

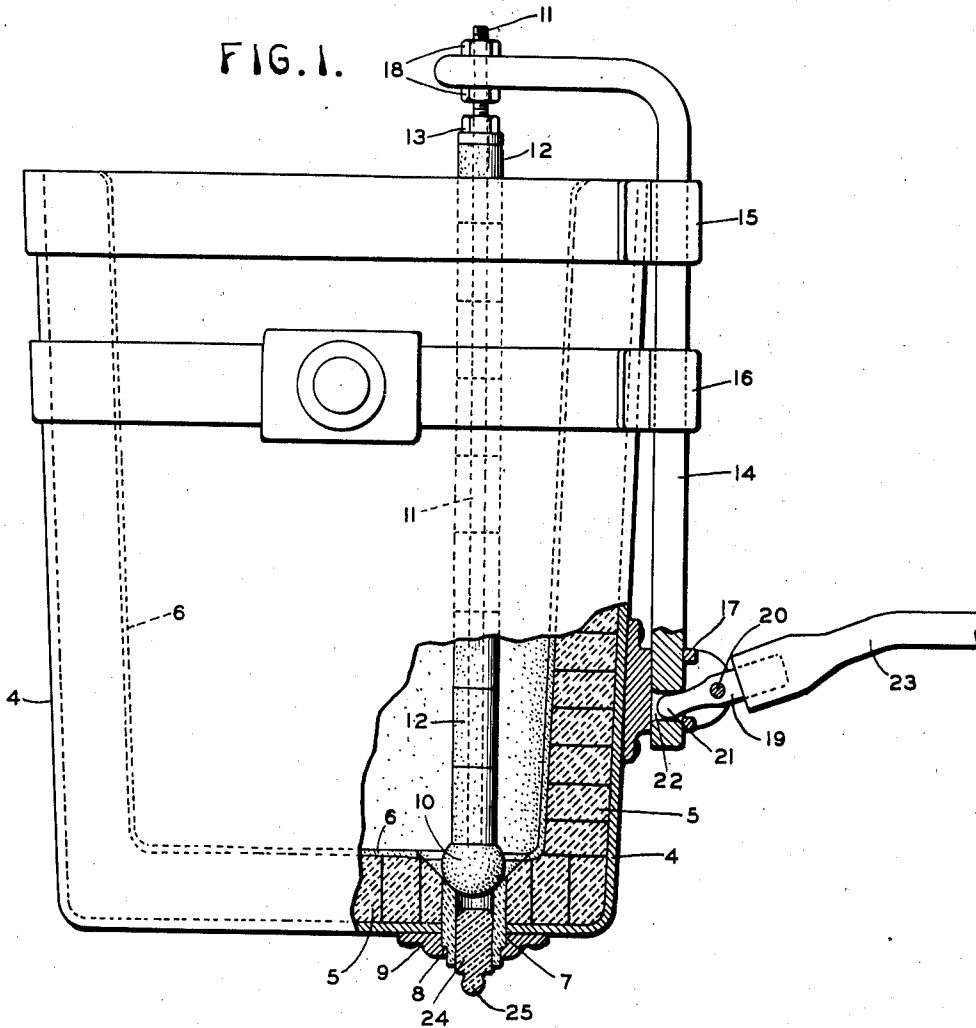
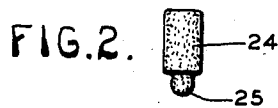
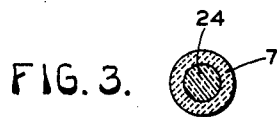
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LADLE

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LADLE

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2 Claims. (Cl. 22—84)

This invention relates to ladles, and more particularly to ladles for conveying molten metal from one location to another in a foundry or the like.

A ladle of this type is usually provided with an outlet nozzle in the bottom thereof and a stopper for controlling the flow of molten metal through the nozzle.

In many operations the molten metal is retained in the ladle for relatively long periods of time. For example in the treatment of certain types of metals, the molten metal may remain in the ladle for twenty to forty minutes. Under such conditions, it has been found that the molten metal around the stopper frequently congeals or freezes, thereby preventing movement of the stopper at the outlet nozzle.

Whenever the molten metal congeals around the stopper, it is difficult, if not impossible, to remove the stopper from the nozzle without dumping the contents of the ladle. Frequently, in the efforts to free the stopper from the nozzle the operating mechanism for the stopper is broken, requiring relatively costly repairs.

Moreover, whenever a stopper is forcibly pulled away from congealed metal, this metal around the nozzle and on the stopper, tends to prevent effective closing of the stopper, thereby permitting the highly heated molten metal to continue to flow from the nozzle. This undesirable flow of molten metal not only results in waste, but is a source of serious danger to workmen adjacent to the ladle.

It has long been a problem in this art to prevent the freezing of molten metal at the outlet nozzle of a ladle, especially when molten metal is retained in the ladle for a relatively long period of time. In view of the loss of time, expense, and hazards resulting from the freezing at the stopper, those skilled in the art have long sought a solution to this old problem, but in so far as I am aware the prior efforts have failed to produce a satisfactory answer to the problem.

An object of this invention is, therefore, to provide a simple and effective means for inhibiting the solidification of molten metal at a stopper for controlling the discharge of said metal from the ladle.

With the foregoing and other objects in view, the invention comprises the construction, combination and arrangement of parts hereinafter described and illustrated in the accompanying drawing. However, it is to be understood that the invention extends to modifications and varia-

tions within the scope of terms employed in the claims hereunto appended.

Fig. 1 is a side elevation, partly in section, illustrating a ladle for molten metal equipped with a simple form of the means to prevent or inhibit freezing of the molten metal at the discharge nozzle.

Fig. 2 is a detail view of the inhibiting baffle shown in Fig. 1.

Fig. 3 is a transverse section through the discharge nozzle, showing the baffle therein.

The ladle shown in the drawing comprises an outer metal shell 4, and a refractory brick lining 5 having a coating of refractory clay 6 on its inner face. As shown in Fig. 1 the ladle is open at the top to receive molten metal, such as steel. The bottom of the ladle is provided with an annular nozzle 7 for the discharge of molten metal from the ladle.

The nozzle 7, which is preferably made of a refractory material, is located in an opening extending through the brick lining 5 and outer shell 4, as shown in Fig. 1. The lower portion of the nozzle 7 projects beyond the shell 4 and is provided with a shoulder 8 seated on a plate 9. This plate 9 is secured to the bottom of the shell 4 to prevent downward displacement of the nozzle.

As an illustration of a means for controlling the discharge of molten metal through the nozzle 7, I have shown a stopper including a head 10 movable into and out of engagement with a beveled seat at the inlet portion of the nozzle 7.

The stopper head 10 may be made of refractory material, such as graphite. This head 10 is secured to the lower end of a metal rod 11 which extends upwardly through the open top of the ladle. To protect the rod 11 from the intense heat of the molten metal, the portion of the rod located in the ladle is surrounded by a plurality of refractory brick sleeves 12. The upper portion of the rod 11 is threaded to receive a nut 13 which secures the sleeves 12 on the rod.

I will now refer to the operating means for moving the stopper head 10 into and out of engagement with the beveled seat at the inlet of the nozzle 7. A bar 14 is slidably mounted in guides 15, 16 and 17 which are secured to the outer face of the shell 4. The upper portion of the bar 14 extends laterally over the ladle, and is secured to the rod 11 by means of nuts 18. It will be understood that by imparting an upward motion to the bar 14, the refractory head 10 will be raised off its seat to permit the discharge of molten metal from the ladle. Thereafter, a

downward movement of the bar 14 will again seat the head 10 to stop the flow of molten metal.

The means for raising and lowering the bar 14 includes a lever 19 pivoted at 20 to the lower guide 17. The lever 19 has a rounded end portion 21 extending into an opening 22 in the bar 14. The other end of the lever 19 is provided with a handle 23 for imparting motion through the lever 19 to the bar 14.

The ladle herein described is of a type in general use in foundries or the like, so I do not deem it necessary to show many of the usual details of construction.

It has long been known in this art that the molten metal in a ladle of the type herein disclosed has a tendency to solidify or freeze at the outlet nozzle, especially when the molten metal remains in the ladle for a relatively long period of time. This solidification of the metal at the outlet nozzle very frequently prevents or interferes with the proper operation of the stopper 10. Prior to my invention, those skilled in the art have failed to successfully overcome this perplexing condition.

I have discovered that the relatively cool air entering through the outlet of the nozzle tends to cool the stopper head and upper portion of the nozzle, causing a solidification of the molten metal. I have also found that by providing the nozzle with a very simple baffle arrangement I can inhibit the solidification of the molten metal at the stopper.

As an illustration of one form of a suitable baffle I have shown a plug 24 made of non-inflammable, thermally non-conductive material, such as asbestos. This plug 24 is adapted to be frictionally secured within the nozzle 7, as shown in Figs. 1 and 3, so as to check the admission of air to the stopper head 10. The insulating plug 24 is preferably elongated, as shown in Fig. 1, to extend from the outlet end of the nozzle to a point adjacent to the stopper valve 10. The large mass of refractory insulating material, formed by the plug 24, frictionally engages the inner face of the nozzle and almost completely fills said nozzle, so as to positively insulate the stopper valve 10 from the atmosphere.

To provide for the convenient removal of the

plug 24 from the nozzle, a handle 25 is formed integral with said plug. This handle as shown in Fig. 1 is adapted to extend beyond the outlet of the nozzle.

To illustrate the invention I have shown the baffle for checking the admission of air through the nozzle to the stopper head 10, as a simple plug 24. However, my invention is not limited to the particular form of baffle shown in the drawing as other suitable forms of baffles may be employed to accomplish the results of my invention.

I claim:

1. In a refractory lined ladle for molten metal, a nozzle provided with an inlet and an outlet for the discharge of molten metal from the ladle, a stopper valve at the inlet of said nozzle to control the flow of metal through said nozzle, and insulating means for inhibiting the solidification of molten metal at said stopper valve, said insulating means comprising a mass of insulating material located within said nozzle and frictionally engaging the inner face thereof to insulate said stopper valve from the atmosphere.

2. In a refractory lined ladle open at the top to receive molten metal, a tubular nozzle of refractory material at the bottom of the ladle, said nozzle being provided with an inlet and an outlet for the discharge of molten metal from said ladle, a stopper valve including a refractory head movable into and out of engagement with the inlet portion of said nozzle and a refractory operating stem secured to and extending upwardly from the refractory stopper valve, an operating member extending over the open top of the ladle and secured to the refractory stem, and means for inhibiting solidification of molten metal at the head of said stopper valve, said means including an elongated insulating plug made of thermally non-conductive asbestos material frictionally secured within the tubular nozzle and extending from the outlet of said nozzle to a point adjacent to the stopper valve at said inlet portion, so as to almost completely fill the nozzle and thereby insulate the head of said stopper valve from the atmosphere.

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