Dec. 11, 1934. J. A. NOCK, JR 1,983,580

METAL TRANSFER DEVICE

Filed Dec. 3, 1932

Fig. 1.

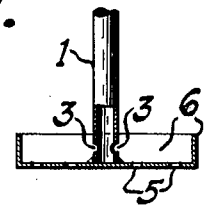


Fig. 2.

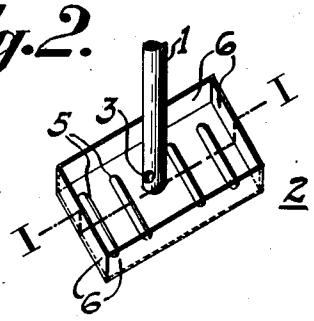
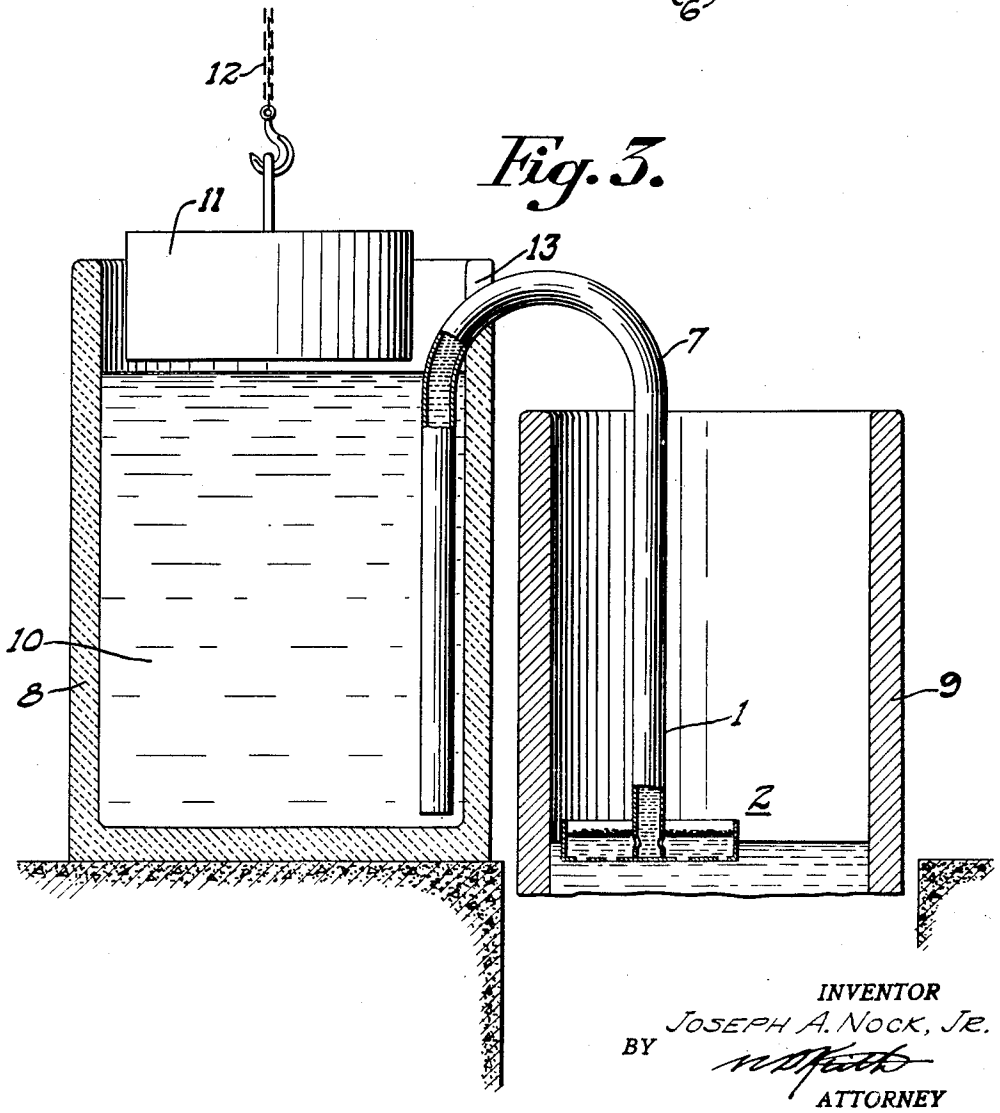


Fig. 3.



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METAL TRANSFER DEVICE

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4 Claims. (Cl. 22—79)

This invention relates to the transfer of molten metal. It relates in particular to the provision of an improved device for use in combination with a transfer apparatus of the vertical discharge type, such as a siphon, for example, to secure simultaneously the quiet transfer of molten metal and the removal of dross therefrom.

In pouring most castings, but especially in casting ingots to be rolled into sheet, difficulty is encountered in preventing the inclusion of some dross or oxide material, which usually floats on the surface of the metal in the casting crucible. This is particularly true with the light metals, such as aluminum for example, due to the relatively high specific gravity of the dross materials and the relatively low specific gravity of the metal. In the vertical type of transfer apparatus, further difficulty is encountered due to the high velocity of the discharge which, if unchecked, often creates a turbulence violent enough to entrap dross and cause it to become intimately entrained in the metal cast, which at times leads to serious defects.

The primary object of my invention is to provide a device for use in combination with a metal transfer device having a vertical discharge which will remove the dross and greatly retard the velocity of the stream of metal discharged.

A further object is to provide a device which will overcome the difficulties described hereinabove and which is simple and convenient to operate and of strong and rugged design.

This and other objects and attainments will be more fully appreciated upon reference to the following description and the accompanying drawing, in which:

Fig. 1 is a vertical sectional view of a preferred embodiment of my invention, taken on the center line I—I of Fig. 2, with parts in elevation;

Fig. 2 is a perspective view of my improved device; and

Fig. 3 is a diagrammatic view showing partially in vertical section and partially in elevation an assembly for the transfer of molten metal in operating position between and connecting a receiver partially filled with molten metal and a crucible containing molten metal.

Referring to the drawing, in which like reference numerals have been used to designate like parts, Figs. 1 and 2 show the end of a vertical discharge tube 1 of a siphon or other metal transfer device provided with a device 2 for diffusing metal and removing dross therefrom in accordance with my invention. The end of the tube is closed by securely fastening it to the bottom of the tray or similar device 2, as by welding or other suitable means. Lateral ports 3 are cut in the tube, adjacent but usually somewhat above its lower end, and preferably on opposite sides of the tube and along the longitudinal axis of the tray, as shown. Other symmetrical arrangements of the ports may sometimes be used, however. Transverse slots 5 are formed in the bottom of the tray, and extend substantially across the bottom thereof. The combined area of these slots is preferably several times the combined area of the ports 3 in the tube 1. These transverse slots constitute an important feature of my invention. I have found that a screening and diffusing device of the type described but having a bottom perforated with round holes or openings of other shape having a maximum dimension smaller than that of the preferred slots is operative, but I have found that because of the increased wall surface exposed to the metal, the consequently increased friction, and/or the increased tendency for such holes to close, and sometimes for other reasons, a device having a bottom so constructed is not as satisfactory or efficient as a device having bottom openings in the form of slots of substantially the same combined area. I have also found that it is preferable to arrange the slots transversely in relation to the current set up on the tray by the flow from the openings 3, rather than parallel with it. The sides 6 of the tray are customarily formed integral with the bottom plate, and are high enough to extend above the ports 3 in the discharge tube 1. The tray is preferably of rectangular shape, but may be square or round or of substantially any shape required to best adapt it to the conditions of pouring. It is essential, however, to allow sufficient distance between each port 3 and the side wall of the tray so that the force of the stream discharged through the ports will be diffused by the body of molten metal in the tray before the metal passes through the slots in the bottom of the tray into the receiver.

While my invention is generally adapted for use in casting operations employing a transfer apparatus of the type described, I have chosen to describe in detail its application to the casting of aluminum ingots, as this example of its application illustrates fully the advantages of my invention and constitutes a preferred embodiment thereof.

The assembly shown in Fig. 3 consists of a siphon 7, a crucible 8, and an ingot mold 9. The crucible contains molten aluminum 10 which is being transferred through the siphon into the

mold. The mold is preferably supported on a hydraulic piston (not shown or analogous known device adapted to lower it as the metal level rises. The vertical discharge end 1 of the siphon 7 is firmly connected to a screening and diffusing device 2, as described hereinabove, and the mold 9 is lowered relatively to the crucible 8 during the pouring operation so that the metal level in the tray 2 is kept below the top of the side walls 6 thereof but above the ports 3 in the pipe 1. Associated with the crucible or the siphon is a suitable device for starting the flow of metal through the siphon. This may take the form of a displacement device 11, such as a weight or a hollow weighted vessel, which is supported by a chain 12 or the like from a crane (not shown) or other adjustable supporting means. Other known means for starting the flow of metal through the siphon may be substituted for the displacement device, and it is to be understood that other types of transfer apparatus terminating in vertical discharge tubes 1, such as pouring spouts, may be substituted for the siphon shown. When a siphon is used, it is preferably placed in a notch or slot 13 in the side of the crucible 8. If desired, the siphon or other transfer device and/or the screening and diffusing device may be given a lime-wash or other protective coating in known manner to protect it from attack by the metal being transferred. It is then preferably heated at least sufficiently to free the surface from moisture.

The siphon 7 is lowered by a hoist or other suitable means into the starting position, with its intake end near or on the bottom of the crucible 8 and its discharge end with the tray 2 affixed thereto resting on the bottom of the mold 9. The molten metal 10 rises in the intake leg of the siphon to a level substantially equal to the level of the metal in the crucible, which is preferably nearly but not quite high enough to start the siphon. The displacement member 11 is then lowered rapidly into the metal, raising its level sufficiently to start the flow of metal through the siphon, or the siphon may be started in some other manner.

The initial flow of metal quickly fills the tray due to the resistance of the small opening between the tray and the bottom of the mold to the flow of metal therethrough, and in a relatively brief period of time the level of the metal in the tray and in the mold rises over the level of the ports 3 in the discharge tube. The siphon and crucible are then lifted by means of a hoist, or the mold is lowered as previously described, and this relative lowering of the mold is continued throughout the remainder of the pouring operation to keep the level of the metal in the tray and the mold above the level of the discharge ports 3 but below the level of the edges 6 of the tray. This relative position is essential, and is illustrated in Fig. 3.

The metal entering the tray through the ports spends the energy resulting from the relatively high velocity of its flow by setting the metal in the tray into a gentle rolling motion which is very efficacious in separating any entrained dross from the metal and allowing it to rise to the surface by the action of gravity. The metal is further freed from any solid impurities as it passes through the slots in the bottom of the tray. The area of the slots is several times greater than the area of the ports, and consequently the velocity of the metal entering the mold itself is very low and the metal enters substantially without turbulence. When the casting operation is completed the siphon is removed and the dross remains in the tray from which it may be easily removed.

It will be readily understood that my invention may take many forms without departing from the principles set forth hereinabove and defined in the following claims.

I claim:

1. In a molten metal transfer device, a vertical tubular discharge member with a discharge port opening laterally adjacent its end, said end being closed by a tray supported therefrom and said tray having a perforate bottom plate and upturned edges extending above said discharge port.

2. In a molten metal transfer device, a vertical tubular molten metal transfer member with symmetrical lateral ports adjacent its discharge end, said end being closed by a tray supported centrally therefrom and said tray having slots in the bottom thereof and edges extending above said discharge ports.

3. In a molten metal transfer device, a vertical tubular molten metal transfer member with opposite discharge ports adjacent its discharge end, said end being closed by and supporting centrally therefrom a rectangular tray with transverse slots in the bottom plate thereof and edges extending above said discharge ports, said tray being so positioned that said ports discharge into the tray along its longitudinal axis and above its said bottom plate.

4. In a molten metal transfer system, a receiver for molten metal, and a tubular discharge member extending downwardly into said receiver and having opposite lateral discharge ports adjacent its lower end, said lower end being closed by a rectangular tray suspended centrally therefrom and so positioned that the ports discharge along its longitudinal axis, said tray having a perforate bottom plate and upturned edges extending above said discharge ports, and being so positioned in relation to said receiver that the molten metal level therein is above said discharge ports and below the top of said upturned edges.

JOSEPH A. NOCK, JR.