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PUMP AND AGITATOR FOR MOLTEN METAL

Filed August 15, 1925

2 Sheets-Sheet 1

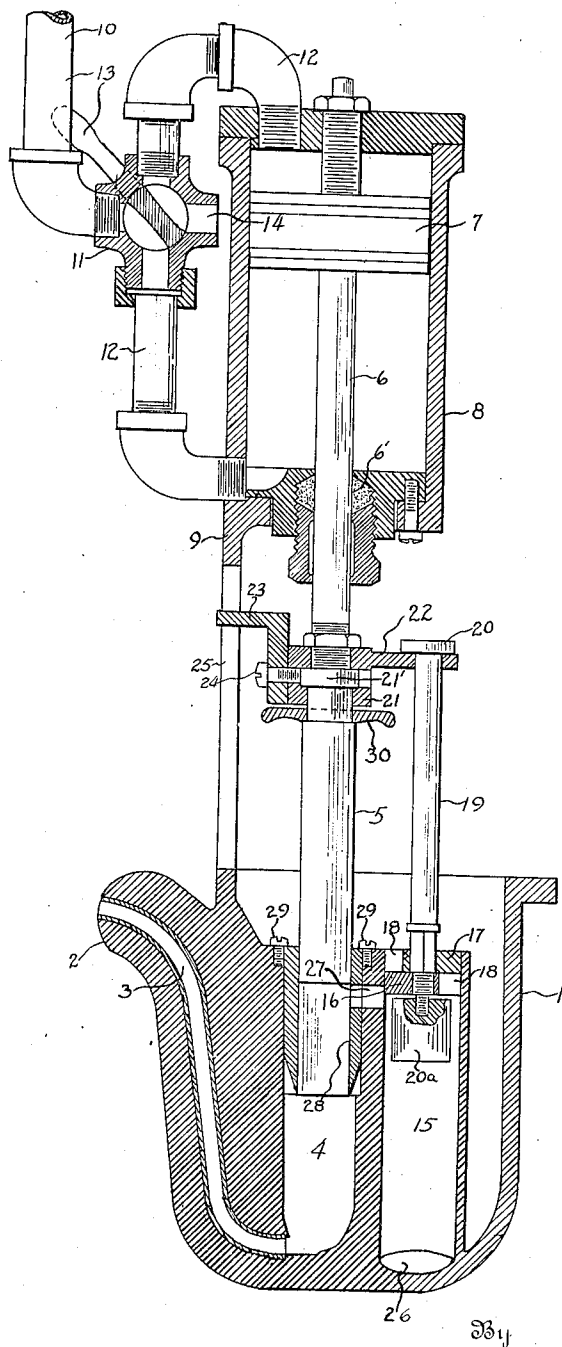


Fig. 1.

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2 Sheets-Sheet 2

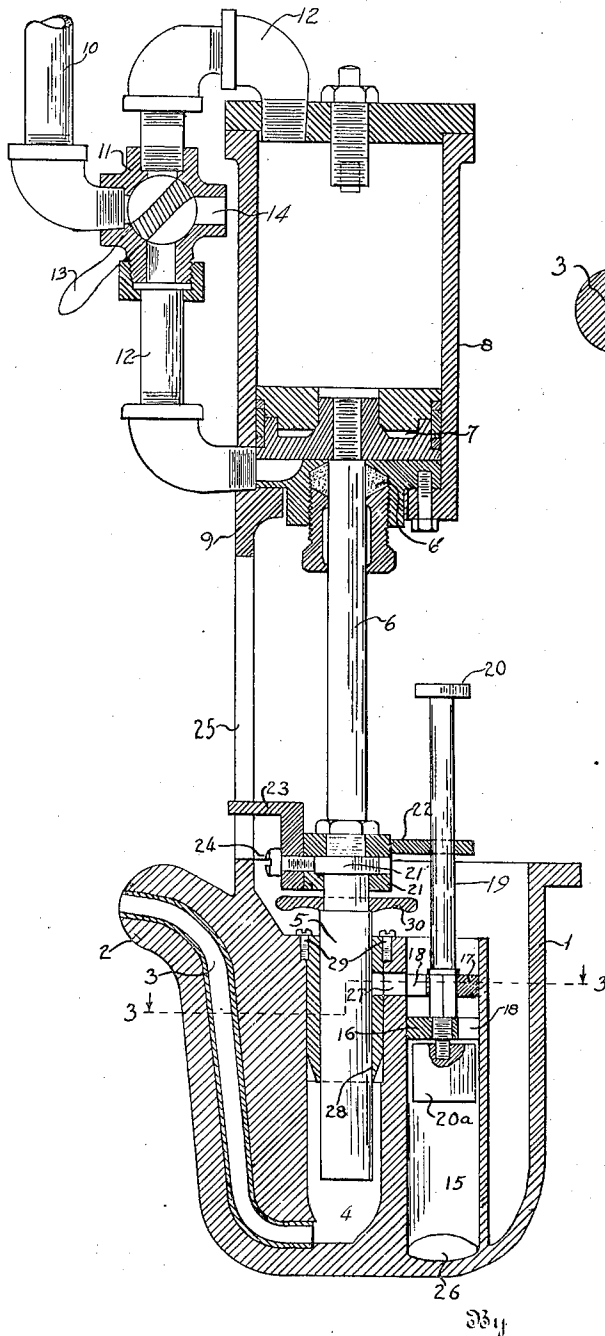


Fig. 3.

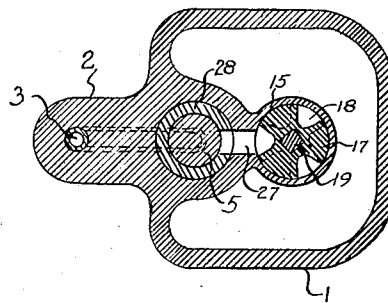


Fig. 2

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UNITED STATES PATENT OFFICE.

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PUMP AND AGITATOR FOR MOLTEN METAL.

Application filed August 15, 1925. Serial No. 50,425.

This invention relates to pumps and agitators for molten metal.

It is an object of the invention to arrange a mixing device in the molten metal container of a die casting machine for the purpose of agitating or stirring up the mixture of metals usually employed in forming die castings, and preventing the same from settling to separate levels according to the different specific gravities of the components of the mixture.

A further object of the invention is to provide a common actuating means for such a mixing device and for simultaneous operation with pressure discharging means by which the molten metal is forced through the outlet of said container.

The invention consists further in certain structural features of the metal container, mixing valve, pump and discharging plungers.

A preferred embodiment of the invention is hereinafter described and is illustrated in the accompanying drawings, wherein:—

Fig. 1 is a sectional elevation of the improved machine, showing the raised position of the pump plunger.

Fig. 2 is a similar view in which the plunger is shown lowered.

Fig. 3 is a cross sectional view of the molten metal container, the section being taken upon the line 3—3 of Fig. 2.

In these views the reference character 1 designates a melting pot or open-topped container for the molten metal to be cast. Said container is formed with an integral spout 2, and in the end thereof, there opens the discharge end of a pipe 3, which is cast into the spout and which has its inlet end opening into the lower extremity of a well or pump barrel 4 formed integral with the container 1 therein. A plunger 5 reciprocatory in said barrel is connected by a piston rod 6, to a piston 7 arranged for reciprocation through a suitable stuffing box 6' in a cylinder 8. Said cylinder is supported at a suitable elevation above the container 1 by a standard 9 suitably mounted upon said container. Air or other suitable fluid, supplied by a pipe 10, is adapted by a three-way valve 11, to be admitted alternatively to the ends of the cylinder through branches 12 communicating therewith, said valve being controlled by a lever 13 and having a port 14 through which air exhausts

from the cylinder at one side of the piston 7 when being admitted at the other side thereof.

Within the container 1, a second barrel 15 is formed integral with and adjacent to the barrel 4 and receives a vertically reciprocatory two-part mixing piston valve 16—17. The members 16 and 17 have duplicate openings 18, non-registering, the former member being fast upon the lower end of a plunger-rod 19, and the latter non-rotatively slidable thereupon above the former. Thus said slidable member acts as a check-valve to close the openings of the lower member, upon the up-stroke of the plunger-rod 19, but rises as the plunger-rod travels downwardly to permit molten metal to flow upwardly through said openings. The upper end of the rod 19 is headed as indicated at 20. Upon the lower end of said rod there is secured within the barrel 15 a weight 20^a, which serves to induce downward travel of the rod and valve members 16, 17. The pump plunger 5 and its actuating rod 6 are connected by a coupling member 21, said rod being connected rigidly to said coupling and the plunger being engaged therewith rotatively by a swiveled connection 21'. 22 is an arm integral with said coupling, apertured to loosely embrace the plunger-rod 19. Said arm, engaging beneath the head 20, serves to raise the rod 19 and its valve 16—17 in unison with the plunger 5 when the latter is raised, permitting the pump plunger, however, to be lowered in advance of the mixing plunger 16—17. From the coupling 21 there also projects a guide finger 23, secured to the coupling by a screw 24, and which is adapted to slide in a guide-way formed by a vertically elongated slot 25 in the standard 9. 26 is an inlet to the lower end of the barrel 15 from the bottom portion of the container 1, and 27 is a delivery passage from the upper end of said barrel into the corresponding end of the barrel 4. Said passage extends through a bushing 28, which is rigidly secured by screws 29 in the upper portion of said barrel, said bushing forming a slide bearing for the plunger 5 and spacing the latter from the inner wall of the barrel 4. The lower end portion of the bushing 28 is gradually tapered and reduced toward the plunger 5, being thus adapted to act as a blade to wipe the molten metal cleanly from the plunger as the latter is drawn upwardly

into said bushing. Furthermore the pressure of the molten metal acting during the downstroke of the pump plunger externally upon the reduced end portion of the bushing tends to compress said end about the plunger 5 and thus increase the sealing effect of said bushing. Upon the upper end of the stem 5, just below its connection with the piston rod 6, is secured a guard collar 30 which serves as a shield to prevent spreading of any of the liquid metal that may be squirted up around the plunger 5 upon the down stroke of said plunger.

Considering now the operation of the described invention, when it is desired to effect a discharge of molten metal, the valve 11 is adjusted as shown in Fig. 2, admitting air above the piston 7 and providing for the exhaust of air from below the piston by way of the port 14. The piston 7, being thus forced down, acts through the rod 6 to lower the plunger 5, displacing molten metal from the barrel 4 through the passage 3 and forcing such metal under pressure into the mold (not shown) which, for that purpose is placed in communication with the spout 2. Having maintained pressure on the metal for the necessary time interval, the position of the valve 11 is reversed, so as to admit air below the piston 7 and provide for a discharge from the upper end of the cylinder 8. The piston 7, rod 6, and plunger 5 are now moved to their raised positions. (See Fig. 1.) The port 27 is thus uncovered and molten metal flows from the barrel 15 into the pump barrel 4 to satisfy the vacuum tendency induced in the latter by the upward stroke of the plunger. Thus the pump is ready to again effect a discharge of metal when the plunger 5 is again downwardly actuated. With each upstroke of the plunger 5, the mixing piston valve 16—17 is also raised, owing to the engagement of the arm 22 beneath the head 20. During this travel, the valve member 17 seats upon the member 16 closing the openings 18. Consequently the metal above said piston valve is ejected from the open upper end of the barrel 15 into the upper portion of the container 1, flowing downwardly and intermixing with the metal therein as the latter is drawn from the bottom of said container into said barrel in refilling the same. Thus it is assured that the metal discharged is well and uniformly mixed since it undergoes a thorough agitation just before entering the pump barrel, while the displacement of metal from the barrel 15 into the container 1 upon each upstroke of the piston valve 16—17 tends to maintain a constant proper mixture of the metals in the container. When the plunger 5 is downwardly actuated, the mixing valve 16—17, with its plunger-rod 19 and weight 20^a lags behind. The member 17 rises under

pressure of the underlying molten metal, permitting the latter to flow up through the openings 18, while the weight 20^a forces said parts gradually down. This provision for a relatively slow lowering of the valve 16—17 is necessary to prevent metal being spouted up too forcibly through the openings 18.

The described construction provides by a simple and inexpensive mechanism for an agitation of the die casting metal such as will avoid unsatisfactory castings resulting from variations in the mixture due to the mixed metals seeking different levels and separating.

What I claim is:—

1. In combination, a container for molten metal, a mixing plunger mounted for substantially vertical reciprocation in said container, and weighted to effect its downward travel, a pump for effecting a discharge of molten metal from said container, said pump comprising a vertically reciprocatory plunger and a loose connection between the pump plunger and mixing plunger for raising the latter by the former.

2. In combination, a container for molten metal, a mixing plunger mounted for substantially vertical reciprocation in said container and weighted to effect its downward travel, an ejector for effecting a discharge of molten metal from said container, and a common means for raising said mixing plunger and actuating said ejector.

3. In combination, a container for molten metal, a mixing plunger adapted for substantially vertical reciprocation within said container, a barrel in which said plunger works, having an inlet thereto, from the lower portion of the container, a pump for effecting a discharge of molten metal from the container, said pump having its inlet opening into the upper portion of said barrel, and a common actuating means for said pump and plunger.

4. In combination, a container for molten metal, a mixing plunger adapted for substantially vertical reciprocation within said container, said plunger being weighted to effect its downward travel, a barrel in which said plunger works, having an inlet thereto from the lower portion of said container, a substantially vertical pump for effecting a discharge of molten metal from said container, and a loose connection between the plunger of said pump and said mixing plunger for actuating the latter upwardly by the former.

5. In combination, a container for molten metal, a plunger barrel extended substantially vertically in said container and having an inlet thereto from the lower portion of the container, a mixing plunger having a piston reciprocatory in said barrel, formed with a passage therethrough, said piston

having a provision for closing said passage responsive to downward pressure thereon and for opening said passage responsive to upward pressure on the piston, a pump for discharging molten metal from said container, said pump having its inlet opening into the upper portion of said barrel, and a common actuating means for said pump and mixing plunger.

6. In combination, a container for molten metal, a plunger barrel having an inlet to one end thereof from the lower portion of said container and having its other end in open communication with the upper portion of said container, a mixing plunger having a piston reciprocatory within said barrel, formed with a passage therethrough, said piston having a provision for closing said passage responsive to downward pressure thereon, and for opening said passage responsive to upward pressure on the piston, said plunger being weighted to effect its downward travel, a pump for discharging molten metal from said container having its inlet opening into the upper portion of said barrel, and a loose connection between the plunger of said pump and said mixing plunger for effecting raising of the latter by the former.

7. In combination, a container for molten metal, a pump barrel integral with said container and having an inlet thereto from said

container, a plunger operating in said barrel, and a bushing rigidly mounted in the inlet end portion of said barrel slidably embracing the plunger and spacing the latter from the inner wall of said barrel.

8. A pump for the discharge of molten metal, comprising a barrel and a plunger, and a bushing slidably embracing the plunger and rigidly secured in the inlet portion of said barrel, the inner end portion of said bushing being reduced to yieldably embrace said plunger.

9. In combination, a container for molten metal, a pump barrel within said container having an inlet thereto from said container, a plunger operating in said barrel, and a collar carried by said plunger above said barrel for limiting upward squirting of metal around the plunger on its pressure stroke.

10. In combination, a container for molten metal having a discharge spout, a pump barrel within said container, a pipe cast into said container, and forming an outlet from the lower end of the barrel through said spout, a plunger operating in said barrel, and actuating means for said plunger.

In testimony whereof I sign this specification.

ADELBERT E. HOWES.