Jan. 10, 1961 J. L. MA ET AL 2,967,339

LADLE

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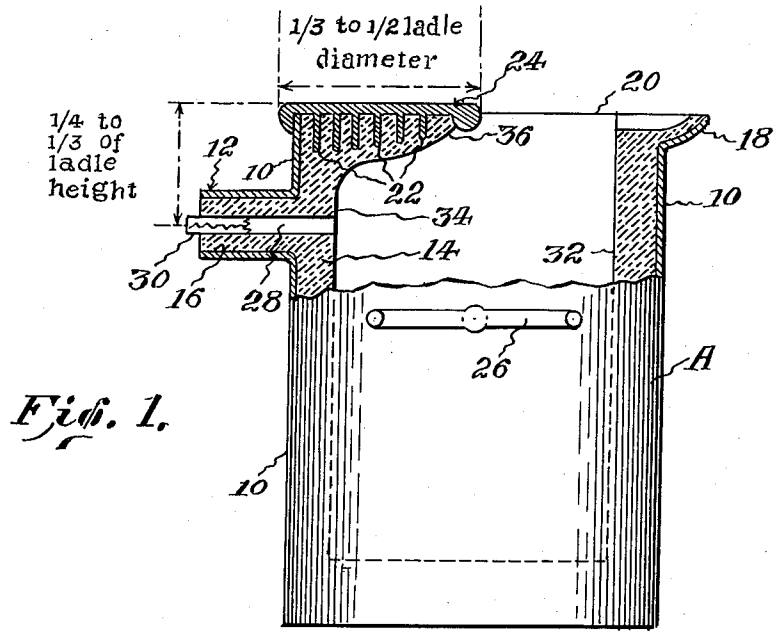


Fig. 1.

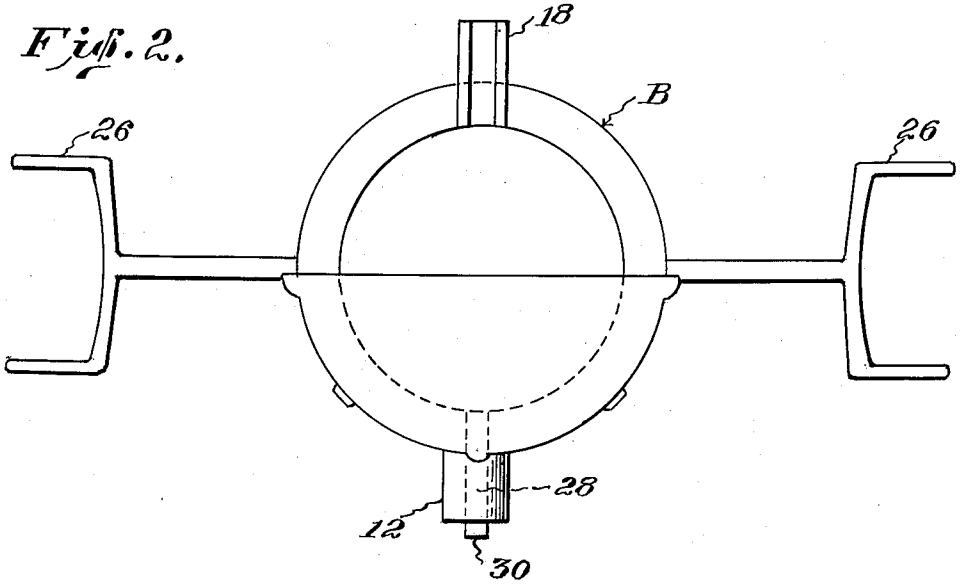


Fig. 2.

INVENTORS.
James L. Ma.
Charles R. Beamesderfer.
By Daniel E. Ogo
Attorney.

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Fig. 3.

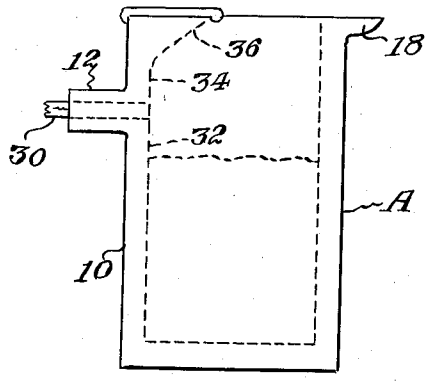
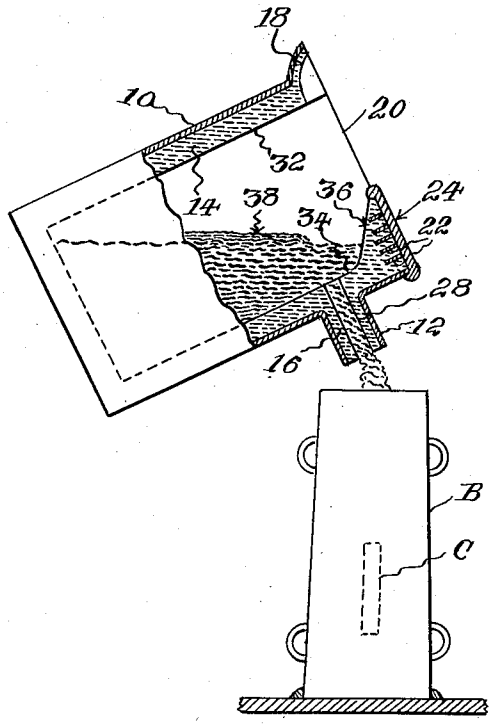


Fig. 4.



INVENTORS.
James L. Ma.
Charles R. Beomesderfer.
Daniel E. Yoo
Attorney

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LADLE

James L. Ma, Coatesville, and Charles R. Beamesderfer, Downingtown, Pa., assignors to Lukens Steel Company, Coatesville, Pa., a corporation of Pennsylvania

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1 Claim. (Cl. 22—209)

This invention relates to a pouring ladle for the pouring of cast clad ingots.

In the making of cast clad ingots, slag contamination of the inserts often results when the molten metal is poured from the top of a ladle. Heretofore it has been extremely difficult to remove the slag from the ladle before the pouring operation. These residual slags rush out from the molten metal and solidify at the surface of the inserts, thereby forming a brittle zone between the insert and the backing steel that results in a weakened bond between the backing steel and the insert.

The principal object of the invention is the provision of a pouring ladle for the pouring of these cast clad ingots which will eliminate the contamination of the inserts. This result is accomplished by preventing the pouring of slags with the molten metal through the pouring spout as the ladle is tipped during the pouring operation.

A further object is the provision of a plug in the pouring spout that will momentarily delay the flow of molten metal into the mold while the ladle is being tilted to the pouring position, to thus cause the slags to float to the top of the molten metal, the uncontaminated metal being allowed to flow through the spout to the mold.

Another object is to so locate the spout on the ladle to obviate molten metal "freeze-up" in the spout, the said spout being located above the normal level of the molten metal whereby the same does not come into contact with the spout until the metal is poured.

Other objects will appear hereinafter throughout the specification.

In the drawings:

Figure 1 is a side elevational view of the ladle with parts shown in vertical section;

Figure 2 is a top plan view of the ladle shown in Fig. 1;

Figure 3 is a side elevational view of the structure shown in Figure 1 showing the plug in the pouring spout opening and showing in dotted lines the normal level of the molten metal; and

Figure 4 is a showing of the ladle similar to Figure 1, the ladle being in pouring position for filling a mold containing clad inserts.

Referring now to the drawings, the ladle as a whole is indicated by the letter A, the mold being shown at B in Figure 4, and the location of the clad inserts in the mold is indicated at C.

As indicated in the several figures, the ladle is generally cylindrical in horizontal cross section and is provided with an outer metallic shell **10**. The ladle has inner and outer straight vertical walls, a pouring spout **12** which is welded to the shell at a point one-fourth to one-third of the ladle below the top thereof, and is lined with refractories **14**. The spout is also lined with refractories **16**. As shown in the several figures, a supplementary or alternate pouring spout **18** is located in a position diagonally opposite from the spout **12** and adjacent the upper periphery **20** of the ladle.

Following the lining of the ladle with refractories,

which may be accomplished by ramming or any other method, retainer bolts **22** are held in place by the refractory material surrounding the same. These bolts are welded to the reservoir cap **24**. The ladle arms are indicated by reference numeral **26**. The pouring spout **12** is provided with a pouring opening **28**, and this opening is adapted to receive a plug of destructible material indicated at **30** in Figures 1 and 3. The material itself comprising the plug is preferably of fibrous nature and may be composed of loosely packed paper. The function of the plug is to momentarily delay the flow of metal into the mold while the ladle is being tilted to the pouring position indicated in Figure 4. During this tilting operation, and with the plug in place, the slags will flow to the top of the molten metal and have no chance of finding their way into the mold until the end of the pouring is reached. Thus, the contamination of the inserts can be minimized or even completely eliminated.

As will be noted by reference to the several figures, the ladle is provided with interior, cylindrical, vertical walls **32**. A portion of the vertical walls, indicated at **34**, extends for a short distance above the spout **12**, and this portion joins an inclined portion **36** above the spout that extends to the reservoir cap **24**. When the ladle is tipped, as indicated in Figure 4, the inclined wall portion **36** causes the slag layer **38** to recede, as indicated in this figure, thereby facilitating the pouring of the uncontaminated molten metal.

It will be appreciated that the plug, when contacted by the molten metal, will quickly be consumed in a matter of a few seconds, but during this time the slags floating on the upper level of the metal will be prevented from finding their way to the pouring opening, and these slags will float on the top of the metal until substantially the end of the pouring operation. They may then be poured out of the spout **18** by tilting the ladle in the opposite direction, following which the ladle may be refilled with fresh molten metal.

The problem of reducing slag contamination of ingots has been previously attempted. However, these previous attempts have for the most part involved complicated valve arrangements in the pouring spout which can not be readily adapted for use with small sized ladles, such as a laboratory sized ladle, because of the limitation in size of a laboratory ladle and its high rate of heat loss. The use of a teapot shape for the ladle is potentially hazardous in that the molten metal may freeze up in the pouring spout when the ladle has been filled with molten metal and is in a standing position, prior to the pouring of the metal. The present construction is a design which may be cheaply and easily constructed. Additionally, its construction greatly reduces, if not entirely eliminates, the chance of molten metal freeze-up in the spout, since the molten metal does not come into contact with the pouring spout until the ladle is tilted for pouring, as shown in Figure 4.

The present construction, therefore, provides advantages in a ladle which include the minimizing of slag contamination of ingots by continuously retaining the slags on the top of a pool of molten metal during pouring, the destructible plug preventing the pouring of the slags as the ladle is tilted from the position of Figure 3 to the position of Figure 4. The ladle may be readily and easily constructed and operated, and it offers no chance of metal freeze-up in the pouring spout provided the level of the molten metal is maintained below the pouring spout, as seen in Figure 3, prior to the beginning of the pouring operation.

The rate of flow of the molten metal can be readily controlled by choosing the proper size of the replaceable pouring spout liner **16**.

The above description and drawings disclose a single

embodiment of the invention, and specific language has been employed in describing the several figures. It will, nevertheless, be understood that no limitations of the scope of the invention are thereby contemplated, and that various alterations and modifications may be made such as would occur to one skilled in the art to which the invention relates.

We claim:

A method of pouring molten metal in the making of cast clad ingots without slag contamination which consists in filling a refractory lined ladle having a pouring spout located below the top thereof and extending substantially horizontally therefrom, and an inner backwardly inclined wall located above said spout, with molten metal to a point below the position of said pouring spout when supported on its base, inserting a plug of heat destructible material in the open end of said spout, tilting the ladle to pouring position until the slag surface is located above the pouring spout and until there exists a layer of molten metal of considerable thickness above said opening, maintaining the slag layer away from said opening by said inclined wall and continuing to hold the said layer of slag away from said opening by said tilting operation until said plug has been consumed, and continuing the tilting operation whereby to form by pouring action an uncontaminated clad ingot.

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