Jan. 5, 1926. 1,568,246

M. SAUNDERS

METHOD OF AND APPARATUS FOR SETTING POURING NOZZLES IN LADLES

Filed May 16, 1925

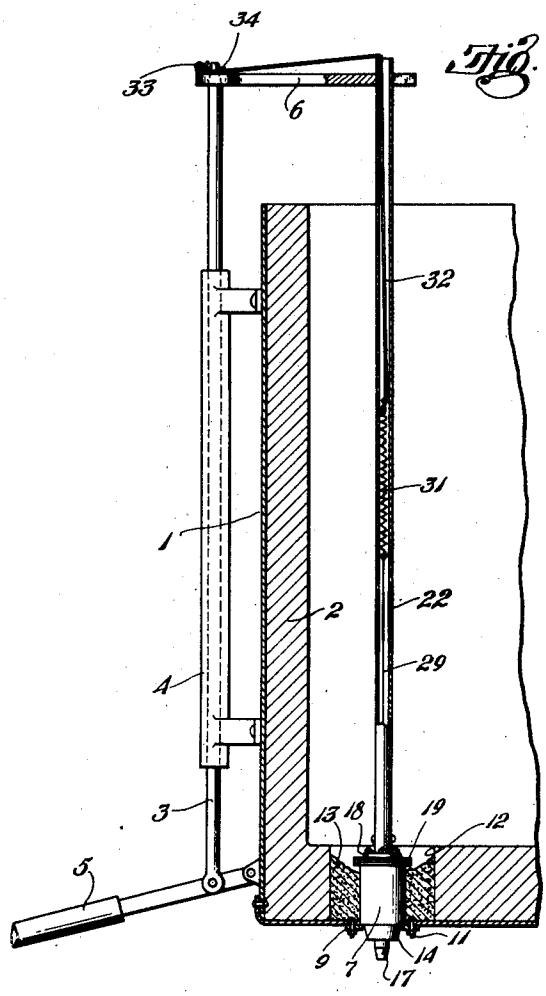


Fig. 1

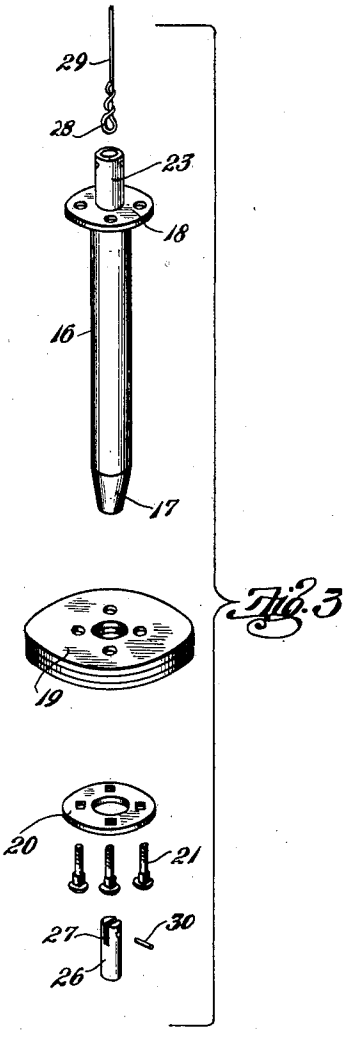


Fig. 3

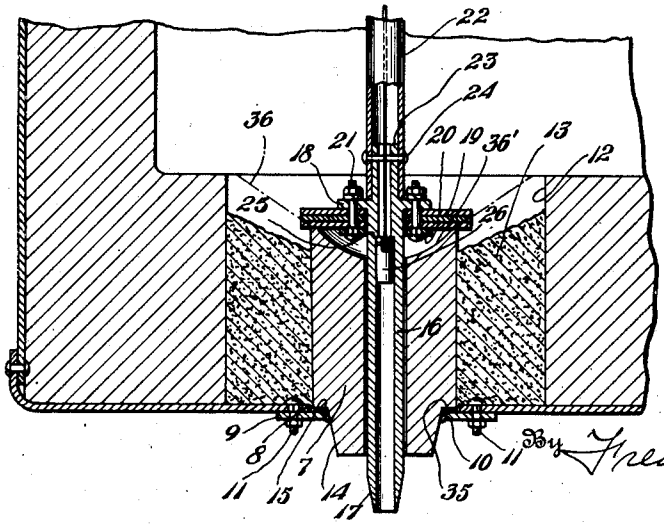


Fig. 2

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Patented Jan. 5, 1926. 1,568,246

UNITED STATES PATENT OFFICE.

MALCOLM SAUNDERS, OF CANTON, OHIO.

METHOD OF AND APPARATUS FOR SETTING POURING NOZZLES IN LADLES.

Application filed May 16, 1925. Serial No. 30,700.

To all whom it may concern:

Be it known that I, MALCOLM SAUNDERS, a citizen of the United States, residing at Canton, in the county of Stark and State of Ohio, have invented a certain new and useful Improved Method of and Apparatus for Setting Pouring Nozzles in Ladles, of which the following is a specification.

This invention relates to pouring nozzles for ladles such as are used for receiving a heat of steel from an open hearth or electric furnace and pouring the same into ingot molds, and more particularly to means for properly aligning the pouring nozzle when it is placed in the ladle.

Ladles of this character ordinarily have about a hundred ton capacity and are lined with fire brick and provided with a fire clay pouring nozzle normally closed by means of a stopper, the molten steel being received in the ladle from the furnace and poured through the nozzle into the ingot molds by operating the stopper rod to open the pouring nozzle when the ladle is placed over a mold and to close the same to immediately cut off the stream of molten metal when the ladle is moved to the next mold.

Owing to the great amount of molten metal poured through the pouring nozzle, it is necessary to replace the same after each heat is poured. It is necessary and desirable, in order that the best results may be obtained, in pouring the steel from the ladle into the ingot mold, that this nozzle be aligned absolutely vertical, in order to cause the stream of molten steel to pour straight down upon the bottom of the ingot mold, in the center of the mold, as when the nozzles are placed out of alignment, which very frequently happens in ordinary practice, the molten steel strikes the sidewalls of the molds, causing the ingot to stick in the mold and preventing stripping of the same from the mold, and burning out the sidewall of the mold, making it necessary to scrap the same.

These nozzles are mounted in an opening in the bottom of the pouring ladle and the fire brick lining thereof, being cemented therein with fire clay, and in placing the nozzle in position with the ordinary methods now in common use, there is no positive means for properly aligning the nozzle vertically when it is installed.

The object of the present invention is to provide means for properly aligning the pouring nozzle, absolutely vertical in the ladle, in order to cause the stream of molten steel to pour straight down from the ladle upon the bottom of the ingot mold, thus preventing the molten metal from striking the sides of the molds and eliminating the objections above described.

The invention may be carried out with the apparatus illustrated in the accompanying drawing, in which,

Figure 1, is a fragmentary sectional view of a portion of a ladle showing the improved device in position during the operation of installing a pouring nozzle in the ladle;

Fig. 2, an enlarged sectional view of the lower portion of the device showing the same in use in installing a nozzle in the ladle, and

Fig. 3, a detached perspective view of the spindle of the tool and the associate parts removed therefrom.

Similar numerals of reference indicate corresponding parts throughout the drawing.

The ladle indicated generally at 1 is lined throughout with fire brick 2 and provided with the usual stopper rod 3 slidable in a housing 4 and arranged to be raised and lowered by the handle 5, the usual fork 6 being carried at the upper end of the rod for connection to the stopper, not shown, which is ordinarily used to normally cut off the flow of molten steel by closing the pouring nozzle 7.

An outlet opening 8 is provided in the bottom of the steel shell of the ladle, a retaining plate 9, having a central opening 10, being connected to the steel shell as by bolts 11 and restricting said opening. An opening, 12, of greater diameter than the outlet opening 8, is provided in the fire brick lining at the bottom of the ladle, and aligned with the outlet opening, the pouring nozzle 7, which is of fire brick, being received therein and cemented by means of fire clay 13, the reduced spout 14 of said nozzle extending through the opening 10 of the retaining plate, and the shoulder 15 thereof resting upon the retaining plate.

The above is common construction, such as is ordinarily used in ladles, and the present invenion consists in the means for aligning this pouring nozzle vertically when the same is installed in the ladle.

The apparatus to which the invention pertains comprises a hollow spindle 16 pref-

erably provided with the tapered lower end 17 and having a flange shoulder 18 near its upper end, to the under side of which are connected several washers 19 of leather or similar material retained thereon by means of the hollow metal disc 20 and the carriage bolts 21.

A tubular handle 22, of considerable length, receives the reduced upper end 23 of the spindle and is permanently attached thereto as by a rivet 24.

The central bore of the spindle is shouldered as at 25 and may act as a stop for the block 26 which is provided with the slotted upper end 27 to receive the eye 28 of a wire 29 which is retained as by the pin 30.

This wire may be connected at its upper end to a coil spring 31, to the upper end of which is connected a rope or other flexible member 32, provided at its upper end with a stop, such as the knot 33, which is normally held against the upper end of the tubular handle by means of the tension upon the spring 31.

In placing the nozzle in the ladle the lower end of the opening 12 is first filled to a depth of two or three inches with soft fire clay, and the nozzle is then placed upon the same in upright position. The spindle 16 of the above described tool is then inserted into the upper end of the nozzle and the tool is held in upright position by placing the tubular handle of the same in the fork 6. The rope 32 may be pulled upward and the stop 33 thereon engaged with the key 34 upon the pouring rod in order to hold the handle against the fork.

The handle is then released permitting the tool to drop vertically, the spindle passing down through the central bore of the nozzle and the leather washers 19 engaging the upper end of the nozzle, depressing the same in the soft clay, to substantially the position best shown in Fig. 2, squeezing the clay entirely around the openings 8 and 10, as shown at 35, thus effectually sealing the nozzle within the opening and aligning the same vertically.

The fire clay is then tamped around the nozzle, within the opening 12, the washers 19 protecting the upper end of the nozzle from damage by the tamping tool. This fire clay is filled in around the nozzle to substantially the point indicated by the dot and dash line 36 in Fig. 2, thus forming a well in the bottom of the ladle terminating in the enlarged opening 36′ at the upper end of the pouring nozzle.

The tool is then removed, and when the clay is dry the stopper may be placed in position in the usual manner, and the nozzle is ready for pouring a heat of steel, and as will be seen from the above description, is properly vertically aligned within the ladle, causing the stream of molten steel poured therefrom to strike directly upon the bottom of the mold, obviating the objections above pointed out, and it has been found by experience that the steel poured in this manner eliminates a considerable amount of the "pipe" ordinarily formed in the upper end of an ingot mold.

I claim:

1. The method of setting a pouring nozzle in a ladle which consists in placing a spindle through the nozzle, in a vertical position, and packing plastic material around the nozzle while said spindle is in place.

2. The method of setting a pouring nozzle in a ladle which consists in placing plastic material in the outlet opening of the ladle, placing a shouldered spindle through the nozzle and lowering the same upon said plastic material, packing more plastic material around the nozzle and holding said spindle in vertical position during said packing operation.

3. A tool for setting pouring nozzles in ladles, comprising a spindle arranged to be located through the pouring nozzle and held in vertical position while plastic material is packed around the nozzle.

4. A tool for setting pouring nozzles in ladles, comprising a spindle arranged to be located through the pouring nozzle and means for holding the spindle in vertical position while plastic material is packed around the nozzle.

5. A tool for setting pouring nozzles in ladles, comprising a shouldered spindle arranged to engage the pouring nozzle to hold the same in vertical position while plastic material is packed around the nozzle.

6. A tool for setting pouring nozzles in ladles, comprising a spindle arranged to be located through the pouring nozzle and having a shoulder for engagement with the upper end of the nozzle and means for holding the tool in vertical position while plastic material is packed around the nozzle.

7. A tool for setting pouring nozzles in ladles, comprising a spindle arranged to be located through the pouring nozzle, and a resilient shoulder upon the spindle for engagement with the upper end of the nozzle.

8. A tool for setting pouring nozzles in ladles, comprising a spindle arranged to be located through the pouring nozzle, a resilient shoulder upon the spindle for engagement with the upper end of the nozzle, and means for holding the spindle in vertical position while plastic material is packed around the nozzle.

In testimony that I claim the above, I have hereunto subscribed my name.

MALCOLM SAUNDERS