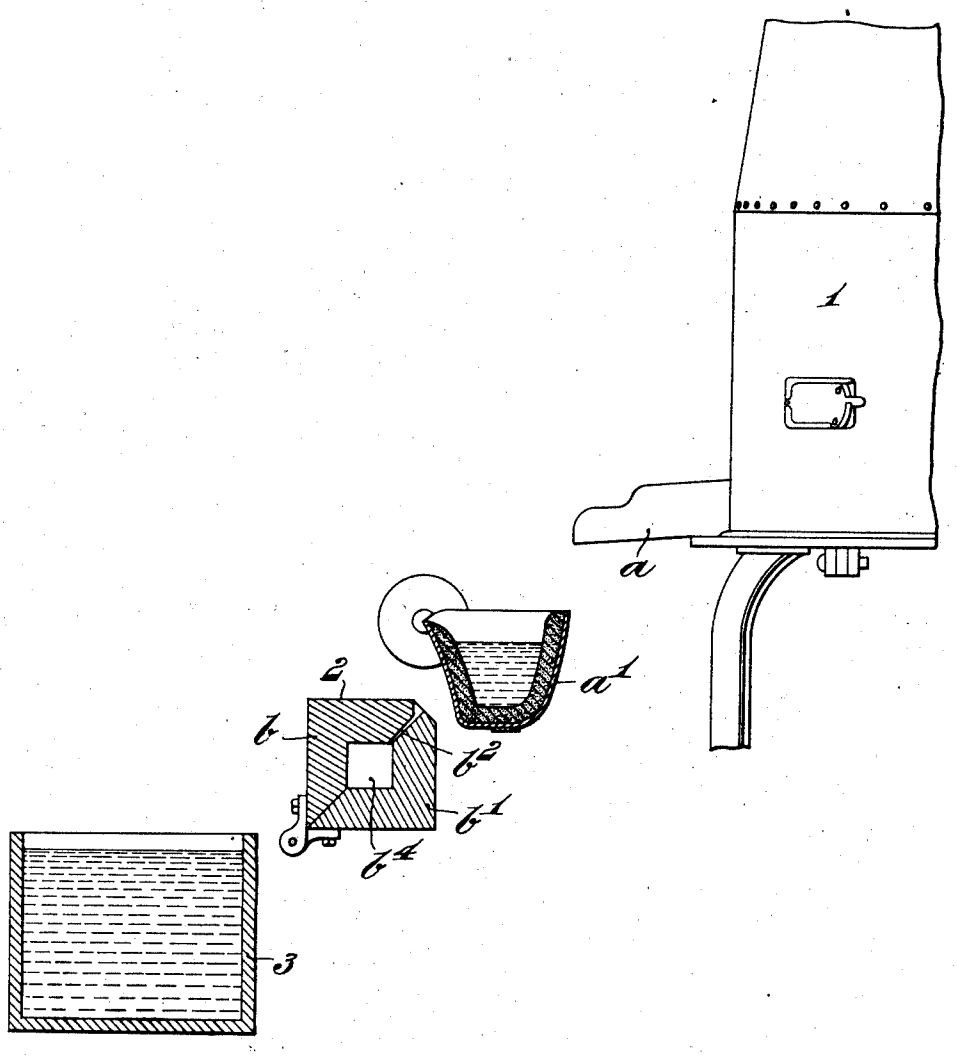
E. A. CUSTER.

ART OF PRODUCING FROM FOUNDRY IRON A PRODUCT HAVING CUTTING AND OTHER PROPERTIES OF HIGH GRADE TOOL AND HIGH SPEED STEEL.

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**927,495.** Patented July 13, 1909.




WITNESSES:

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## ART OF PRODUCING FROM FOUNDRY-IRON A PRODUCT HAVING CUTTING AND OTHER PROPERTIES OF HIGH-GRADE TOOL AND HIGH-SPEED STEEL.

No. 927,495. Specification of Letters Patent. Patented July 13, 1909.

Application filed December 11, 1908. Serial No. 466,968.

*To all whom it may concern:*

Be it known that I, EDGAR ALAN CUSTER, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful improvements in the art of producing from foundry-iron a product having cutting and other properties of high-grade tool and high-speed steel, of which the following is a specification.

My invention has relation to the art of producing a product having the cutting and other properties of high speed and high grade tool steel, from ordinary foundry-iron, by chilling such iron while in a molten state swiftly to the point of setting in a permanent sectional metal mold in a solid structure, then removing from the mold and immersing in a fluid bath, as water, to fix the changed molecular conditions of the metal in passing from the molten to the solid state in a homogeneous structure, whereby the mixed homogeneity of the resultant product is established adapting such, for tool making and other uses, and comparing in composition, cutting and other qualities, to the present high grade tool and high speed steel of commerce.

My invention basically considered, consists of producing from foundry-iron, a homogeneous product having the composition, strength, cutting and other qualities of the high grade tool steel of commerce, by chilling molten foundry-iron in a permanent metal mold to the point of setting in a solid structure, then removing from the mold and chilling quickly in a fluid bath, for use, such as tool making and many other uses.

The nature and general scope of my present invention will be more fully understood from the following description taken in connection with the accompanying drawing forming part hereof, illustrating diagrammatically a type of plant adapted for employment, in the carrying into effect of the method of my said invention.

Referring to the drawing 1, represents an ordinary cupola-furnace provided with a pouring spout $a$, and ladle $a^1$, located in proximity to a permanent sectional metal mold 2, consisting of a cope $b$, and drag $b^1$, having pour-holes $b^2$, located about the meeting edges of two sections of the mold 2, and having internal channelways, not shown, directly leading to a central cavity $b^4$, of any required shape or form, according to the shape of the solid structure to be cast in the mold. The molten metal from the cupola-furnace 1, passes by the pouring-spout $a$, into the ladle $a^1$, and thence into the mold 2, and therein it is swiftly chilled to the point of setting, covering as to time but a few moments, when the mold is automatically opened by the parting of the cope $b$, from the drag $b^1$, if a horizontal mold, as shown, or if a vertical mold, one part or section is separated from the other part or section, to enable the cast structure set in the mold to be removed immediately after being cast, for the instant removed to be immersed in a cold water tank 3, so as to chill suddenly the hot structure, to a cold state. Practice has demonstrated that this effect upon ordinary foundry-iron, when so treated is to fix the changed molecular conditions, that is, to give a fine texture thereto, and to establish throughout a homogeneity to the structure cast which is fully accomplished by the chilling of the molten foundry-iron, first in the permanent metal mold swiftly, to establish the defined homogeneity to the structure; and second the cooling thereafter quickly of the solid structure cast, by immersing the same in a cold water bath, fixes reliably throughout the homogeneity of the structure. The character of the structure cast in such manner is found to compare with the well known high grade tool and high speed steel of commerce, for tool making and many other uses.

In some instances, to the ordinary foundry-iron may be added in the mix of the iron in a molten state a certain percentage of nickel, tungsten, vanadium, titanium or other metallic substances or alloys, where special uses are to be made of the structures produced, but what is known as ordinary foundry-iron comparatively high in silicon and reasonably low in sulfur and phosphorous has been found, when brought into a solid cast structural form, by the method hereinbefore fully described, to give a product new in the art for tool making, machining and threading different structures for use in the applied arts.

Having thus described my invention I claim:—

1. The art of producing tool and other metal from foundry-iron, which consists in chilling molten foundry-iron in a permanent metal mold swiftly to the point of setting in a solid structure and thereafter chilling quickly in a fluid bath, substantially as and for the purposes described.

2. The art of producing tool and other metal from foundry-iron, which consists in pouring molten foundry-iron and chilling swiftly in a permanent sectional metal mold to the point of setting in a solid structure and then quickly cooling in a fluid bath to reliably fix the homogeneity of the structure established in passing from the molten to the solid state, substantially as and for the purposes described.

3. The art of producing tool or other metal, from foundry-iron, which consists in pouring molten foundry-iron into a permanent metal mold and chilling swiftly therein to the point of setting in a solid structure and then removing instantly when set in the mold into a fluid-bath, substantially as and for the purposes described.

4. The art of producing tool and other metal, from foundry-iron, which consists in pouring such molten metal to which previously has been added a certain percentage of tungsten, nickel, vanadium, titanium or other metallic substances or alloys thereto into a permanent metal mold, chilling swiftly to the point of setting in a solid structure and thereafter chilling quickly in a fluid bath to obtain a product of the quality of high speed or high grade tool steel, substantially as and for the purposes described.

In witness whereof, I have hereunto set my signature in the presence of two subscribing witnesses.

EDGAR ALAN CUSTER.

Witnesses:

J. WALTER DOUGLASS,

THOMAS M. SMITH.