J. H. GRAY.

LADLE.

APPLICATION FILED NOV. 15, 1918.

1,386,702. Patented Aug. 9, 1921.

2 SHEETS—SHEET 1.

Fig. 1.

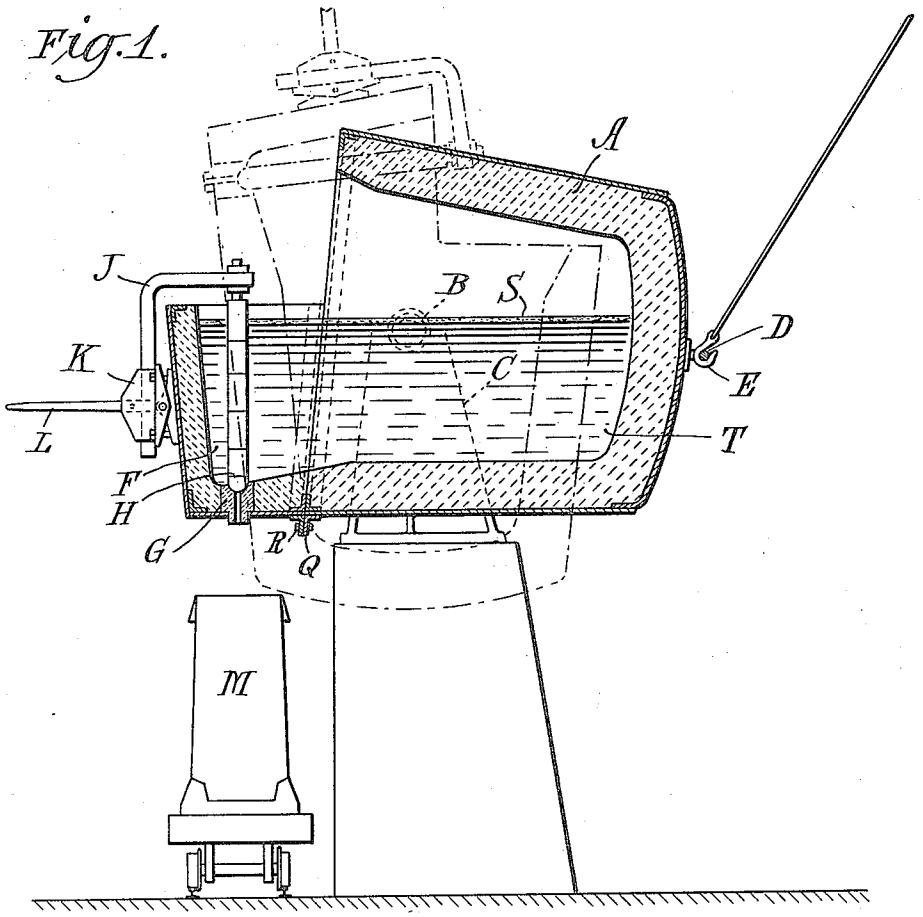
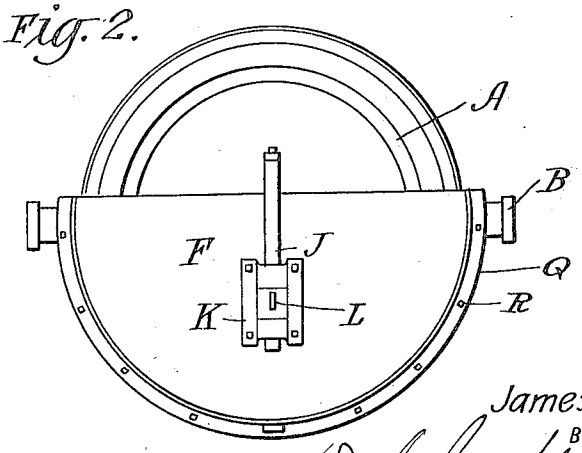


Fig. 2.



INVENTOR

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2 SHEETS—SHEET 2.

Fig. 3.

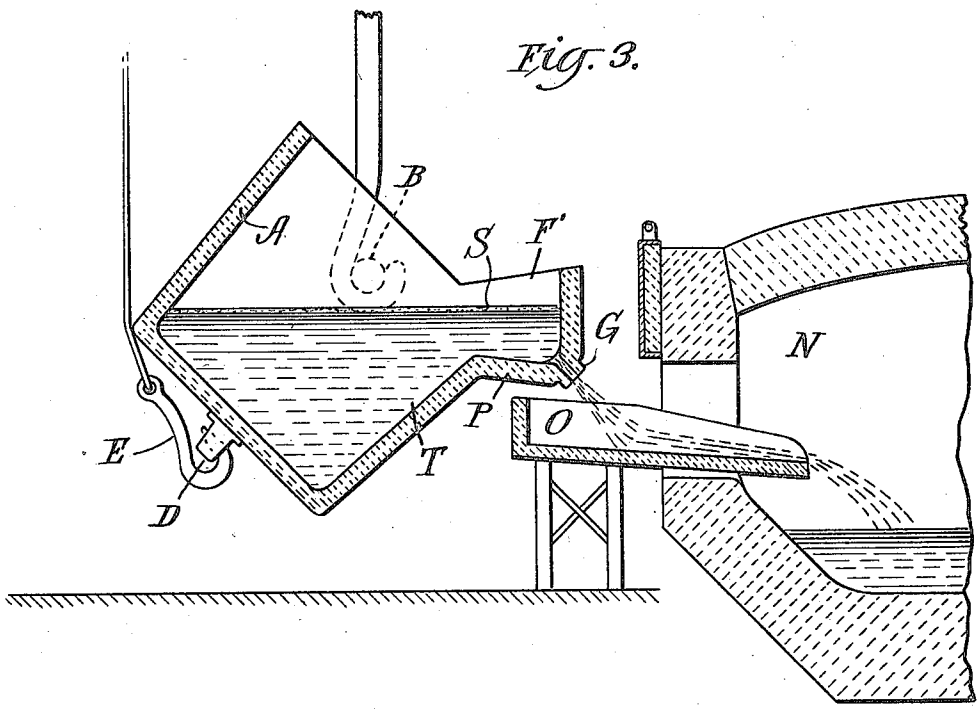
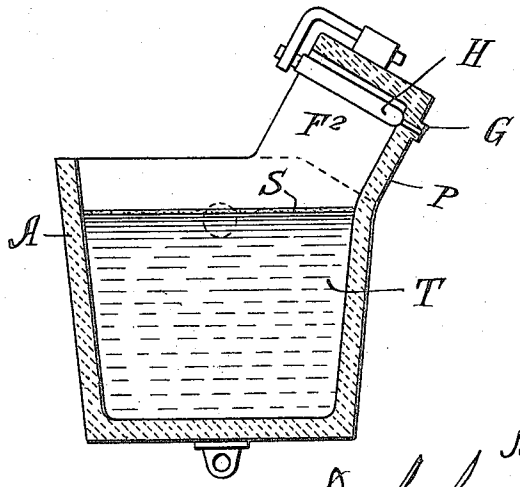


Fig. 4.



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UNITED STATES PATENT OFFICE.

JAMES H. GRAY, OF NEW YORK, N. Y.

LADLE.

1,386,702. Specification of Letters Patent. Patented Aug. 9, 1921.

Application filed November 15, 1918. Serial No. 262,667.

To all whom it may concern:

Be it known that I, JAMES H. GRAY, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Ladles, of which the following is a specification.

The invention relates to ladles for molten metal such as are commonly used in steel plants for transferring the molten steel from one point to another or from a furnace to the ingot molds and for pouring the steel into such molds. It is common practice to use ladles of different sizes, some containing as much as one hundred tons of steel. They are usually provided with a nozzle in the bottom through which the steel flows and a stopper which may be raised and lowered from the outside to cut off or permit the flow of steel. Trouble is frequently experienced with such nozzles and stoppers. The latter sometimes leak so that steel is spilled and wasted; or the stopper freezes to the nozzle making it difficult or impossible to open. It is good practice to hold the steel in the ladle for a certain length of time to reduce it to a proper casting temperature and for other purposes; but in thus holding the ladle the heat of the steel may burn off the stopper rod, thus causing trouble and loss of steel and possible injury to the men. To avoid these disadvantages and to facilitate the holding of the steel in the ladle as long as may be desired I provide a ladle in which the nozzle (and the stopper and stopper rod where these are used) is out of contact with the steel. When the steel is to be poured it is only necessary to change the position of the ladle, which will bring the steel above the nozzle and permit pouring in the usual way.

The accompanying drawings illustrate embodiments of the invention.

Figure 1 is a vertical section of a ladle in pouring position;

Fig. 2 is a plan of such a ladle in upright position, that is in the position in which it is used to transfer metal;

Fig. 3 is a vertical section of a different form of the ladle, in pouring position;

Fig 4 is a vertical section of a third design of the ladle, in upright position.

In each of the constructions illustrated the nozzle is located at one side and at a point above the metal when the ladle is standing upright and is filled to the usual level; that is, when it is carrying its intended or desired quantity of metal. A cover or wall is arranged beyond the nozzle so as to form a pocket for the metal above the nozzle when the ladle is tilted.

Referring first to Fig. 1 the body A of the ladle is similar in design to ladles now commonly used, having trunnions B which are engaged by hooks when it is to be lifted and which may rest on pillars C when the metal is to be poured, and having an eye D on the bottom adapted to be engaged by a hook E for tilting it. This body portion of the ladle preferably lacks the usual nozzle and stopper in its bottom, but these may be provided for supplementary use if desired. On the upper end of the body of the ladle is mounted a pocket F constituting an extension of a portion of the approximately cylindrical wall of the ladle and shaped to form a cover which in the upright position extends transversely across a part of the mouth of the ladle and beyond a nozzle G which is formed in the extended side of the ladle; which becomes the bottom of the body when the ladle is tilted as in Fig. 1. The nozzle is closed by means of a stopper H, the stem or rod of which extends upward in the pouring position, which is transverse to the axis of the ladle in the upright position, either approximately at a right angle to such axis as in Fig. 1 or more obliquely as in Fig. 4. The stopper rod is supported at its upper end from an arm J which extends down through a bracket K of usual design on the outer face of the pocket and which is manipulated by a hand lever L. The supporting blocks C for the ladle are so positioned that the nozzle G will be brought directly over a line of ingot molds M carried on cars which are run under the nozzle so as to bring the successive molds into casting position. Each mold is filled by lifting the stopper, and then the stopper is closed and the next mold is brought into casting position.

Where the entire ladle full of metal is to be poured at each operation a stopper may be dispensed with since the nozzle is normally above the level of the metal in the ladle. Such a construction is shown in Fig. 3 for a ladle which transfers metal to a furnace N, pouring directly into a trough O from which the metal runs directly into the furnace. The extension or pocket F′ in this case is arranged with its bottom P extended

obliquely from the side of the body or main portion A of the ladle, thus leaving a greater clear opening for pouring metal into the ladle than in the construction of Fig. 1.

The ladle of Fig. 4 is provided with a pocket F^2 analogous to that of Fig. 3 in having its bottom P inclined outward with relation to the side of the body A of the ladle, and in addition has its nozzle G controlled by a stopper H so that the opening or closing of the nozzle can be effected and the operation of pouring can be resumed or stopped without having to tilt the ladle forward and back as in Fig. 3.

In all these designs the stopper rod and the nozzle are out of the steel while the ladle is filled and is being transported or is being held to perfect the steel. When this is done the ladle is tilted to transfer the steel to a point above the nozzle and it remains there only during the time required for casting.

The stopper rod may be made much shorter than usual, less than one-half in the design shown in Fig. 1. For a hundred ton ladle the common practice is to use a stopper rod twelve feet long; whereas in my design it may be only five feet long. A longer stopper is harder to handle and to set in proper position for closing and to maintain in such position, and tends to warp more than a shorter stopper.

With my construction if it be found that the stopper leaks in turning the ladle over the latter may be turned back to a vertical position and the nozzle readjusted. In the designs shown the head of metal above the nozzle in pouring position is less than in the upright position. This is an advantage especially in large ladles where the ferro-static pressure has been so great that the metal splashes greatly in the mold and pours out at an objectionable rapid rate. It will be understood, however, that the proportions may vary from those illustrated. In the design of Fig. 1 the ferro-static pressure is about one-half that of an ordinary ladle of the same capacity.

The pocket may be a fixed part of the ladle, as in Figs. 3 and 4, or it may be detachably mounted thereon, as in Fig. 1, where the shells of the ladle proper and the pocket are shown provided with flanges Q fastened together at intervals by bolts R. This construction may be used for converting old ladles into the new type by merely adding the necessary flange around a portion of its lip, closing the old nozzle permanently or leaving it and the stopper in as circumstances may demand.

It is important to prevent the pouring out of the slag which floats on top of the metal, especially when transferring from one furnace to another. Where no stopper is used, as in Fig. 3, the metal is caused to flow quickly over the nozzle by sufficiently tilting the ladle, thus raising the slag S above the nozzle. When the steel T is all out of the ladle and the slag begins to flow the ladle is quickly dropped back to an upright position, so as to retain the slag. With a stopper, as in Fig. 4, the nozzle is opened and the steel allowed to flow until the slag arrives at the nozzle, whereupon it is closed by the stopper.

Though I have described with great particularity of detail certain embodiments of my invention yet it is not to be understood therefrom that the invention is restricted to the embodiments disclosed. Various modifications thereof in detail and in the arrangement of the parts may be made by those skilled in the art without departure from the invention as defined in the following claims.

What I claim is—

1. A ladle for molten metal having a nozzle in an upward extension at one side at a point above the usual level of the metal when the ladle is upright and having a cover or wall beyond said nozzle forming a pocket for the metal when the ladle is tilted and a stopper for said nozzle extending transversely across the ladle and supported in vertical position by said cover when the ladle is thus tilted.

2. A ladle for molten metal having a detachable pocket section bolted to its upper end adapted to receive the metal from the ladle when the latter is tilted and having a nozzle for pouring the metal in this position.

3. A ladle comprising a metallic shell having an inner lining of refractory material, an outer rim secured to the upper edge of said shell and a detachable pouring section having a metallic shell secured to said rim and lined with refractory material, said section being adapted to receive the molten metal when the ladle is tilted to pouring position.

4. A ladle comprising a metallic shell having an inner lining of refractory material, a fastening rim secured to said shell having a detachable pouring section secured thereto which is provided with a stoppered nozzle, said section being above the usual metal level and having a wall which overhangs approximately one half of the top of the ladle when it is upright, said section being adapted to receive the metal when the ladle is tilted.

In witness whereof I have hereunto signed my name.

JAMES H. GRAY.