Aug. 2, 1949. J. A. TOLEIK 2,477,838

LADLE FOR CASTING METALS AND THE LIKE

Filed April 17, 1946 2 Sheets-Sheet 1

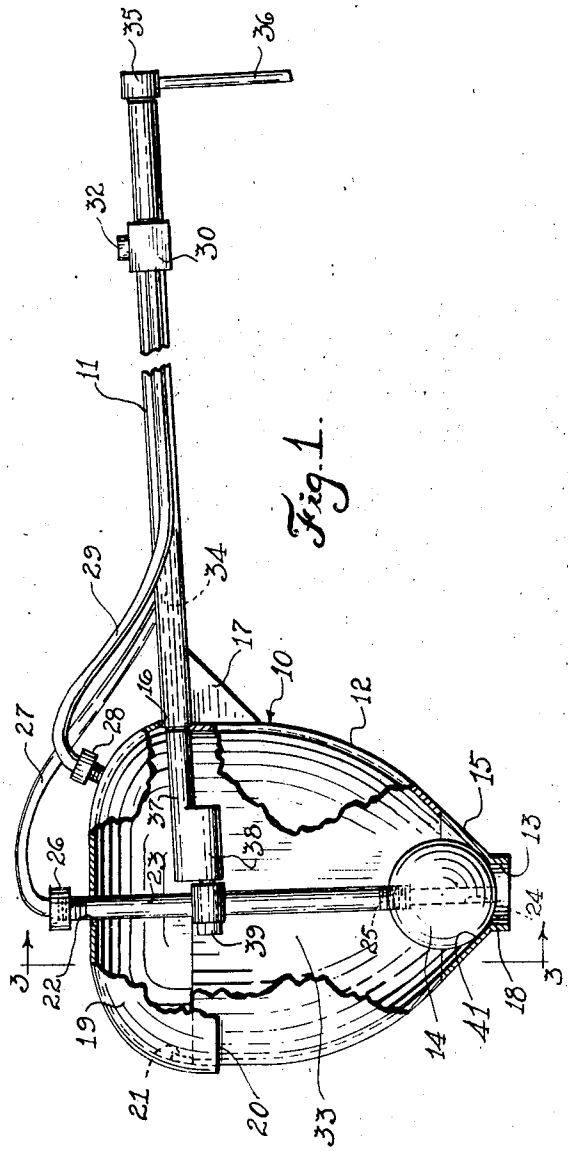


Fig. 1.

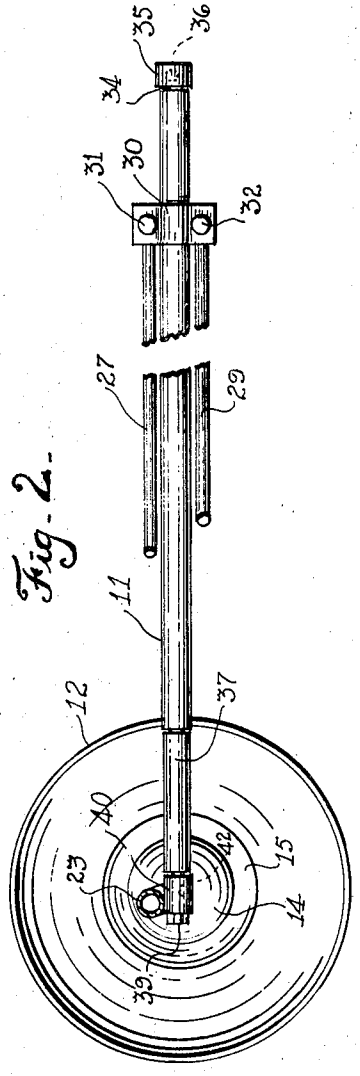


Fig. 2.

John A. Toleik, INVENTOR.
BY
Robert H. Wendt
ATTORNEY

Aug. 2, 1949. J. A. TOLEIK 2,477,838

LADLE FOR CASTING METALS AND THE LIKE

Filed April 17, 1946 2 Sheets-Sheet 2

Fig. 3.

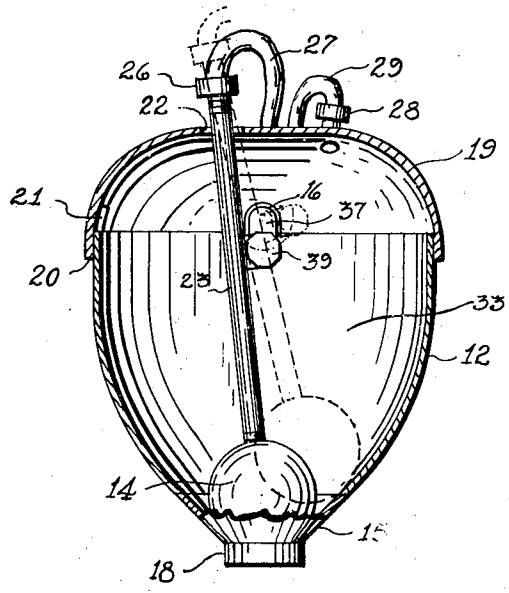
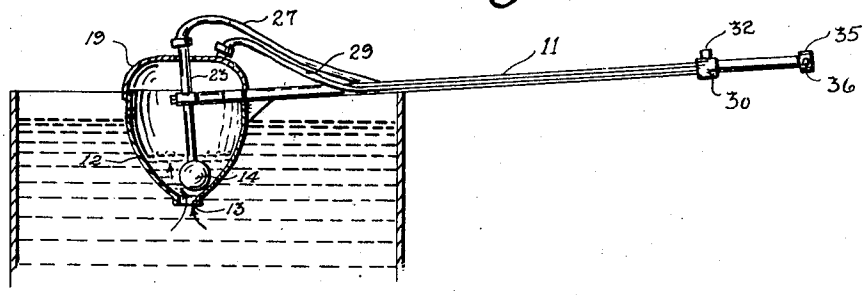


Fig. 4.



John A. Toleik INVENTOR.
BY
Robert H. Wendt
ATTORNEY

Patented Aug. 2, 1949

2,477,838

UNITED STATES PATENT OFFICE

2,477,838

LADLE FOR CASTING METALS AND THE LIKE

John A. Tolcik, Berwyn, Ill.

Application April 17, 1946, Serial No. 662,733

2 Claims. (Cl. 22—85)

1

The present invention relates to ladles for casting metals and the like, and is particularly concerned with the provision of an improved ladle adapted to be used for pouring castings, while avoiding the inclusion of oxides or other impurities floating on top of the metal.

Another object of the invention is the provision of an improved casting ladle by means of which a neutral atmosphere may be applied to the metal in the ladle, and by means of which the mold itself may be gassed and an inert or reducing atmosphere applied to the mold preliminary to the pouring of the casting.

Another object of the invention is the provision of an improved ladle adapted to be filled from the bottom below the surface of the metal in the melting furnace or crucible, and also adapted to be poured from the bottom so that any oxides which might be on the top of the metal in the furnace will be pushed aside and avoided in the filling of the ladle, and any small amount of oxides which might appear at the top of the metal in the ladle will appear in the sprue if the supply of metal is used up in pouring the casting.

Another object of the invention is the provision of an improved method of handling molten metals for casting, and an improved method of pouring castings whereby the presence of dirt and oxides in the ladle is minimized, and whereby dirt and oxides are substantially eliminated from the casting.

Another object of the invention is the provision of an improved ladle which is sturdy, adapted to be manufactured economically, and adapted to be used for performing a new series of steps in the filling of the ladle and the pouring of the casting, whereby the casting may be made substantially free of oxides and other inclusions.

Other objects and advantages of the invention will be apparent from the following description and the accompanying drawings, in which similar characters of reference indicate similar parts throughout the several views.

Referring to the drawings, of which there are two sheets,

Fig. 1 is a side elevational view of a ladle embodying the invention shown in partial section along a plane passing through the axis of the ladle to illustrate the parts thereof.

Fig. 2 is a top plan view in partial section along a plane passing above the handle, with the cover removed.

Fig. 3 is a vertical sectional view taken on the plane of the line 3—3 of Fig. 1, looking in the direction of the arrows.

2

Fig. 4 is a side elevational view in partial section, showing the use of the ladle in the act of filling the ladle with molten metal.

The present ladle is indicated in its entirety by the numeral 10 in Fig. 1, and it preferably includes an elongated handle member 11 supporting a container 12 provided with a lower filling and discharge opening 13, which is closed with a valve 14. The container 12 of the ladle and all of the other parts which are subjected to heat are preferably made of metal having a high melting point, such as a nickel chrome steel, while the discharge nozzle member 15 may be made of the same material or a special refractory insert adapted to withstand the heat, even to a higher degree.

The ladle 12 is preferably secured to a tubular handle 11 which may consist of an elongated steel pipe extending through an aperture 16 into the ladle to which it is welded completely around the edge of the handle pipe 11, and also reinforced by one or more triangular brace members 17 welded to both the handle and the container. The length of the handle and its size depend upon the size of the ladle and the degree of heat to which it is to be subjected.

The shape of the ladle container 12 may vary, but it is preferably circular in plan, and preferably tapers downwardly toward the discharge and filling opening 13, with gradually curved lines, so as to facilitate cleaning.

The discharge port insert or nozzle 15 is preferably flush with the surface of the container 12 on the inside and outside, and preferably terminates in a tubular body 18 of substantially cylindrical form. The container 12 is preferably closed by means of a cover 19, which may be a domed metal member of the same metal and of sufficient size to have its large open end 20 fit over the container 12 with which it has a frictional engagement.

A suitable limiting shoulder may be provided by a strip 21 of metal welded on the inside of the cover for engaging the top of the container 12. The container 12 and cover 19 may be made of pressed steel members, or they may be made of castings, depending upon the conditions to which they are to be subjected.

At its upper end the cover is provided with an aperture 22 of sufficient size to pass a valve rod 23 which carries the ball valve 14 at its lower end. The ball valve 14 may consist of a steel ball which is of the same metal and adapted to withstand the temperatures of the molten metal. The ball 14 is provided with a through bore 24

terminating in a threaded counterbore 25 for receiving the threaded end of the valve rod 23, which is preferably a tubular steel member adapted to conduct gas into the mold in which the metal is to be poured.

At its upper end valve rod 23 may be provided with a suitable fitting 26 for attachment of a flexible hose 27 of a type adapted to conduct gas and adapted to resist the action of the heat from the ladle. Another suitable fitting 28 communicates with the interior of cover 19 and has a similar hose 29 to be used for conducting an inert or reducing gas to the surface of the metal in the ladle.

The hoses 27 and 29 may extend outwardly along the handle to a valve block 30, having a pair of shut-off valves spring-actuated to the closed position, and adapted to be actuated by buttons 31 and 32 to cause gas from suitable sources to pass down the hoses 27 and 29 into the valve conduit 24 or into the ladle chamber 33, as desired.

In order to actuate the valve 14 the tubular handle 11 preferably contains a shaft in the form of a rod 34 which is provided at its outer end with a thrust bearing 35 and a radially extending handle 36. At its inner end the shaft or rod 34 is connected to a crank fitting 37 having a radially extending portion 38 for receiving a screw bolt 39. The valve rod or tube 23 may have a suitable bearing sleeve 40 welded to it, the bolt 39 passing through the sleeve 40 and being threaded home in the eccentric part 38 of the crank fitting 37.

The arrangement of the parts is preferably such that the valve 14 is firmly seated on its conical seat 41 in the ladle 12 before the crank 37 reaches its lower dead center. The hole 22 in the cover 19 is preferably a relatively loose sliding fit, but is as small as possible so that although the rotation of the crank 37 involves a lateral movement of the rod 23, this is permitted by the ball 14 being lifted from its seat 41.

In other embodiments of the invention the bore 42 in sleeve 40 may be made an oval slot to permit the necessary lateral movement of the bolt 39 while the rod 23 moves upward and downward.

Inasmuch as the ball 14 is a sphere, it seats perfectly upon the conical seat 41, irrespective of the position of the valve rod 23, as is shown in Fig. 3. Also, the arrangement of having a round hole 22 at the top and the crank 37 tends to lift the ball valve 14 toward one side, as shown in Fig. 3, moving the ball out of the way of the discharge aperture 13 more effectively.

The mode of use of my ladle is as follows: The metal may be melted in any suitable crucible or furnace, and in the case of an open hearth furnace the furnace might be provided with a suitable cavity in its bottom for providing a well of molten metal into which the ladle may be inserted. Assuming that no neutral atmosphere or reducing atmosphere is necessary, the operator may dispense entirely with the cover 19 and the hoses 27 and 29. If it is desirable to have an inert atmosphere or a reducing atmosphere in casting some metal, the cover and hoses should be suitable connected to such sources of gas.

The ladle itself may be filled with an inert or reducing gas by means of the hoses 29 and corresponding valve button 32, while the valve 14 is lifted slightly, and after the valve has been seated the gas in the ladle may be maintained by merely having a slight increase in pressure over the outside atmosphere, the gas tending to escape

through the cracks around the cover and through the hole 22 around the rod 23.

With the ladle full of such gas, it may then be inserted in the furnace, and may have its nozzle opening 13 inserted through the free surface of the metal past any oxides or impurities which may rest upon the surface. The valve 14 may then be opened by rotating the crank handle 36 in a clockwise direction, looking at the right end of Fig. 1, to lift the ball 14.

The molten metal will then pass up into the ladle from the bottom until a suitable supply is acquired in the ladle, preferably at a level below the crank fitting 37 when the valve 14 may be closed by rotating the crank handle 36 backward in a counterclockwise direction, and the valve will be held in this closed position by the metal in the ladle as the ladle is lifted from the molten metal in the furnace and carried to the point of pouring the casting.

If a neutral or reducing atmosphere is used, this gas, having previously been placed in the ladle, will be driven out as the ladle is filled from the bottom, but sufficient will rest on top of the molten metal to maintain neutral or reducing conditions. If any small amount of oxides may have been caught in the nozzle 13 of the ladle when it is pushed through the surface of the molten metal in the furnace, these will pass to the top of the molten metal in the ladle.

Assuming that the mold is also to be gassed with an inert atmosphere or a reducing atmosphere, the nozzle 13 is placed adjacent the filling opening of the ladle, and, by means of the push-button valve 31, the gas, which is usually heavier than air, is caused to pass down the hose 27 and down the valve tube 23 through the valve conduit 24, into the mold, displacing all of the air in the mold, until the mold is filled with this inert or reducing atmosphere. Thereafter, the valve 14 may again be opened by turning the crank handle 36 clockwise, looking at the right end of Fig. 1, and the metal will run out of the bottom of the ladle into the mold, the oxides or other light inclusions staying at the top of the surface of the metal in the ladle.

If only enough metal is included in the ladle for one casting, the oxides at the top of the molten metal in the ladle will come out last through the discharge opening 13, and will be located in the sprue of the casting. The same result will be secured if there is sufficient metal in the ladle for a number of castings, as the oxides and other light inclusions resting on top of the molten metal in the ladle will then be in the sprue of the last casting.

It will thus be observed that I have invented an improved ladle by means of which the presence of oxides or other inclusions in the poured castings is minimized or substantially eliminated. My ladle may be used with an inert or reducing atmosphere on top of the metal in the ladle, and it may also be used to gas the mold and apply such atmosphere to the interior of the mold preliminary to the pouring of the casting so that oxidation of the metal is reduced to a minimum.

The discharge nozzle of the ladle may be made to fit the filling opening of the mold so that metal passes directly from the ladle into the filling openings of the mold without oxidation. As the present ladle is adapted to be filled from the bottom and from below the surface of the metal in the furnace, the oxides and other impurities which rise to the surface of the molten metal are left in the furnace. Any small amount of oxides

which might impinge upon the discharge opening of the ladle as it is passed through the free surface of the molten metal, may pass to the surface of the molten metal in the ladle and is there retained until it is at last discharged into the sprue of a casting.

As the ladle will fill to a depth which depends upon the depth of its immersion in the molten metal of the furnace, it is not necessary to remove the cover or to have any other indication of the amount of its filling, but in casting certain metals no cover need be employed.

While I have illustrated a preferred embodiment of my invention, many modifications may be made without departing from the spirit of the invention, and I do not wish to be limited to the precise details of construction set forth, but desire to avail myself of all changes within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is:

1. In a portable ladle for filling molds without exposing the molten metal to oxidation, the combination of a round metal receptacle tapered toward its lower end and provided at its lower end with a circular filling and discharge opening communicating with a tubular downwardly projecting locating spout for engagement in the filling opening of a mold, a handle for said ladle, comprising an elongated pipe having one end secured to said receptacle and communicating with the receptacle, the other end being for support by the hands, an elongated shaft rotatably mounted in said pipe handle and projecting from the outer end thereof, a manual actuating member carried by the outer end of said shaft, a radially extending arm carried by the inner end of said shaft, an eccentrically located pin extending substantially parallel to said shaft and carried by said arm on an axis eccentric to said shaft, a cover for said receptacle, and a ball valve for opening or closing said discharge and filling opening, said ball valve being carried by a rod extending substantially axially of the receptacle and discharge opening, said rod having a bearing for said eccentric pin, and the said elongated shaft being rotatable to lift said ball valve from said discharge opening, the manual actuating means and ball valve and metal in the receptacle serving to hold the ball valve in closed position after the receptacle has been filled with molten metal, the said receptacle being filled by pressing the receptacle down into the molten metal with the filling opening open, and the metal being retained by moving the ball valve to close the filling opening, and the metal being transferable to a mold through the same discharge opening by the opening of the ball valve, with the tubular spout located in the filling opening of the mold.

2. In a portable ladle for filling molds without exposing the molten metal to oxidation, the combination of a round metal receptacle tapered toward its lower end and provided at its lower end with a circular filling and discharge opening communicating with a tubular downwardly projecting locating spout for engagement in the filling opening of a mold, a handle for said ladle, comprising an elongated pipe having one end secured to said receptacle and communicating with the receptacle, the other end being for support by the hands, an elongated shaft rotatably mounted in said pipe handle and projecting from the outer end thereof, a manual actuating member carried by the outer end of said shaft, a radially extending arm carried by the inner end of said shaft, an eccentrically located pin extending substantially parallel to said shaft and carried by said arm on an axis eccentric to said shaft, a cover for said receptacle, and a ball valve for opening or closing said discharge and filling opening, said ball valve being carried by a rod extending substantially axially of the receptacle and discharge opening, said rod having a bearing for said eccentric pin, and the said elongated shaft being rotatable to lift said ball valve from said discharge opening, the manual actuating means and ball valve and metal in the receptacle serving to hold the ball valve in closed position after the receptacle has been filled with molten metal, the said receptacle being filled by pressing the receptacle down into the molten metal with the filling opening open, and the metal being retained by moving the ball valve to close the filling opening, and the metal being transferable to a mold through the same discharge opening by the opening of the ball valve, with the tubular spout located in the filling opening of the mold, the said rod comprising a metal pipe extending from the ball valve through an opening in said cover, and a flexible conduit carried by said pipe for connection to a source of inert gas, the said cover also having a flexible conduit connected to it for connection to a source of gas for maintaining a neutral gas above the molten metal, both said conduits being carried at their free ends by said handle, and the first-mentioned conduit and pipe communicating with said spout through a bore in the ball valve, for permitting the preliminary gassing of the mold to remove the air and replace it with a suitable gas.

JOHN A. TOLEIK.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,261,509	Getman	Apr. 2, 1918
1,280,973	Dowrey	Oct. 8, 1918
1,332,973	Clark	Mar. 9, 1920
2,020,101	Brown	Nov. 5, 1935
2,113,894	Lucier	Apr. 12, 1938
2,359,524	Lane	Oct. 3, 1944

FOREIGN PATENTS

Number	Country	Date
261,607	Germany	June 26, 1913