(No Model.)

W. R. HINSDALE.

INGOT PROTECTOR.

No. 476,383. Patented June 7, 1892.

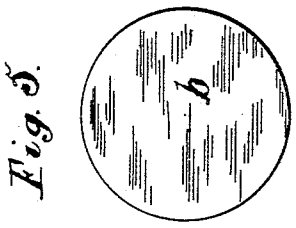

Fig. 5.

Fig. 4.

Fig. 3.

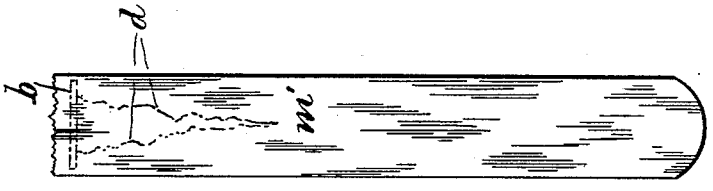

Fig. 2.

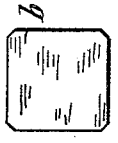

Fig. 6.

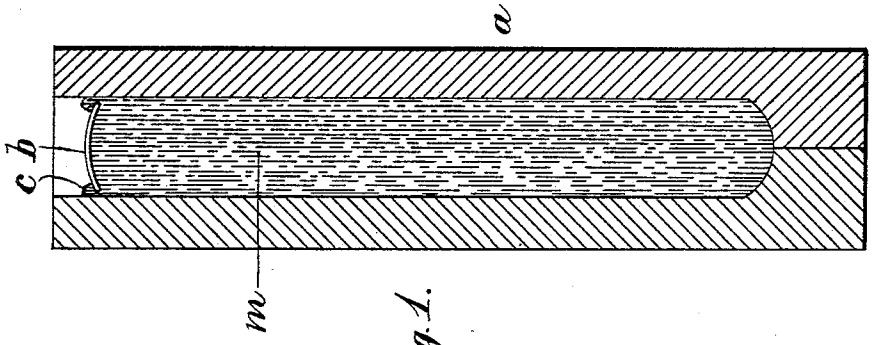

Fig. 1.

Attest:
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Inventor.
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Crane & Miller, attys.

UNITED STATES PATENT OFFICE.

WILLIAM R. HINSDALE, OF NEWARK, NEW JERSEY.

INGOT-PROTECTOR.

SPECIFICATION forming part of Letters Patent No. 476,383, dated June 7, 1892.

Application filed August 22, 1891. Serial No. 403,422. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM R. HINSDALE, a citizen of the United States, residing at Newark, Essex county, New Jersey, have invented certain new and useful Improvements in Ingot-Protectors, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of the present invention is to prevent the evil effects which result from the oxidation of the shrinkage-cavity formed in steel ingots at the upper end. Such shrinkage-cavity, when formed in contact with the atmosphere, speedily becomes oxidized and cannot thereafter be closed up effectively by any subsequent working of the ingot in reducing the same.

The means employed in my present invention prevents the access of air to such shrinkage-cavity by covering the top of the cavity with a cover of suitable material to unite with the metal of the ingot, and preferably of the same grade of steel, so as to be rolled or welded into the same without detriment thereto. The cover may therefore be formed of sheet-steel stamped to the desired shape, and is applied to the top of the fluid metal after pouring, being pressed upon the same with sufficient force to crowd the fluid metal up around its edges and thus lock it firmly to the ingot. The cover is made round or square, according to the shape of the mold, and about half an inch smaller in diameter than the same.

I have heretofore described in United States Patent No. 448,881, dated March 24, 1891, means for turning or inverting the ingot-mold to remove the shrinkage-cavity from the mouth of the mold; and my present invention is adapted, if desired, to promptly close and seal the mouth of the mold, and to thus prevent the discharge of the fluid contents when the mold is partially or wholly inverted.

In the annexed drawings I have shown the cover applied merely as a stopper to exclude the air from the shrinkage-cavity, Figure 1 of the drawings showing a central vertical section of an ingot-mold filled with metal and the cover embedded in its mouth. Fig. 2 is a view of the ingot with the shrinkage-cavity shown in dotted lines and the cover applied to the mouth of the same. Fig. 3 is an edge view of a convex cover like that shown in Fig. 1. Fig. 4 is an edge view of a flat cover; Fig. 5, a plan of a round cover, and Fig. 6 of a square cover.

a is an ingot-mold of the ordinary type, shown herein divided longitudinally, as is usual. The cover *b* within the mold is shown as a convex disk, as in Fig. 3, pressed upon the top of the fluid metal, with a film of the fluid metal between the edge of the cover and the interior of the mold, forming a bead *c* above the edge of the cover. This bead, when chilled, remains integral with the top of the ingot and anchors the cover *b* to the same and hermetically seals the joint between the cover and the body of the ingot in which the shrinkage-cavity occurs.

In Fig. 2 the shrinkage-cavity *d* is indicated by dotted lines in contact with the under side of a flat cover *b*, and the cover is shown wholly concealed by the metal *m'*, which is liable to be the case if the metal in the mold is caused to "boil up" by the application of the cover thereto. Such boiling is always excited by the presence of foreign substances in the molten metal and serves to close and lock the cover upon the ingot most effectively. It is preferable to make the disk thin enough to become highly heated and thus wholly cemented to the body of the ingot; but it is immaterial whether the disk be convex or not if made of material rigid enough to resist, when heated by contact with the fluid metal, the atmospheric pressure developed by the shrinkage-cavity. As the cover is liable to a high degree of heat, sufficient to soften it materially, it is preferable to dish the same, to increase its strength, with the same thinness of material as shown in Figs. 1 and 3.

The ingots furnished with my improvement may be rolled, hammered, or worked in any other suitable manner, and the shrinkage-cavity will be found to weld perfectly, so as to avoid the formation of any fault or flaw in the finished product. If the cover be formed of the same material as the ingot, it may become welded into the head of the ingot without injury to the quality of the latter; but if made of other material its presence in the end of the ingot permits its removal by break-

ing off a portion of the product after the ingot has been worked. It is better in any case that the cover should be formed of sheet or wrought metal, so that it may be malleable in character and adapted to weld when the ingot is worked. It is thus adapted to protect the shrinkage-cavity until the product is completed and to preserve its union with the head of the ingot during any reheating that the latter may be subjected to and during which the shrinkage-cavity would be liable to oxidation.

The cover described, being a permanent attachment of the ingot, is adapted to protect the shrinkage-cavity from the rusting effect of the atmosphere for any length of time, and thus preserve the ingot from injury for any period until it can be worked.

As stated above, the invention is adapted for use in the process described in my United States Patent No. 448,881, but is entirely operative without practicing such process to protect the shrinkage-cavity, as desired.

From the above description it will be seen that the method of preventing the oxidation of the shrinkage-cavity consists, essentially, in embedding a cover in the head of the fluid ingot before the shrinkage-cavity is formed, by which operation the cover becomes sealed to the head of the ingot, so that the penetration of air to the cavity is wholly prevented.

The mere pressing of a cover upon the top of the fluid metal does not prevent the access of air to the body of the ingot, as the shrinkage of the metal inevitably forms apertures beneath the cover through which the air may penetrate.

In my method the cover is placed in the head of the fluid ingot sufficiently below its surface for the fluid metal to flow around the edges of the cover, and in a greater or less degree over the upper corners of the same. The film of metal in contact with the edges of the cover chills in advance of the metal in the body of the ingot, so that the cover becomes firmly locked to the head of the ingot before any shrinkage-cavity is formed. The cavity is thus hermetically sealed and its oxidation is wholly prevented.

The method and product which I have devised being inseparable I have claimed them both in the present specification.

I am aware that it has been proposed heretofore to apply to an ingot-mold a sheet-metal plate provided with vent-holes, and fitted closely to the bore of the mold to operate as a stopper in forming ingots of different lengths in a single mold. By this means the air could readily penetrate through such vent-holes during the cooling of the ingot formed within the mold and thereby cause the oxidation of the walls of the shrinkage-cavity. By my invention such a defect is avoided by forming an imperforate cover of sheet metal and embedding its edges in the fluid upper portion of the ingot and allowing the metal to chill arc und such edges, whereby the joint betwen the cover and the ingot is hermetically sealed and thoroughly protected from the penetration of the air. I hereby disclaim the said means of stopping ingot-molds heretofore devised.

Having thus set forth the nature of my invention, what I claim is—

1. The method of casting steel ingots, which consists in first pouring the fluid metal into a suitable mold, and, second, embedding in the upper portion of the fluid metal an imperforate cover of suitable metal and of smaller dimensions than the bore of the mold to form and engage with a fin upon the head of the ingot, as and for the purpose set forth.

2. A steel ingot having an imperforate sheet-metal cover with its edges embedded in the upper portion of the same, as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WILLIAM R. HINSDALE.

Witnesses:
THOS. S. CRANE,
L. LEE.