Nov. 17, 1925. 1,561,924

A. M. HENRY

METAL FOUNDING

Filed Jan. 23, 1924

Fig. 1.

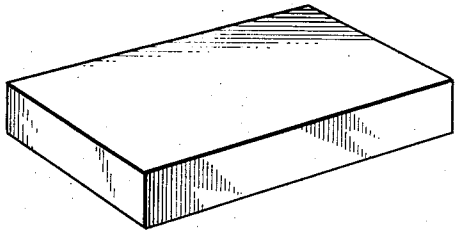


Fig. 2.

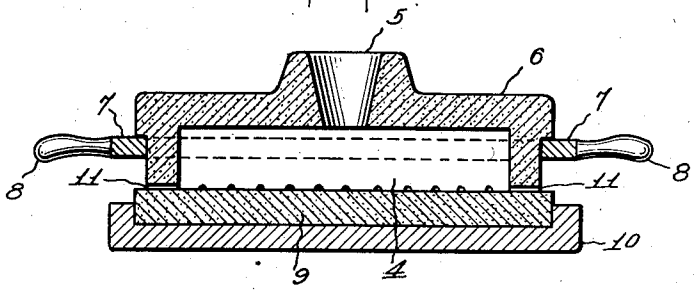
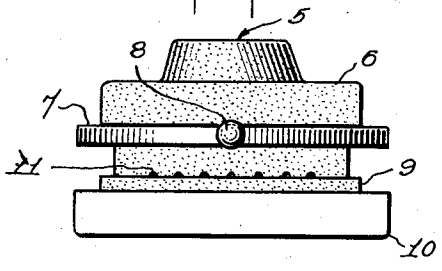


Fig. 3.



INVENTOR

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UNITED STATES PATENT OFFICE.

AUGUSTUS M. HENRY, OF BROOKLYN, NEW YORK, ASSIGNOR TO WILLIAM W. WEITLING, TRUSTEE, OF COLLEGE POINT, NEW YORK.

METAL FOUNDING.

Application filed January 23, 1924. Serial No. 688,031.

To all whom it may concern:

Be it known that I, AUGUSTUS M. HENRY, a citizen of the United States, and a resident of the city of New York, borough of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Metal Founding, of which the following is a full, clear, and exact description.

The present invention relates to the art of casting metals of comparatively high melting temperatures (say of over 1000 degrees F.), and particularly the ferrous metals; and aims to provide a novel and valuable method of an apparatus for (*a*) rapidly and economically producing ferrous castings of any desired form, while insuring (*b*) that such castings always will include, merely as the result of the casting operation itself, a particular metallurgical characteristic essential if not highly desirable in various industries.

An important object of the present invention, in the latter regard, is to form the casting, say in a fixed as contradistinguished from a rotary mold, and in what may be truly termed a permanent mold, and at the same time treat the casting as it solidifies so that the same will be case-hardened where contacted by all or some of the walls of the mold cavity,—the novel apparatus aforesaid being comprised of a lining or partial lining for the mold cavity having the characteristics described immediately below.

Another object is to provide a method and apparatus as above, wherein the mold is formed of or has its cavity lined or faced with a material which is practically as inexpensive and as easy to machine smoothly and nicely to shape, as is iron or steel; which material is made up of masses of granular components so compacted, naturally or artificially, as to be as tenaciously cohesive as iron or steel but yet a material adapted to be machined, or pressed (as to accomplish such compacting) into a mold or mold-part not having the liability of a similar iron or steel part to crack, chip and distort from molecular "growth" as the result of repeated heat-shocks, i. e., as the result of repeated casting operations,—thus truly providing a permanent casting mold; which material may be absolutely depended on to give up some of its own content to the contacting superficies of the molten metal impacted against the mold by the pouring force at each casting operation but not enough thereof to preclude the mold from being employed for making a great number of castings having only absolutely negligible variations of contour, bulk and weight; such donated content constituting the carbonaceous matter for coacting with the heat of the metal incident to its molten state, thereby to predetermine that the casting when ejected from the mold and merely allowed to cool on the floor of the foundry will be case-hardened according to the invention; and which material will not, like iron or steel, deeply chill the casting as an iron or steel mold always does. Such a material, I have discovered, is carbon, preferably densely compacted; such for instance, as is used for making carbon-electrodes for electric arc lamps or for making the commutator brushes for dynamos, motors and the like.

To explain the practical and salient distinctions between a chilling and a case-hardening of a ferrous casting: When such a casting is chilled, the term is used, herein and indeed generally, to describe what happens to the superficial layer of a fairly large mass of cast iron when such mass is cast and such layer is solidified against a metal mold. Said layer, obviously, has the same carbon content as the rest of the casting, except that the layer has its carbon in the combined form and the carbon of the mass of the casting underlying such layer is largely or wholly graphite. On the other hand, case-hardening as hitherto practiced, has involved (*a*) the making, usually if not always in a sand-mold, of a soft iron casting, that is, a casting having therein a more or less uniform distribution of carbon largely or wholly in the graphitic form throughout; and (*b*) the application to the superficies of such casting, some time after removal from the mold and generally some time after the casting has been permitted to cool, of a carbonaceous material, as powdered charcoal, and a simultaneous heating of the casting to a point where the outer cuticle of the casting is converted into a high-carbon steel by the cementation process, or, in other words, to a point where the mere skin of the casting is chemically carburized and such skin becomes a hard, strong case for the inner metal mass of the casting. Such case; obviously, has a different and greater carbon content than the rest of the casting; as contradistinguished

from the conditions prevailing in a chilled casting, where, as stated above, the outer chilled layer has the same carbon content as the inner mass of the casting, and further, the carbon of the chilled layer is carbon in the combined form and so resulting in a layer very brittle and of little toughness and absolutely no malleability.

As a result of the fact, then, that the present invention provides a casting which is case-hardened merely, and not chilled as above, when formed against the mold lining of the present invention, there is provided by the invention a method and apparatus particularly adapted, thereby to attain a special object of the invention, for making rapidly and economically, and in a permanent mold, ferrous metal castings of any particular shape desired, and in a mold which does not have to be rotated or moved during the casting operation.

An important advantage of the invention is the fact, as I have discovered, that the case-hardening of the casting may be kept almost impalpable as to thickness, and negligibly resistant to ordinary machining, if the casting is ejected from the mold when still quite hot.

Referring now to the accompanying drawing wherein is illustrated a preferred embodiment of such apparatus and an illustrative method of casting facilitated thereby according to the invention,

Figure 1 is a perspective view of a casting to be formed, purposely shown as a simple slab to clarify the disclosure;

Figure 2 is a vertical longitudinal section taken through the apparatus; and

Figure 3 is an end elevation of the apparatus.

It will be understood that the invention preferably contemplates the provision of a mold lining, whether such lining is really an integral part of a single member forming the entire cope or drag structure (as shown in the drawing) or whether such lining is a separate lining for a metallic or other suitable cope or drag structure,—such lining including a plurality of pre-formed shaped blocks or pieces, hereinafter called blocks, constructed of a material having the qualities hereinabove described.

Thus, referring now to the details of the drawing, the casting of Figure 1 is adapted to be made in the casting cavity 4 of the mold of Figures 2 and 3, the molten metal being introduced through the funnel or gate 5.

Such gate 5 is formed as a part of a preformed block 6 of the material aforesaid; such block really constituting the entire cope, since the metal encircling structure 7 is merely provided for mounting a pair of handles 8 at opposite ends of the mold for lifting the cope clear of the underlying drag when the casting has set.

The drag is shown at 9 and really comprises a large flat slab of the material aforesaid; since the cupped metal plate or structure 10 constitutes merely a foundation in the cup of which the drag proper sets by gravity.

Of course, such a very simple drag 9 is permitted in the case of a simple casting like that shown in Figure 1.

Attention is directed to the fact that the drag proper 6, although one piece of said material, provides not only the gate 5 but the forming surfaces for all the six sides of the casting except the bottom thereof.

It is recommended that the lower bounding edge of the cope 6 be provided with transverse half-round grooves as indicated at 11, to facilitate the escape of the gases of congelation. It will, of course, be understood that the dimensions of these grooves are very greatly exaggerated in the drawing, since they are actually most minute, or at least so minute that the molten metal will not enter the spaces provided by the same.

As to the apparatus shown, obviously variations may be freely resorted to within the scope of the appended claims.

In said claims, wherever a mold or mold part is characterized as permanent, there is meant merely that said part is of a material or so constructed that the part will not be so injured by a single casting operation as to be useless for a second casting operation, as contradistinguished from a mold or part constructed or lined with ordinary foundry sand.

I claim:

1. A mold including a molding cavity having a permanent facing formed of a surface of a preformed block of a material having the qualities of being able to be pressed to such shape from granular components, and of having the ability to withstand repeated heat-shocks as the result of repeated casting operations.

2. A fixed mold including a molding cavity having a permanent facing formed of a surface of a preformed block of a material having the qualities of being able to be pressed to such shape from granular components, and of having the ability to withstand repeated heat-shocks as the result of repeated casting operations.

AUGUSTUS M. HENRY.

DISCLAIMER.

1,561,924.—*Augustus M. Henry*, Brooklyn, N. Y. METAL FOUNDING. Patent dated November 17, 1925. Disclaimer filed February 1, 1926, by the assignee, *William W. Weitling.*

Hereby enters this disclaimer to that part of the claim in said specification which is in the following words, to wit:

"1. A mold including a molding cavity having a permanent facing formed of a surface of a preformed block of a material having the qualities of being able to be pressed to such shape from granular components, and of having the ability to withstand repeated heat-shocks as the result of repeated casting operations."

Further, inasmuch as this disclaimer is based on the discovery just made that United States Letters Patent No. 1,501,337, granted said Henry July 15, 1924. contains in claim 2 thereof a claim to subject matter which might conceivably be held to cover (although that is not now conceded) substantially the same subject matter as that to which is directed the hereinabove quoted claim 1 of said Letters Patent No. 1,561,924, your petitioner also enters this disclaimer to that part of the term of said Letters Patent No. 1,561,924 as shall overlap or extend beyond the date of expiration of the term of said Letters Patent No. 1,501,337.

[*Official Gazette February 16, 1926.*]