Aug. 12, 1941. R. KARR 2,252,635

LADLE POURING NOZZLE

Filed March 5, 1940

Fig. 1.

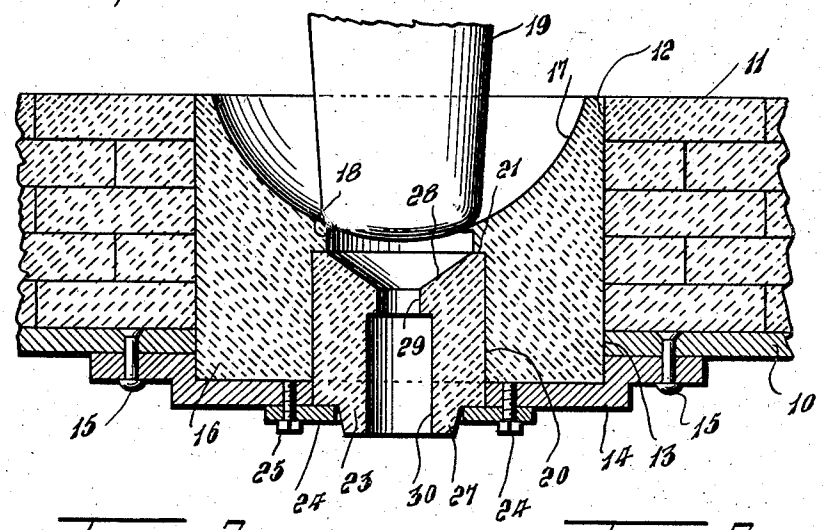


Fig. 2.

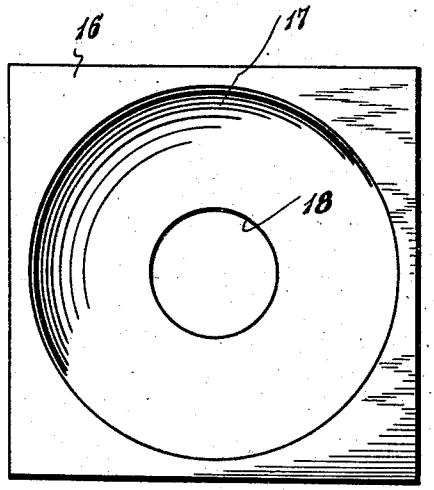
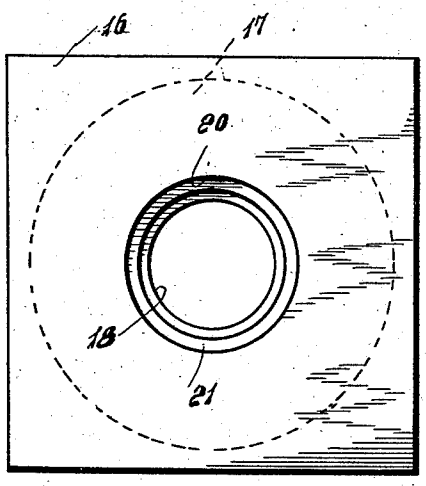


Fig. 3.



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LADLE POURING NOZZLE

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3 Claims. (Cl. 22—85)

This invention relates to the pouring of molten metals, and more particularly to a means to facilitate the placement of a nozzle in a bottom pouring ladle used in the steel industry.

An object of this invention is to provide in combination with a ladle and a pouring nozzle a holding means for the nozzle which is adapted to be built into the refractory walls of the ladle.

Another object of this invention is to provide in combination with a ladle and a pouring nozzle a refractory socket within which the nozzle is adapted to be positioned.

A further object of this invention is to provide a refractory socket or nozzle holding member which is adapted to be built into the refractory bottom wall of the ladle, the nozzle holding member being provided with an outwardly opening recess or socket within which the nozzle may be positioned and from which the nozzle may be removed without disturbing the contents of the ladle, or while the ladle is still in a heated condition.

With the foregoing and other objects in view, the invention will be more fully described hereinafter, and will be more particularly pointed out in the claims appended hereto.

In the drawing, wherein like symbols refer to like or corresponding parts throughout the several views,

Figure 1 is a fragmentary vertical sectional view of the bottom of a ladle having a device constructed according to my invention mounted therein.

Figure 2 is a top plan of the device, and

Figure 3 is a bottom plan of the device.

Referring to the drawing, the numeral 10 designates the outer wall of a ladle which is provided on the interior thereof with a refractory lining 11. The lining 11 may be formed of bricks or other suitable refractory material. The bottom wall 10 of the ladle is provided with an opening 13, and the lining 11 is provided with an opening 12 alining with the opening 13.

A flanged plate 14 is secured to the outer side of the bottom wall 10 by means of fastening devices 15 in the form of rivets or the like, the plate 14 forming a support for both the nozzle socket or holding member and the nozzle. The opening 12 is preferably square, and when the lining 11 is placed within the ladle a square nozzle brick, generally designated as 16 is inserted in the opening 12. The brick 16 is formed of refractory material which may be similar to the material of which the lining 11 is formed, and the brick 16 on the inner end thereof is provided with a concave recess 17 which is round in plan, as shown in Figure 2.

In the axial center of the recess 17 there is formed a cylindrical opening 18 of relatively small diameter through which the molten metal is initially adapted to pass. A plug or stopper 19, of conventional construction is adapted to seat in the bottom of the recess 17 and to close the opening 18. The stopper 19 is actuated in a conventional manner and as the use of this stopper 19 is well known it is not considered necessary to set forth in detail the manner in which this stopper is supported within the ladle, or the manner in which it is operated.

The brick 16 at a point slightly below the bottom of the recess 17 is provided with a second cylindrical opening or socket 20 which is substantially larger in diameter than the opening 18, forming a shoulder 21 extending laterally of the opening 18. The opening or socket 20 opens through the bottom of the brick 16, and alines with an opening 22 formed in the plate 14.

A nozzle, generally designated as 23, is adapted to seat in the socket 20, the inner end of the nozzle 23 abutting against the shoulder 21. The outer or lower portion of the nozzle 23 is adapted to extend through the opening 22, and a holding plate 24 engages against the lower or outer end of the nozzle 23. The plate 24 is adapted to be detachably secured to the plate 14 by means of fastening devices 25 in the form of bolts or the like. The plate 24 may be provided with an opening 26 coaxial with the socket 20, the nozzle 23 being formed with a reduced portion 27 projecting downwardly through the opening 26.

The nozzle 23 is formed at the inner end thereof with a frusto-conical mouth 28, a reduced cylindrical passage 29, and an enlarged cylindrical passage 30 which opens through the lower end of the nozzle 23. The passage 29 is substantially shorter in length than the passage 30 so as to restrict the flow of the molten metal. The passage 30 forms a combined discharge mouth and a splash chamber which prevents the scattering of slag particles or the like.

The nozzle 23 is one form of nozzle which may be used with the brick 16, and it will be understood that the nozzle 23 is merely illustrative of how a nozzle of this character may be mounted within the brick 16.

The diameter of the base of the frusto-conical mouth 28 of the nozzle 23 is substantially equal to the diameter of the outlet opening 18 in the brick 16, and the inner end of the nozzle 23 fits snug against the shoulder 21 so that no molten

metal will flow about the outer surface of the nozzle 23.

In the use of this nozzle brick and nozzle, the brick 16 is embedded in the lining 11 during the formation of the lining 11. The nozzle 23 may be inserted in the socket 20 by removing the plate 24 from the plate 14 and securing the plate 14 about the reduced portion 27 of the nozzle 23. In the event the nozzle 23 should become frozen, clogged, broken or otherwise unuseable and there should be molten metal still within the ladle, or the ladle should be heated from a discharged load of metal, the nozzle 23 may readily be removed without disturbing the contents of the ladle or without waiting for the ladle to cool, by reinserting the stopper so as to close up the outlet 18. Where the ladle is empty but still heated it will not, of course, be necessary to apply the stopper 19. The nozzle clamping or holding plate 24 may be removed by withdrawing the bolts or fastening devices 25, after which the nozzle 23 may be withdrawn from below the ladle. If the nozzle 23 should stick in the socket 20 it may be chipped out without damaging the nozzle brick 16.

With a nozzle brick or socket of this character the pouring operations will be speeded up as it will not be necessary after each operation to wait until the ladle cools before inserting a new nozzle, and it will not be necessary to pack the nozzle in alum or other similar material which at present is inserted from the upper end of the ladle and which process requires the cooling of the ladle before the nozzle can be inserted. With a nozzle brick or socket constructed according to this invention, if the ladle is still hot a new nozzle may be quickly inserted by removing the clamping or holding plate 24, withdrawing the old nozzle and replacing it with a new nozzle.

It is, of course understood that various changes and modifications may be made in the hereinbefore described embodiment of this invention, such changes and modifications being limited only by the scope of the appended claims.

What is claimed is:

1. In combination, a ladle, a refractory wall in the ladle, a nozzle brick embedded in said wall and having a length greater than the thickness of said wall, said ladle having an opening and said brick extending through and beyond said opening, a plate fixed to said ladle and formed with an outwardly offset seat to receive the outer end of said brick, said brick having a concave recess in its inner end and a socket extending inwardly from its outer end and terminating outwardly of said recess, said brick also having a passage communicating said recess with said socket, an axially apertured nozzle member formed with a body engaging in said socket and with a reduced nozzle at its outer end, and a holding plate removably fixed to said first plate having an aperture through which said nozzle projects.

2. In combination, a ladle, a refractory wall in the ladle, a nozzle brick embedded in said wall, said ladle having an opening and said brick extending outwardly through and beyond said opening, a plate fixed to said ladle and formed with an outwardly offset seat to receive the outer end of said brick, said brick having a concave recess in its inner end and a socket extending inwardly from its outer end and terminating outwardly of said recess, said brick also having a passage communicating said recess with said socket, an axially apertured nozzle member formed with a body engaging in said socket and with a reduced nozzle at its outer end, the inner end of said nozzle member having an inverted conical recess confronting said passage, and a holding plate removably fixed to said first plate having an aperture through which said nozzle projects.

3. In combination, a ladle, a refractory wall in the ladle, a nozzle brick embedded in said wall, said ladle having an opening and said brick extending through said opening, a plate fixed to said ladle and formed with a seat to receive the outer end of said brick, said brick having a concave recess in its inner end and a socket extending inwardly from its outer end and terminating outwardly of said recess, said brick also having a passage communicating said recess with said socket and said passage being smaller in diameter than the diameter of said socket to thereby form a shoulder at the inner end of said socket, an axially apertured nozzle member formed with a body engaging in said socket against said shoulder and also with a reduced nozzle at its outer end, the inner end of said nozzle member having an inverted conical recess confronting said passage with the largest diameter of said conical recess equal in diameter to the diameter of said passage, the axial aperture of said nozzle member terminating outwardly of said conical recess, said nozzle member having a cylindrical passage communicating said conical recess with said axial aperture, and said axial aperture being substantially larger in diameter than the diameter of said nozzle member passage to provide space for expansion of the molten metal discharged from said nozzle member passage, and a holding plate removably fixed to said first plate having an aperture through which said nozzle projects.

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