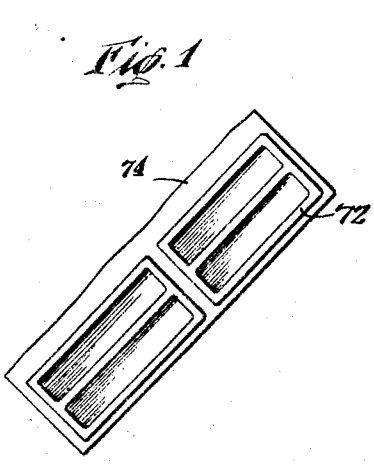
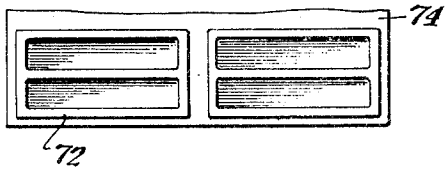
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MECHANISM FOR HANDLING MOLTEN METAL

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Fig. 1





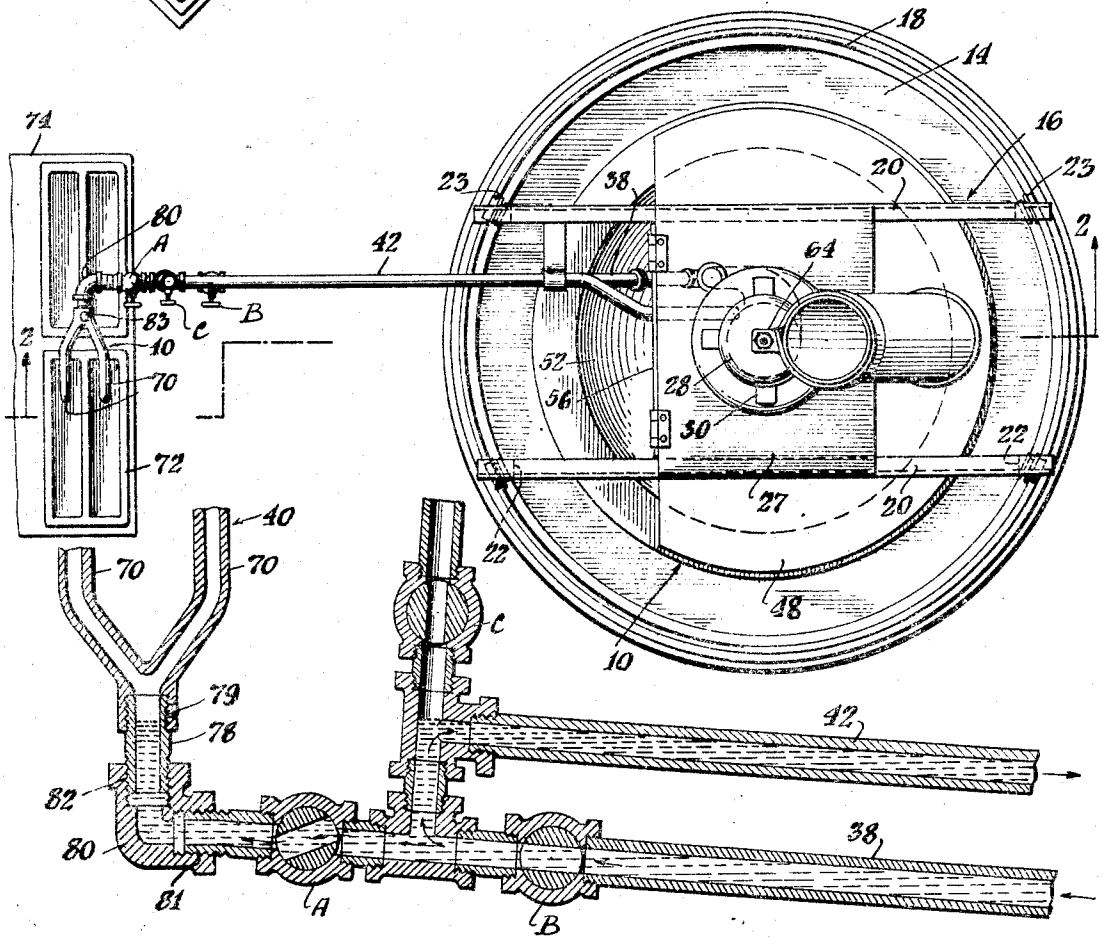
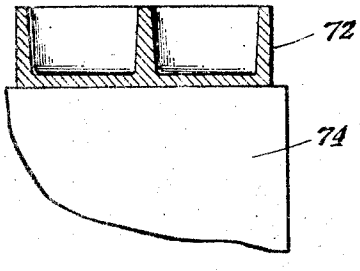


Fig. 3



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Fig. 4

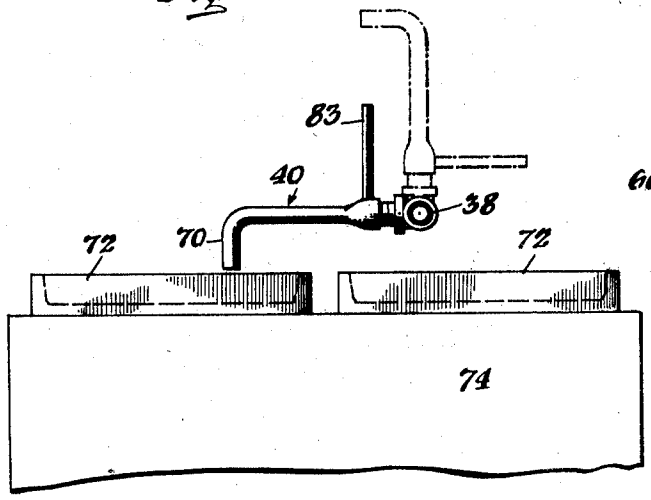


Fig. 2

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2,364,615

MECHANISM FOR HANDLING MOLTEN METAL

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Application July 22, 1942, Serial No. 451,827

12 Claims. (Cl. 22—79)

This invention relates to mechanism for handling molten metal and more particularly to an improved apparatus for pouring molten metal into molds. The invention is especially useful for transferring metal directly from the melting pot into molds without the use of ladles or similar auxiliary handling equipment. Various kinds of metals and alloys can be handled by the apparatus of this invention such as, molten lead, tin, zinc, aluminum, babbitt, type-metal, and the like.

One object of the invention is to provide an apparatus of the character described which is operable to maintain a continuous flow of molten metal from the melting pot through the apparatus whereby the parts are kept heated sufficiently high to prevent cooling of the molten metal to a point where its discharge from a pouring spout is interrupted.

Another object of the invention is to provide an apparatus for handling molten metal which is simple in construction but highly efficient in operation and wherein the stream of molten metal can be easily controlled so that no splashing occurs and whereupon excess metal is returned to the melting pot to stir the melt.

Another object is to provide an improved mechanism for dispensing metal directly from the melting pot so that exposure of the molten metal to air and the atmosphere in which the operator is working is held to a minimum thereby decreasing the amount of oxidized metal ordinarily formed while affording increased safety to the operator.

A further object is to provide a device of this nature which utilizes a pump, discharge and return pipe line and nozzle mechanism for conveying and handling the molten metal, and wherein the mechanism is supported over the melt and moved as a unit while connected therewith, whereby molten metal may be discharged into molds or receptacles disposed in the form of a circle about the melting pot.

Although the novel features which are believed to be characteristic of this invention will be more particularly pointed out in the claims appended hereto, the invention itself, as to its other objects and advantages and manner of operation may be better understood by referring to the following description taken in connection with the accompanying drawings forming a part thereof, in which:

Figure 1 is a plan view of one form of apparatus for practicing the invention and wherein molds for forming castings are shown arranged thereabout;

Figure 2 is a sectional elevation view taken substantially on the line 2—2 of Figure 1 and looking in the direction of the arrows;

Figure 3 is a fragmentary sectional view taken through the pipe line system and nozzle means, and indicating by arrows the normal course followed by the liquid metal when the pump is operating and the nozzle is in raised non-pouring position;

Figure 4 is an enlarged elevational view taken substantially on the line 4—4 of Figure 2 looking in the direction of the arrows, the mold stand being shown partly broken away.

Referring to the drawings in detail, particularly Figures 1 and 2, the numeral 10 designates a melting pot or reservoir for holding molten metal 12, which is to be cast. The melting pot is supported on a circular wall means 14, as shown in Figure 2, and sufficient heat is supplied to the pot to maintain its contents, for example lead, in a molten state. Any suitable means for heating the pot to melt and maintain the metal at the desired temperature may be used.

A carriage-like movable frame means 16 is disposed over the melting pot 10. This frame is arranged to rotate about its vertical axis while supported on the endless track 18 which extends around the melting pot on top of the wall means 14. A frame of sturdy construction is provided and, as illustrated, comprises the spaced beams 20, spanning the melting pot, which are tied together by suitable cross members 21 to form a rigid structure. The under frame portion 22 is fitted with wheels 23 which are set on a radius to run on the track 18.

In order to feed the molten metal from the pot 10, a rotary pump means 25 is utilized which is carried by the frame 16 and positioned near the bottom of the melting pot or so that it is immersed in the molten metal when in use. The pump is preferably of the gear type but any other kind may be used as the particular design of the pump is not a feature of this invention. As illustrated in Figure 2, the pump 25 is suitably fastened to the frame 16 by securing the upper end portion of the pump drive shaft housing 26 to the member 27 attached to the frame. A motor 28 is utilized to operate the pump. This motor is supported on the frame 16 and preferably mounted a suitable distance above the melt as by fixing the motor bracket means 30 on the stand 31 which in turn is fastened to the frame. The pump shaft 32 is extended and drivingly connected to the motor drive shaft 34 through a suitable clutch means 36 in the conventional manner.

During the dispensing operation, molten metal is pumped from the melting pot through the pipe line 38 and is discharged from the nozzle means, generally designated 40. To provide for continuous circulation of hot molten metal through the parts to prevent freezing of the metal which would interrupt the discharge of molten metal from the nozzle, a return pipe line means 42 is connected to the discharge line 38 near its outer end. The apparatus is arranged to deliver excess metal to the discharge nozzle means 40 which is returned to the melting pot through pipe 42 as shown in Figures 2 and 3. Suitable means are provided for fixedly attaching the pipe lines 38 and 42 to the rotatable frame 16, as shown at 44 and 46.

A hood 48, having depending side wall means 49 and a communicating duct 50 is arranged over the melting pot 10 to limit the access of air and carry off any vapors formed. This hood and associated duct is carried by the frame 16 and moves therewith. Preferably, the hood 48 extends only partially over the top of the melting pot leaving an open space 52 through which pipes 38 and 42 are conveniently arranged to pass. A hinged door member 56 provides a closure for the hood adjacent the opening 52. This door can be swung back to afford access to the interior when desired.

The return pipe 42 passes through an aperture 57 in the door 56 and the discharge end portion is curved downwardly and extended, as shown at 58, so that the molten metal returned is discharged below the surface of the melt. This provides an effective way of maintaining the molten metal in the melting pot thoroughly stirred while it is being dispensed which is desirable. Circulation of the molten metal in the pipes 38 and 42, it will be observed, performs the dual function of preventing the molten metal from chilling in the outermost pipe and nozzle sections, which would interfere with the delivery of metal, while at the same time serving to effectively stir the melt.

In my improved apparatus, the pump, connecting pipes and attached nozzle means are carried by the frame 16 and move as a unit therewith as the frame is turned about on the track 18. To permit the duct 50 to move with the frame 16 while remaining in communication with a stationary stack portion 60, the stack 60 is connected with the duct 50 by means of a telescoping stationary section 62 which is positioned so that its longitudinal axis coincides with the extended central axis about which frame 16 rotates. A rotatable joint, such as illustrated at 63 in Figure 2, is preferably provided. The duct 50 is held rigidly in place by suitably securing it to the top of motor 28 by means of a brace member 64.

In order to regulate the flow of metal in the pipes 38 and 42, valves A, B and C are provided in the system as illustrated in Figure 3. By varying the setting of valves A and B, the flow of metal through pipe lines 38 and 42 can be balanced so that no overflow from the nozzle 40 occurs when it is tipped up in the position shown in Figure 3. The surplus flow of molten metal, in this instance, is diverted back to the melting pot 10 by way of the pipe 42 which is suitably connected to the discharge pipe 38 between the valves A and B. The return pipe line 42 connects with the discharge line 38 sufficiently near the nozzle 40 so that heat from the molten metal flowing through the system is continuously supplied to the nozzle and associated parts to prevent freezing of the molten metal in these parts when the nozzle 40 is cut off or turned up as illustrated in Figure 3. Valve C is placed in the return line, as shown, to provide means for venting the pipe line.

The nozzle 40 is preferably forked to form two pouring spouts 70. This permits the simultaneous filling of two single or compound molds, as illustrated at 72. Nozzles having any desired number of spots may be used. The molds 72 are supported on stands 74 in the conventional manner and arranged in a circle about the melting pot as shown in Figure 1. A manifold pipe section 78 is attached to the nozzle 40 and is fixedly secured thereto by means of a set screw 79. At the opposite end, the manifold section 78 is connected to an elbow pipe member 80 which is threaded onto the outer end of the pump discharge pipe line 38. The elbow pipe 80 comprises the threaded sections 81 and 82 which permit turning of the nozzle to different positions of adjustment.

A handle member 83 is preferably provided on the nozzle 40, as illustrated in Figures 2 and 4, to facilitate turning the nozzle up or down and sideways to adjust the flow of metal from the spouts 70. Pouring of molten metal from the spouts 70 is controlled by raising or lowering the nozzle as by turning it about the pipe thread section 81. To proportion the discharge from the two pouring spouts 70, the nozzle manifold 78 is rotated about the threaded pipe sections 82 which will cause unequal streams of metal to flow from the spouts depending upon the amount of rotation.

The operation and use of my apparatus will be readily understood by those skilled in the art from the foregoing description. When casting with my apparatus the molten metal can be melted and pumped directly from the melting pot into the molds arranged therearound as illustrated in the drawings and the use of hand or crane operated ladles or the like equipment is unnecessary. Further, by utilizing my apparatus the casting operation is markedly speeded up and freezing and clogging of the nozzle or discharge line is avoided. Also as a result of the novel arrangement of the discharge line and valve control means, it is possible to accurately regulate the flow of metal so that no splashing or undue exposure of the molten metal to air during casting occurs.

The apparatus is adapted for a wide range of capacities and may, if desired, be mounted on a portable base for transportation. It will also be understood that the apparatus may be modified to adapt it to varying conditions and uses without departing from the spirit and scope of the invention as defined by the claims.

What is claimed is:

1. Apparatus for handling and dispensing molten metal comprising a melting pot, a frame mounted thereover, said frame being movable relative to said melting pot, a pump disposed in said melting pot and carried by said frame, means for operating said pump, a discharge conduit connected to said pump through which molten metal is forced from said pot into molds or the like receptacles, means comprising a second conduit which is connected to said discharge conduit near its outlet for by-passing excess molten metal back to said melting pot.

2. Apparatus for handling and dispensing molten metal comprising a melting pot, a frame arranged thereover which is movable relative to

said melting pot, a pump carried by said frame and suspended in said melting pot, means for operating said pump, discharge conduit means connected to the outlet of said pump through which molten metal is adapted to be pumped, nozzle means on the outer end of said discharge conduit, means for by-passing molten metal flowing through said conduit back to said melting pot, said by-pass means being connected to said discharge conduit in close proximity to said nozzle whereby molten metal retained in said nozzle when the same is shut off is maintained molten by heat supplied by the metal circulated through said discharge conduit and by-pass means to said melting pot.

3. Apparatus for handling and dispensing molten metal from a melting pot or receptacle holding molten metal comprising a frame means disposed adjacent to said melting pot and movable relative thereto, a pump carried by said frame and arranged to be immersed in the molten metal contained in said receptacle said frame being supported for movement on a circular endless track which extends around said melting pot, means for operating said pump, a discharge line connected to said pump from which molten metal is dispensed, means for circulating at least a portion of said molten metal entering said discharge line back to said receptacle to maintain the molten metal thoroughly mixed in said receptacle while at the same time preventing freezing of the molten metal in the discharge line or associated parts during the dispensing operation.

4. Apparatus for handling and dispensing molten metal into molds or the like comprising a frame, a pump mounted on said frame which is adapted to be positioned and operated to pump molten metal from a melting pot or receptacle containing molten metal, said pump having a discharge line extending from said pump, nozzle means on the outer end of said discharge line, return line means connected with said discharge line adjacent said nozzle means for conducting excess molten metal delivered to said nozzle back to said receptacle, said pump, discharge and return line means being supported for movement as a unit relative to said melting pot and forming a circuit through which molten metal may be continuously circulated, said pump and associated molten metal dispensing mechanism being carried by the frame, said frame being supported for rotation on a track arranged around said melting pot.

5. An apparatus according to the preceding claim wherein valve means are provided in the discharge line for controlling the flow of molten metal through the discharge and return lines.

6. Apparatus for handling and dispensing molten metal from a melting pot into molds or the like arranged in a circle thereabout comprising a pump and discharge conduit means, structural frame means arranged adjacent said melting pot for supporting said pump and discharge conduit, means for operating said pump carried by said frame, molten metal passageway means communicating with said discharge conduit near its outer end and extending back to said melting pot for returning a portion of the molten metal being pumped through said discharge conduit to said pot, means for rotatively supporting said frame and associated parts whereby said discharge conduit can be moved laterally in a circle about said melting pot to dispense molten metal into molds stationed therearound.

7. Apparatus for handling and dispensing molten metal from a melting pot or container comprising a movable frame means, a pump and discharge conduit carried by said frame, a hood mounted on said frame and disposed over said melting pot, a duct connected to said hood and communicating with a stack, a nozzle on said discharge conduit for controlling the flow of molten metal dispensed, means for by-passing a portion of said molten metal flowing through said discharge conduit back to said melting pot whereby sufficient heat is continuously supplied to the nozzle and associated discharge conduit sections to prevent chilling of the molten metal to a point where clogging of the apparatus would result, said by-passed metal being arranged to discharge below the surface of said molten metal in the melting pot to effect a thorough mixing of the melt.

8. An apparatus according to the preceding claim wherein the nozzle comprises a number of spouts for discharging molten metal simultaneously into a plurality of molds, said nozzle being adjustable whereby the same can be raised or lowered to control the pouring of the molten metal from said spouts or turned sideways to vary the proportionate amount of molten metal discharged from said spouts.

9. Apparatus for handling and dispensing molten metal from a melting pot or similar receptacle comprising a frame, said frame being supported for rotation on a track adjacent said melting pot, a pump and discharge conduit means carried by said frame and arranged so that the pump can be disposed in said melting pot, means for operating said pump, a hood and connecting stack means supported by said frame and adapted to be positioned over at least a portion of the melt, additional conduit means carried by said frame and communicating with said discharge conduit near its outer end for conveying at least some of the molten metal which is pumped through said discharge conduit back to said melting pot to stir the melt and maintain the discharge conduit heated whereby molten metal can be dispensed intermittently therefrom.

10. In apparatus of the class described, mechanism comprising a pump for pumping molten metal, discharge conduit means connected to the outlet side of said pump, return conduit means communicating with said discharge conduit intermediate its ends to provide for continuous circulation of molten metal through said discharge and return conduits when said pump is in operation, said discharge and return conduits being arranged to be swung about the melt as a unit whereby molten metal can be dispensed into receptacle means disposed adjacent thereto, valve means positioned in said discharge conduit beyond the juncture of said return conduit with said discharge conduit, additional valve means positioned in said discharge conduit between said juncture and said pump, said valves being adjustable to regulate the flow of molten metal through said conduits.

11. In apparatus of the class described, mechanism comprising a pump, interconnected discharge and return pipe line means to provide for continuous flow of molten metal through the apparatus, means for supporting said mechanism over a container holding molten metal, said mechanism being arranged to be rotated as a unit whereby molten metal can be discharged into molds disposed about the melt, a plurality of valves disposed in said line for controlling the flow of molten metal through said apparatus, and

adjustable nozzle means disposed on the outer end of said discharge pipe for regulating the pouring of the molten metal into said molds.

12. In apparatus of the class described, mechanism for dispensing molten metal from a melting pot or similar receptacle, said mechanism comprising a rotatable frame, a pump and discharge conduit carried by said frame, said pump being adapted to be suspended in said melting pot while pumping molten metal from said pot outward through said discharge conduit, means for operating said pump, a hood carried by said frame and movable therewith, said hood being arranged over said melting pot, a duct connected to said hood for conveying away vapors, a stationary stack means communicating with said duct, said stack being continuously connected to said duct by a rotatable section which is positioned so that the axis about which it rotates is in alignment with the vertical axis about which said frame rotates.

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