Sept. 14, 1937. E. R. WILLIAMS 2,093,024

INGOT MOLD STOOL

Filed Feb. 13, 1934

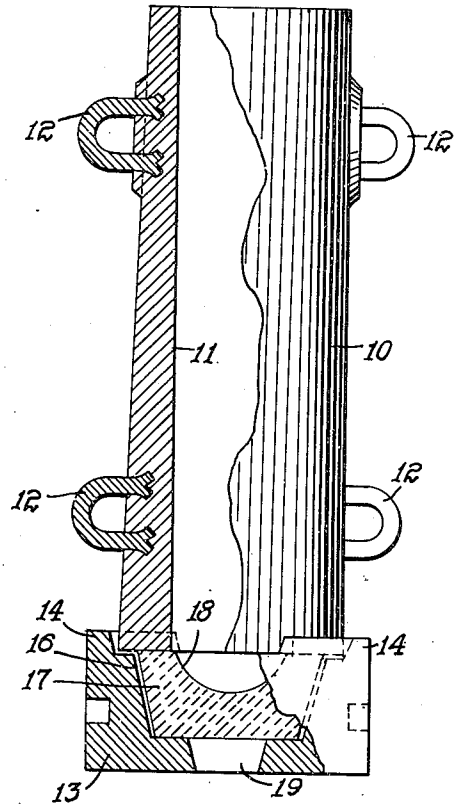


Fig. 1.

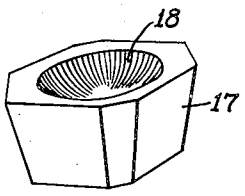


Fig. 3.

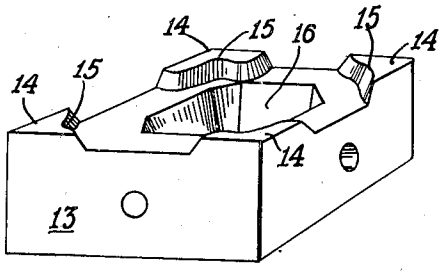


Fig. 2.

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INGOT MOLD STOOL

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2 Claims. (Cl. 22—139)

This invention relates to ingot molds, and more particularly to improvements in ingot mold stools for support of molds of the open-end type which are adapted to be positioned on the stool with the big end of the ingot up when in casting position, and to a method of casting ingots in such molds.

In casting ingots in an open bottom mold of either the big end up or the big end down type, the mold is positioned on a suitable stool, usually made of cast iron, which supports the bottom end of the ingot. When a mold of the so-called "plug bottom" type is used, the bottom end thereof is generally closed with a suitable metallic plug, which is slightly smaller than the internal diameter of the mold.

When the ingot is being cast, the molten metal which is poured into the top of the mold falls against the top of the plug or stool, and as it comes in contact therewith, it welds to the plug or stool and also frequently splashes and impinges against the sides of the mold. As a result of the molten metal welding to the plug or stool and to the sides of the mold adjacent the plug or stool, the difficulties encountered in stripping the ingot from the mold are materially increased since there is always present the danger of cutting the mold wall adjacent the plug or stool during the stripping operation or pieces of the mold wall may be broken away which results in the premature scrapping of the mold. Hence, the welding of the ingot to the plug or stool and to the mold wall, not only increases the expense and time of stripping the ingot from the mold, but also cracks are formed in the ingot which necessitates the discard of a large portion of the bottom end of the ingot.

I am aware that attempts have been made heretofore to overcome these difficulties, that is, to prevent the ingot from welding to the plug closing the bottom of the mold to prevent the metal from splashing onto and welding to the sides of the mold adjacent to the plug. For example, in the patent to Howard & Turner, No. 1,335,865, a refractory insert for a mold stool is disclosed for eliminating these objectionable features. This insert is made of refractory material to prevent welding, is dished out to prevent splashing, and it is stated to be for the further purpose of retaining heat in the bottom of the molten metal to prevent rapid cooling thereof and thereby secure an even cooling of the entire ingot and as a result, reduce ingot cracking and the formation of pipes therein.

While this patent contemplates a mold stool which will prevent splashing of the molten metal, and retain the heat in the ingot, it will not eliminate or concentrate the formation of shrinkage cavities or piping in the top of the ingot which can only be done by solidifying the metal adjacent the bottom of the mold while the metal at the top of the mold is still molten so that it flows into and fills up the piping.

It is the principal object of the present invention to provide a means for closing the bottom end of a mold which will extract and cause the heat in the molten metal to be dissipated instead of retained, and thus cause the lower end of the ingot to be solidified much more rapidly than is the upper end and as a result, cause a concentration of the shrinkage cavity or piping in the top of the ingot.

Another object of this invention is to provide a seal for the lower end of a mold which will prevent the metal being poured from welding to the mold stool.

A further object of this invention is to provide a method of casting ingots in which the speed of solidification of the metal adjacent the lower end of the mold takes place much more rapidly than the solidification of the upper end of the ingot and as a result, shrinkage cavities are confined to the top of the mold and the amount of the ingot which must be discarded, due to such cavities, is materially reduced.

These and other objects which will hereinafter be made apparent to those skilled in this particular art, I attain by means of this invention, one embodiment of which is described in the following specification and illustrated in the accompanying drawing, wherein:

Figure 1 is a view partially in vertical section and partially in elevation of an open-end mold, big end up type, which is supported on a stool embodying my invention;

Fig. 2 is a view in perspective of a mold stool; and

Fig. 3 is a view in perspective of the insert for the mold stool.

Referring to the drawing, 10 represents a body of a mold of the open-end type having a molding wall 11 which tapers from one end to the other and is adapted to have its big end up when in casting position. The outer face of the mold 10 is provided with staples 12 for receiving the hooks (not shown) of a hoisting device for lifting the mold.

When in position for casting, the mold rests upon a stool 13 which is made of cast iron or other suitable material, and is provided at its

outer edges with upstanding lugs 14 which are cut away on the inner faces thereof to form beveled recesses 15 for receiving the corners of the mold 10 and holding it in position on the stool.

The stool 13 is provided with a recess 16 in which a member 17 made of copper or some other suitable metal having a high thermal conductivity is snugly positioned. Preferably, the area of the recess at the top of the stool 13 is considerably greater than the inside area of the mold, but of smaller area than the outside area thereof so that when the mold 10 is positioned on the stool 13, it rests entirely on the member 17, the top of which extends slightly above the top face of the stool. The upper face of member 17 is provided with a dished-out portion 18 to prevent the molten metal falling thereon from splashing and welding to the wall 11 of the mold. Since the top of the member 17 extends slightly above the top of the stool 13, it is apparent that the mold 10 is supported directly on the member 17 and a tight joint is formed between the mold and the member which will prevent the molten metal from finning or leaking out therebetween and thus make it difficult to strip the ingot from the mold.

In casting, the mold 10 is positioned on the copper member 17 which is supported by the stool 13 and molten metal is poured into and fills the mold 10. The molten metal, as it drops in the mold, strikes in the dished portion 18 of the copper member 17 the mass of which is preferably less than one-third the mass of the ingot being cast thereon. As the mold is filled, the heat in the molten metal adjacent the bottom of the mold is extracted by the copper member 17 and I have found that when the weight of the copper is approximately one-third the weight of the ingot being cast that it has sufficient mass and heat capacity to absorb the heat from the ingot without having its temperature raised to its melting point or to its welding point. Since the heat in the ingot adjacent the member 17 is rapidly extracted and absorbed by the copper member 17, the bottom of the ingot is quickly solidified while the metal in the top of the mold is still in its molten state and as a result there is a concentration of "piping" in the top of the ingot. The dished-out portion 18 of the member 17 is of sufficient depth and shape to prevent the molten metal from splashing and impinging against the walls of the mold severely enough to weld thereto or to cut the wall of the mold.

From the foregoing description it is apparent that the lower end of the ingot rests on the copper member 17, and since this member has a high thermal conductivity, the heat in the lower end of the molten metal is quickly dissipated and as a result, not only is the metal prevented from welding to the member 17, but also the lower end of the ingot is quickly solidified and piping which would ordinarily be formed therein is filled with the still molten metal in the top of the mold and the shrinkage cavity or pipe is concentrated in the top of the mold which is the last part of the ingot to solidify. The heat in the metal in the top of the mold may be retained to prevent solidification thereof by use of an ordinary refractory hot top which is adapted to be positioned on the top of the mold.

While I have described my preferred construction as having the member 17 of such height that it extends a slight distance above the top of the stool 13 and of an area larger than the internal diameter, it is to be understood that the top of the member 17 may be made so that it is flush with the top of the stool and it may be of the same or slightly less area than the end of the mold supported on the stool. Such construction may be especially desirable with the "big end down" type of mold since it would permit molds of various sizes to be used on the same stool and further, it would permit the weight and size of the member needed in connection with my preferred construction to be reduced for the bigger molds.

Further, it is apparent that the entire stool may be made of a material having a high heat conductivity as well as having a cast iron stool with an insert made of such material as described. It is also apparent that other changes, additions, substitutions and omissions may be made therein without departing from my invention and the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. An ingot mold and base assembly comprising a base member having a pocket therein, a mold, integral means on the base member for centering the mold on the base member and restraining them from relative lateral movement, and a replaceable copper insert in the pocket, the top of which projects above the top of the pocket and on which the mold rests whereby the weight of the mold is transmitted through the insert to the base assuring a tight seal between the mold and the insert.

2. An ingot mold and base assembly comprising a cast iron ingot mold, a cast iron base member, a copper insert in the base member, means on the base member for centering the ingot mold with respect to the copper insert and centering the copper insert with respect to the mold, the copper base member having a bearing surface to engage the bottom of the mold and a thickness such that the weight of the mold is transmitted through the insert to the base, whereby a tight seal is formed between the insert and the mold while the base serves to align and center the parts whereby the area of the copper block may be less than the over-all area of the mold bottom.

EDWARD R. WILLIAMS.