(No Model.)

H. SCHULZE-BERGE.

APPARATUS FOR CONTAINING AND TRANSFERRING MOLTEN METAL.

No. 329,491. Patented Nov. 3, 1885.

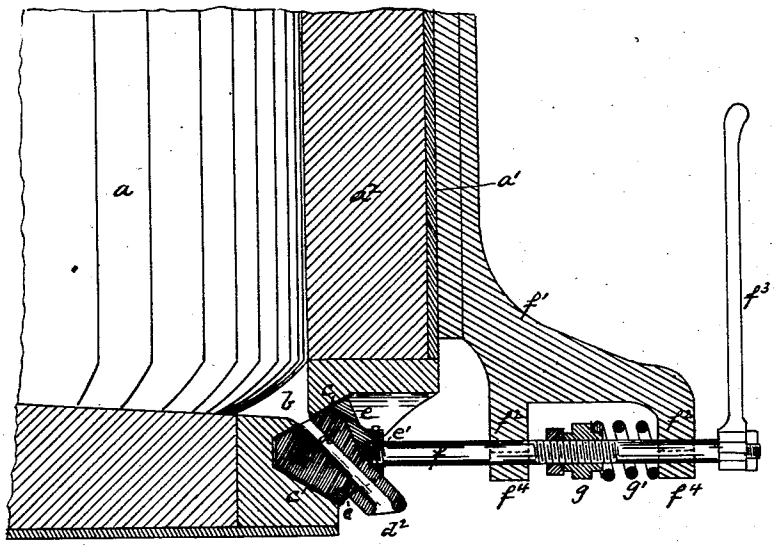


Fig. 1.



Fig. 2.



Fig. 3.

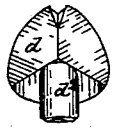


Fig. 4.



Fig. 5.



Fig. 6.

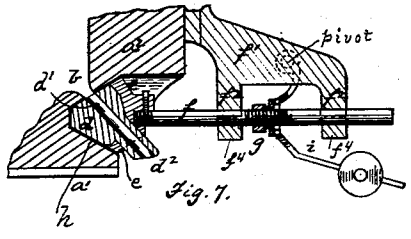


Fig. 7.

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APPARATUS FOR CONTAINING AND TRANSFERRING MOLTEN METAL.

SPECIFICATION forming part of Letters Patent No. 329,491, dated November 3, 1885.

Application filed March 22, 1884. Serial No. 125,139. (No model.)

To all whom it may concern:

Be it known that I, HERMANN SCHULZE-BERGE, of Rochester, in the county of Beaver and State of Pennsylvania, have invented a new and useful Improvement in Apparatus for Containing and Transferring Molten Metal; and I do hereby declare the following to be a full, clear, and exact description thereof.

Heretofore ladles used for conveying molten steel from Bessemer converters and open-hearth furnaces to discharge it into the molds have been provided with stoppers working from the inside to regulate the flow of metal out of the ladle and eventually to stop it. These stoppers consist of an iron rod provided with a plug or stopper proper at its lower end, and with a tubular covering of refractory material to protect it from the action of the molten steel through which it passes. The stopper is composed of refractory material, and is set in a suitable cavity or recess in the bottom of the ladle. The seat is made in the refractory lining of the ladle and surrounds the discharge-opening. In making use of this stopper, the stopper is first put in place with the upper end of the rod projecting above the mouth of the vessel and curving over so as to be secured to the edge of the same. The steel is then run into the ladle from the converter or furnace, and when the ladle is brought to position over the molds the stopper is raised, so as to permit the discharge of the proper quantity of molten steel. A ladle contains a sufficient quantity of steel to fill several molds, so that the flow of steel has to stop while the ladle is being transferred from mold to mold. As the molten metal passes out of the ladle between the stopper and its seat, it cuts the latter so that the stopper cannot close the discharge-orifice tightly. The result is at the best that such stoppers and seats will stand but about three charges before they require to be renewed. As the stopper cannot be raised very high from its seat in securing its proper manipulation, metal leaving the ladle is prevented from forming a solid stream and is caused to spatter in every direction. This causes the fluid metal to absorb oxygen or to form in parts of the ingot-mold not yet reached by the rising metal therein particles of steel producing defective places in the ingots and in the articles which are rolled out therefrom. In addition to this a considerable quantity of metal is lost in shifting the ladle from one mold to another, because, even when the stopper or seat is not worn, it cannot be closed tight instantaneously. Moreover, the rod to which the stopper is attached, although protected by a covering of refractory material, sometimes gets too hot and bends, so that the stopper does not come to its seat.

My invention is designed to overcome the difficulties above recited and facilitate the transfer and treatment of molten metal in the various metallurgical processes; and, generally stated, it consists in employing a tapering revoluble stopper arranged in a corresponding seat at the melting angle of the sides and bottom of the vessel, and in the employment therewith of a securing-plate, axle for rotating the stopper, axle-bracket, and yielding pressure devices, skeleton for securing a lubricating substance to the stopper, and other details, all as will hereinafter more fully appear, whereby the use of a revoluble stopper with metallurgic vessels is rendered practical and possible.

To enable others skilled in the art to make and use my invention, I will now describe it by reference to the accompanying drawings, in which—

Figure 1 is a vertical section of a portion of a ladle provided with my improved stopper. Figs. 2, 3, and 4 are front, side, and rear views, respectively, of the stopper. Fig. 5 is a section on *x x* of Fig. 3. Fig. 6 is a view of a skeleton frame for securing a lubricating mineral substance to the face of the stopper. Fig. 7 is a view of a modification.

Like letters of reference indicate like parts in each.

The ladle *a* is constructed in the usual manner with a shell, *a'*, and refractory lining a^2. The discharge-opening *b* is made at the corner or shoulder between the side and bottom, instead of through the bottom, as heretofore. This portion of the vessel is fitted with a conical or other suitably-shaped seat, *c*, of suitable refractory material, designed for the reception of a conical-shaped stopper, *d*, which is provided with a bore or hole, *d'*, extending diagonally through it. The stopper *d* is made

of refractory material, and is secured to a metal plate, *e*, which plate is provided with a socket or a screw or square recess, *e'*, for the reception of the end of a revoluble shaft or axle, *f*. The axle *f* is supported by a bracket, *f'*, secured to the metallic casing *a'* of the ladle. The shaft *f* extends through two lugs, f^2, of the bracket, and at the portion which lies between the lugs is screw-threaded and supplied with an adjusting-nut, *g*, between the end of which and the outer lug f^2 is a spring, *g'*. This spring is designed to hold the stopper *d* tightly to its seat, and for that purpose is made very strong, its pressure being regulated by the tension-nut *g*. The axle *f* is provided with a lever, f^3, by which the stopper is turned to open and close it. When it is desired to discharge the molten metal from the ladle, the lever is turned so as to bring the stopper to the position shown in Fig. 1, and when it is desired to close the discharge-opening of the ladle the lever is turned so as to bring the bore *d'* of the stopper out of connection with the discharge-orifice *b* of the ladle. Thus it will be seen that the molten metal does not enter between the stopper and its seat, and consequently neither of these parts is exposed to wear by the metal. The discharge opening or bore of the stopper stands at an angle to the axle *f*, so that the turning of the axle will cause the discharge-opening of the stopper to register with that of the ladle. If it is desired, a lubricating medium consisting of a felt-like substance, such as asbestus, may be placed between the stopper and its seat and gathered upon a skeleton, *h*, of very fine wire-gauze, and permeated with lubricating mineral powders—such as graphite and soapstone. In Fig. 6 I show a view of such a skeleton. The stopper is attached to its metallic axle by resting in a pyramidal or cornered seat in the plate *e*, the prolonged tube d^2 extending through the plate, as shown in Fig. 1. It may, however, be connected to the axle in any other convenient way. The axle is secured in its bearings by removable boxes f^4, and can be taken off by removing the boxes. The function of the spring *g'* may be obtained by the use of a weighted lever, *i*, as shown in Fig. 7, said lever being pivoted to the bracket *f'*, and bearing against the adjustable nut *g*. The shape of the stopper may be conical, as shown, or hemispherical, cylindrical, or elliptical in longitudinal section, or it may be a circular disk, and the bore or hole may terminate inside of the vessel at any place in the surface of such disk which does not lie in the direct prolongation of the axis of the axle *f*. The axle *f* is in such relation to the opening in the vessel which is to be closed that such opening is not situated in the axial line of the stopper. The stopper may be located in the sides of the vessel or in the bottom, or in that portion of the lining connecting the side walls and the bottom, as shown. It can be used in connection with ladles or with ovens, hearths, or furnaces to tap molten metal therefrom, and if properly arranged it can also be used for the purpose of introducing through its bore gaseous or fluid substances into such ladle, furnace, or hearth.

The advantages derived from the invention hereinbefore set forth are as follows: The tap-orifice may be fully opened to obtain a free discharge of the molten metal, and perfectly closed to arrest the discharge; secondly, the metal is discharged in a solid column, which reduces materially its cutting effect on the lining or the tap, and the loss by oxidization of the metal, which two points of advantage insure better castings; and, thirdly, the wear or cutting action of the metal is confined to the revoluble plug, which can be readily replaced, and which wear does not materially affect the efficiency of the plug.

I am aware that refractory material is commonly and necessarily employed for linings and plugs of furnaces, ladles, and like metallurgic vessels; and I am also aware that revoluble stoppers or faucets having through ports at an angle to the axis of rotation are old as applied to beer-barrels, &c., and do not herein claim such devices, broadly, and I wish to be distinctly understood as limiting my invention to an improvement in the art of metallurgy.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A metallurgic vessel having a tapered stopper-seat, a port situated at the meeting angle of the side and bottom thereof, a tapering revoluble stopper having an eccentric port therethrough, and a metallic securing-plate for confining the revoluble stopper, substantially as and for the purposes specified.

2. The combination, with a metallurgic vessel having a port and a tapered stopper-seat recessed therein, of a tapering revoluble stopper having an eccentric discharge-port therethrough, a stopper-axle, a bracket wherein the stopper-axle is journaled, and a counterweight which acts on the stopper, substantially as and for the purposes specified.

3. The combination, with a metallurgic vessel having a port and a recessed seat adapted to receive a revoluble stopper, of a revoluble stopper arranged in said seat, an axle for actuating the stopper, and an adjustable pressure device which bears on the stopper-axle, substantially as and for the purposes specified.

4. The combination, with a metallurgic vessel having a port and a recessed seat adapted to receive a revoluble stopper, of a revoluble stopper and a skeleton for securing a lubricating substance to the face of the stopper, substantially as and for the purposes specified.

In testimony whereof I have hereunto set my hand this 17th day of February, A. D. 1884.

HERMANN SCHULZE-BERGE.

Witnesses:
W. B. CORWIN,
T. B. KERR.