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LADLE NOZZLE CONSTRUCTION

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FIG. 1.

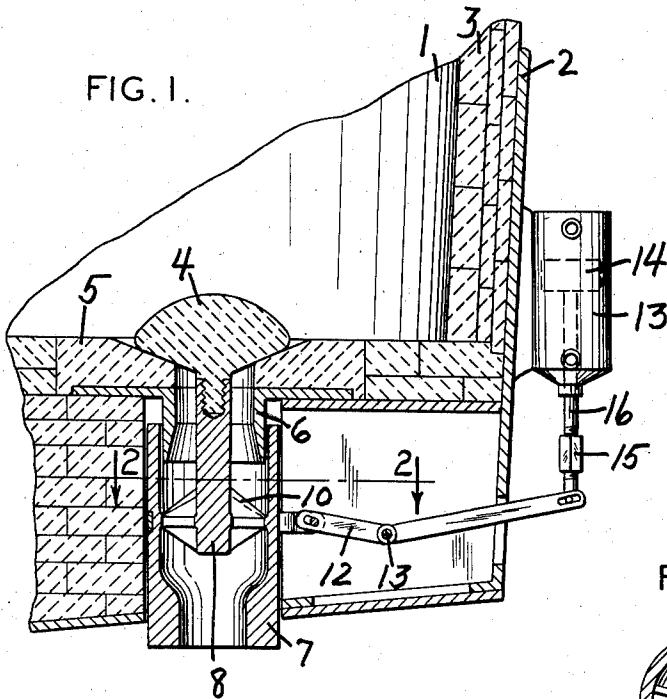


FIG. 2.

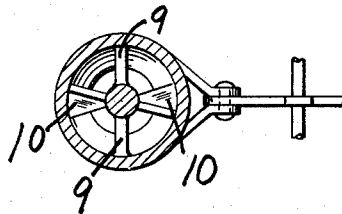
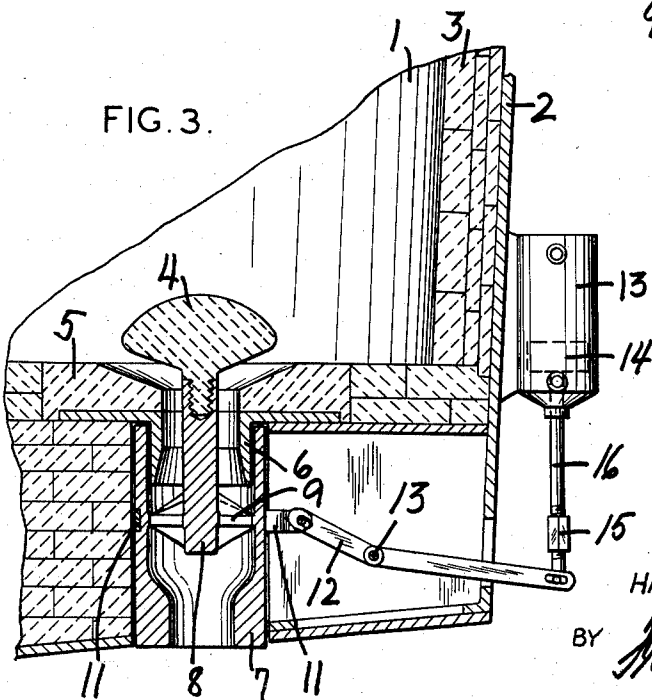


FIG. 3.



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LADLE NOZZLE CONSTRUCTION

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1 Claim. (Cl. 22—85)

This invention relates to improvements in a nozzle construction for ladles, and more particularly to a nozzle and valve control to be used in connection with ladles from which molten metal is poured. The invention is of paramount importance for use in connection with ladles of relatively large size such as those which hold and deliver a number of tons of molten metal, although the invention will have other uses and purposes as will be apparent to those skilled in the art.

It has been customary to pour metal in the past from ladles which have a nozzle in the bottom thereof which does not project any material distance out of the ladle and the pouring has heretofore been controlled by the use of a stopper rod in the form of a tapering plug disposed inside the ladle at the bottom.

This stopper was in turn controlled by a lever and linkage arrangement, one end of which consisted in an iron rod which extended through the ladle and, more inconveniently, through the molten contents of the ladle to the nozzle.

The rod which extended through the molten ladle contents was covered with fitted sections called "refractories" of a ceramic tubing whose purpose is to protect the rod from melting by transfer of the heat from the ladle contents. However every time a melt is made in the ladle and poured, the intense heat warps the steel rod or iron rod which extends through the ceramic tubing. The rod must then be taken to a forge. There the tubing, which is usually badly cracked and vitrified, is broken off and the rod is heated and forged and shaped back into a straight form.

With the foregoing in mind, it is an important object of the present invention to provide a nozzle and valve construction for a ladle wherein the nozzle projects well beyond the bottom of the ladle and all the operational and activating linkages for the nozzle are disposed on the outside of the ladle in positions to be readily accessible and easily and accurately operated.

Another object of the invention is to provide a novel construction for a ladle, in which the nozzle is designed to provide a swirling action to the molten metal exiting from the ladle which will provide a self-clearing action to the valve construction. At the same time swirling of the exiting metal prevents splashing in the molds and prevents the formation of "scabs" in the ingots.

A further object of the invention is to provide a novel construction for a ladle nozzle which will be extremely simple and cheap to replace, having a few parts which wear out and are replaced as they wear out, while the major operating parts will not require individual maintenance after each melt.

While some of the more salient features, characteristics and advantages of the present invention have been pointed out, other and additional ones will become apparent from the following disclosures, taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a fragmentary cross-sectional view of a lower portion of the nozzle and valve construction of the ladle,

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together with the actuating members, so that the valve is shown in the closed position;

Fig. 2 is a transverse cross-sectional view along the section line 2—2 of Fig. 1, of the nozzle construction, showing the vanes in a view which illustrates how they provide a swirling action to the molten metal passing therethrough; and

Fig. 3 is a fragmentary cross-sectional view, similar to Fig. 1, but showing the valve in the open position.

As shown in the drawings:

The illustrated embodiment of the present invention is shown in connection with a foundry ladle 1 which, in Figs. 1 and 3, includes an outer metal wall 2, and an inner refractory lining 3 of fire brick, fire clay, or equivalent material. Inside the bottom of the ladle an exit for the molten metal is provided by the nozzle and valve construction consisting of a stopper valve head 4, in the closed position of Fig. 1 shown resting against a tamped seat of fire clay 5. An annular flange 6 rests under the tamped seat and its central opening provides the channel through which the molten metal flows when the stopper valve head 4 is raised, as in Fig. 3. A sleeve 7, disposed outside the central opening of the annular flange 6, rides up and down with the stopper valve head 4. The sleeve 7 is made integral with the reinforced post 8. Post 8 made integral by appropriate threads, with the stopper valve head 4. Support rods 9, 9 best shown in Fig. 2 are provided to make the assembly rigid. Vanes 10, 10 are provided to direct the flowing metal in a swirling stream. The entire assembly of the flange, sleeve, post, support rods and vanes are formed of a highly refractory material such as magnesia chromic oxide or some such material with an extremely high melting point.

The numeral 11 is applied to a clamp which extends around the sleeve and which is linked to the lever 12. The lever 12 is fulcrumed on the bolt 13, affixed to the side of the lower metallic wall 2. The opposite end of the lever 12 is driven by the pneumatic cylinder 13, containing the piston 14, shown in dotted line only. An adjustment nut 15 is provided upon the rod 16, upon which the piston rides to provide an accurate adjustment for the driving assemblage.

In operation the assembly is placed in the condition shown in Fig. 1, and metal is melted in the ladle. It will be noted that the weight of the metal forces the stopper valve head into a firm leakproof seal against the seat 5 of fire clay.

When it is desired to open the valve and nozzle assembly, air is introduced into the cylinder 13 under pressure. The rise in pressure drives the piston 14 downward in Fig. 3, raising the opposite end of the lever 12 and raising the sleeve 7 as well as the stopper valve head 4.

Raising of the head 4 opens the valve and provides a clear passage for the molten metal to drop or flow through the nozzle past the vanes 10 which impart to it a swirling action. This swirling action causes the metal to flow evenly into the molds without splashing and results in ingots formed entirely without "scabs" or cold spots.

It will be noted that the sleeve, flange, vanes and head are the parts which take the most wear and which must be replaced periodically.

However it will also be noted that the assembly of the parts is extremely simple and easily accomplished.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted herein otherwise than necessitated by the scope of the appended claim.

I claim as my invention:

A ladle nozzle construction consisting of a stopper

valve head, a seat of tamped fire clay against which said valve head seats, an annular flange surrounding the lower portion of said valve head and provided with a central opening through which said lower portion projects, a post member threadably disposed upon said valve head and provided with vanes, a sleeve member integral with said vanes and post member, and a cylinder and power piston assembly to actuate movement of said valve head and sleeve with respect to said seat.

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