April 14, 1959 F. M. SCHWEINBERG 2,881,488

TILTING LADLE

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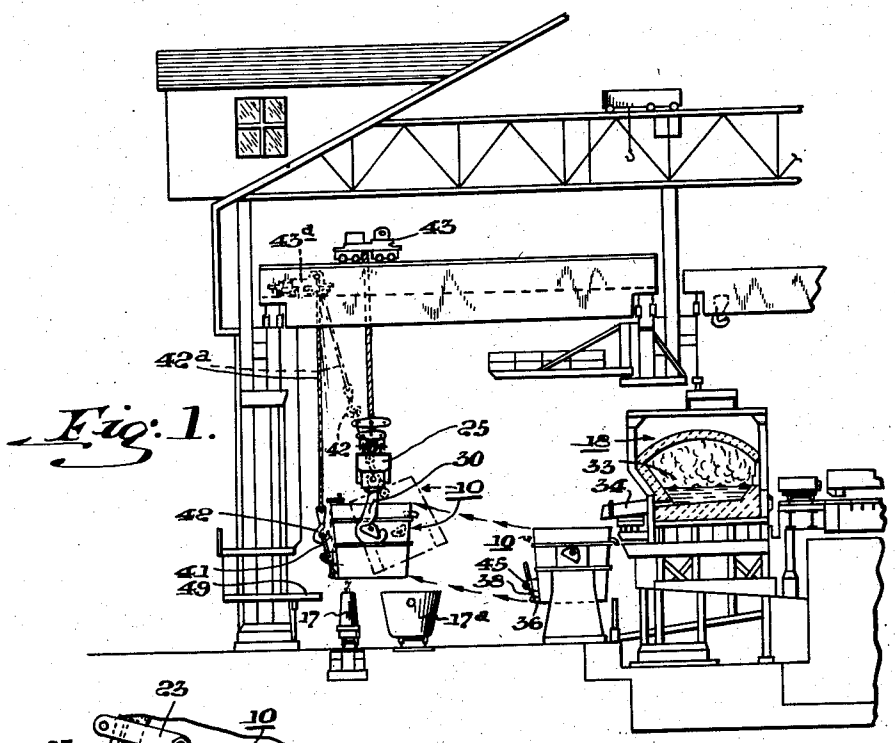

Fig. 1.

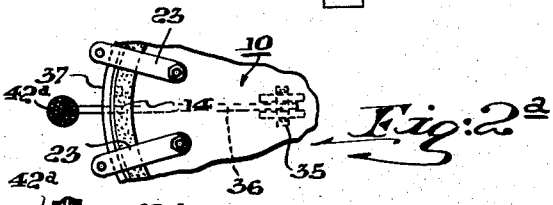

Fig. 2a

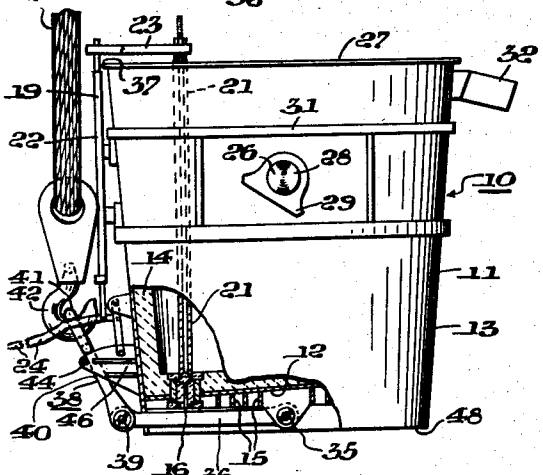

Fig. 2.

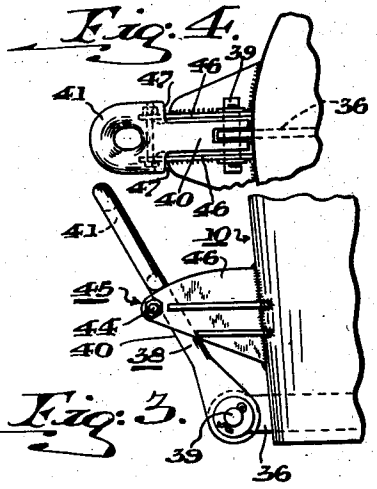

Fig. 4.

Fig. 3.

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TILTING LADLE

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3 Claims. (Cl. 22—82)

The present invention relates to improvements in the general operation of tilting ladles for molten metal, such as commonly used for transferring molten metal from an open hearth furnace to ingot molds, and more particularly, to improvements in such open hearth ladles, whereby the skull and slag may be more readily and easily dumped from the larger size open hearth ladles which are designed to contain three to four hundred tons of steel, and which are provided with bottom pouring nozzles for gravity flow of steel into the ingot molds, and so must be later turned over completely, 180°, to dump the skull and slag clear of the inner sides of the bottom discharge ladles.

The main object of the invention is the provision of a ladle of this type having a tilting mechanism incorporated as a permanent part of the ladle for turning the same completely over, 180°, and which can be readily engaged by the lifting hook of a hoist table, solely by manipulation of the strand of the hoist cable by an operator of the same at a point above the ladle, without having a workman go under the ladle or around the base of the same to connect the lifting hook to the ladle preliminarily to tilting to remove the skull and slag.

The physical dimensions of steel ladles of said capacities are such that it is no longer possible for workmen to manually manipulate the hoisting hook into lifting engagement with a connecting part on the ladle located around or underneath the base of the ladle at a region suitable for turning the ladle completely over. These ladles are built of the order of 16 feet diameter at the top, 13 feet inside diameter at the bottom, and 15 feet high. Necessarily, therefore, any hook or eye for tilting a vessel of such great weight must itself also be of such great weight that they are too heavy and cumbersome for one or two workmen to manipulate into lifting engagement while another hoisting hook is suspending the ladle in position for tilting by means of its bail through trunnions located somewhat above the center of gravity of the ladle.

The present invention provides for this purpose an improved tilting open hearth ladle of the aforesaid type having a simply operable pivoted lever, pin and link dumping mechanism that forms a permanent part of the ladle, and in which a member in the form of a pin or bolt holds the dumping link alongside the outerside of the vessel in a position at which a hook grasping part in the form of an eyelet at one end of a shank can be grasped at any time by a hoisting hook manipulated into grasping relation by a crane operator above the ladle without having another workman manipulate the heavy lifting hook into the eye of the dumping link from a position underneath or around the base of the ladle while the vessel is being suspended by its trunnion and bail by another hook from the hoisting crane above the ladle.

In addition to the general objects recited above, the invention has for further objects such other improvements or advantages as may be found to obtain in the structure and general operation of a ladle as shown on the drawing and hereinafter described or claimed.

Referring to the drawings:

Figure 1 is a schematic arrangement of apparatus embodying the ladle of the present invention with parts in section and parts in dotted lines to illustrate the various operations of the ladle;

Figure 2 is a side elevational view of the ladle, parts being in section;

Figure 2*a* is a fragmentary plan view of a part of Figure 2;

Figure 3 is a detailed side elevational view of the pin and link connection to the side of the ladle vessel;

Figure 4 is a detailed horizontal top plan view of Figure 3.

10 designates a ladle having a main body portion with a tapered side **11** and bottom **12**, both of welded rolled steel plate **13**.

The ladle is lined with brick **14** down to 350 tons. The bottom **12** is supported on a grid of steel beams **15**, and is provided preferably with two bottom pouring nozzles **16** for gravity flow of molten metal into ingot molds **17** on a trackway in the pouring aisle alongside the open hearth **18**. The ladle also carries as a permanent part a conventional stopper rod rigging **19** for the outlets of the nozzles **16** which, as shown, comprises a stopper rod **21**, rig **22**, link **23** and operating lever **24**.

As conventional, the ladle is provided with a bail **25** and trunnions **26** positioned on diammetrically opposite sides of the ladle with the center of the trunnion located with respect to the center of gravity of the full ladle so that the top **27** of the ladle will right itself into the horizontal plane when the full ladle is lifted by crane hooks **30**. Each trunnion consists of a trunnion pin **28** and trunnion block **29**. The ladle is also provided with a reinforcing ring **31** and a slag runoff spout **32** for overflow of slag from the hearth **33** directly into a slag bowl (not shown) at one side of the ladle when the ladle is alongside the pouring spout **34** for the hearth.

In accordance with the present invention, the ladle is provided with an eyelet **35** at the radial center of the bottom **12**, to which is pivotally connected a tilting lever **36** extending outwardly beyond the side of the vessel, preferably to a vertical plane beyond the outermost periphery **37** of the side of the vessel, namely the widest part of the top **27** of the vessel. A dumping link **38** with a shank **40** is pivotally connected at its lower end to the outermost end of the lever **36** by a pin **39**, and is provided at its upper end with a part in the form of an eyelet **41** for grasping engagement by the lifting hook **42** of the strand **42a** of an auxiliary overhead hoisting crane **43a**. The eyelet **41** is spaced from its pivotal pin end **39** by shank **40** to be extensible upwardly alongside the side of the vessel to be held there in position to be grasped by the hook **42** of the auxiliary overhead crane **43a**. A link retaining member in the form of a bolt or pin **44** is movably mounted, preferably manually removed mounted, on the side of the vessel in position to hold the link **38** upwardly alongside the vessel **10** with a fix to maintain the eyelet **41** of the link **38** in a vertical plane beyond the outermost perimeter **37** of the vessel where hook **42** of crane **43a** may be readily inserted in the eye of the eyelet and the link **38** thus grasped by the hook **42** of the overhead crane **43a**. Preferably, the bolt or pin **39** is mounted on a bracket **45** fixed to the outerside of the vessel **10**, which bracket is in the form of two peripherally spaced vertical plates **46**, between which the stem **40** may enter and be locked in by the bolt **44**. The eyelet is provided with shoulders **47** which straddle the tops of the bracket

plates 46 and thus coact with the bolt or pin 44 to hold the lever 36 up in horizontal position below the bottom of the vessel and the eye of the link in position to be grasped by the auxiliary overhead crane hook 42. The bolt or pin 44 is movable out of the path of the stem 40 of the link to permit the link 38 and lever 36 of the mechanism to straighten out when hoisted by the auxiliary overhead crane hook 42, and thus pull the center 35 of the bottom 12 around the trunnions of the ladle, 180°, to turn the vessel completely over in dumping the skull and slag.

To permit the vessel 10 to be set flat on the ground, the sides of the vessel are extended down as shown at 48 to below the level of the eyelet 35 for lever 36, at the radial center of the bottom of the vessel, to form a flat seat for the same and thus enclose the lever 36 all around the base of the ladle, thus protecting it from damage and dirt when the ladle vessel is set down on the ground.

In operation, after the ladle vessel 10 is filled with molten steel from the hearth, and the slag therefrom overflowed through the ladle and its slag run-off spout 32, the ladle 10 is hoisted by its bail and trunnions 28 upon the hook 30 of the main overhead crane 43 and then moved over to the ingot molds 17 when the stopper rod operating mechanism 19 is then operated to pour the metal out through the bottom nozzles 16 into the ingot molds 17.

To remove the residue of skull and slag from the ladle, it is necessary to completely upset the ladle by turning it completely over so that the slag can strike the skull and break the same away from the inner sides of the ladle. Heretofore, it has been necessary to have an operator on the ground manually swing a cable from the auxiliary hook of the pit crane 43^a and attach it to an eyelet on the side or underneath the ladle 10. This operation is hazardous and in many cases, the hook 42 on the crane did not engage itself in the eyelet 35 on the first try.

With the present invention, after the metal has been poured into the ingot molds, the cranemen manipulate the auxiliary hook 42 of the pit auxiliary crane 43*a* by manipulation of the strands 42^a of the hoisting hook 42 from the crane 43^a above the ladle 10, so as to engage the auxiliary hook 42 of the crane 43^a with the eyelet 41 of the dumping link 38 while it still is held in the bracket 45 by the bolt 44. This is done without any help from an operator below and around the base 48 of the ladle 10, while it is still being suspended by the main hoisting hooks 30, operated from the main crane 43, in lifting engagement with the trunnions 28. When this is accomplished without any help from the operator around or under the ladle, then the operator on the platform 49 or ground removes the bolt or pin 44 and the main crane 43 then moves the ladle 10 over the slag pots 17^a, and the auxiliary hook 42 of the crane 43^a is then hoisted to pull upon the dumping link 38 so that the ladle is turned completely over as a result of the link 38 moving out of the bracket 45 and pulling the lever 36 on a line transversely to the axis of the trunnions 28. The auxiliary hoisting hook 42 holds the ladle upside down, while the ladle is still suspended by its trunnions 28 from the main hoisting hook 30. When the auxiliary hoisting hook 42 is released, the ladle swings back to upright position, since the trunnions are above the center of gravity of the ladle 10 and the dumping link 38 is repositioned in the bracket 45 by further manipulation of its auxiliary hoisting hook 42, whereupon the bolt 44 is replaced to retain the lever 36 and link 38 in position on the ladle for a next dumping operation.

As shown, the lever 36 is held up close below the grid of beams 15 by the link 38 and bolt 44, and a slot 50 is provided in the skirt 48 through which the lever extends beyond the outside of the skirt. The nozzles

16 are so spaced from each other that the lever 36 is located a sufficient distance away from the nozzles, that the lever 36 does not interfere in any way with the flow of hot metal from the nozzles into the ingot molds 17, nor does the lever ever come in contact with the hot metal from the nozzles during the pour. Alternatively, the beams 15 of the grid may be provided with aligned grooves within which the lever 36 can nest, to be held off the ground by the link and bolt. With these arrangements, the aforesaid hazardous operation is eliminated, and the necessity of workmen moving underneath or around the base 48 of the ladle 10 to hand swing the hoisting hook 42 or dumping link 38 into and out of engagement, is eliminated. This is especially important for operation with ladles for three or more hundred tons, since the hook 42 and dumping link 38 must be made of such correspondingly large size, that they are too cumbersome and heavy for even several men to manipulate manually into and out of operative relation.

The invention, as hereinabove set forth, is embodied in a particular form of construction but may be variously embodied within the scope of the claims hereinafter made.

I claim:

1. A ladle comprising a metallic shell having an inner lining of refractory material and a bottom pouring nozzle for gravity discharge of molten metal therefrom, trunnions secured at diametrically opposite sides of the ladle above its center of gravity, and a ladle dumping mechanism permanently connected with the ladle comprising a lever pivoted at one end to its bottom at the center thereof and extending outwardly laterally of the line of the axis of the trunnions to a region beyond the outer side of the base of said shell, a dumping link with a shank pivotally connected at one end to the lever at the outer side of the shell in position to be extended upwardly along said shell and provided with a hook grasping part at its other end for grasping the hoisting hook of a hoisting strand, and a link retaining member mounted on the side of the shell for retaining engagement with the shank of the link at a location to maintain the same upwardly alongside said shell with said hook grasping part in position to be readily grasped by said hoisting hook solely by manipulation of its hoisting strand from a point above the ladle, said link retaining member being movable out of retaining engagement with the link to free the same to permit it to be pulled out straight with the lever to tilt the ladle, 180°, when the link is hoisted by the hoisting hook to completely turn over the ladle for dumping.

2. A ladle comprising a metallic shell having an inner lining of refractory material and a bottom pouring nozzle for gravity discharge of molten metal therefrom, trunnions secured at diametrically opposite sides of the ladle above its center of gravity, and a ladle dumping mechanism permanently connected with the ladle comprising a lever pivoted at one end to the bottom of the ladle at the center thereof and extending outwardly laterally of the line of the axis of the trunnions to a region beyond the outer side of the base of said shell, a dumping link with a shank pivotally connected at one end to the lever at the outer side of the shell in position to be extended upwardly along said shell and provided with an eyelet at its other end for grasping the hoisting hook of a hoisting strand, and link retaining means comprising a bracket located on the side of said shell in position to receive the shank of the link and a bolt movably mounted in said bracket at a location to support the shank at an angle at which the eyelet is maintained in a position to be readily grasped by said hoisting hook solely by manipulation of its hoisting strand from a point above the ladle, said bolt being manually movable out of the path of the shank when in the bracket to free the link to permit it to be pulled out straight with the lever to tilt

the ladle, 180°, when the link is hoisted by the hoisting hook to completely turn over the ladle for dumping.

3. An open hearth ladle comprising a metallic shell having an inner lining of refractory material and a bottom pouring nozzle for gravity discharge of molten metal therefrom, trunnions secured at diametrically opposite sides of the ladle above its center of gravity, and a ladle dumping mechanism permanently connected with the ladle comprising a lever pivoted at one end to the bottom of the ladle at the center thereof and extending outwardly laterally of the line of the axis of the trunnions to a region beyond the outer side of the base of said shell, a dumping link with a shank pivotally connected at one end to the lever at the outer side of the shell in position to be extended upwardly along said shell and provided with an eyelet at its other end

for grasping the hoisting hook of a hoisting strand, and link retaining means comprising a bracket of peripherally spaced apart elements located on the side of said shell in position to receive the shank of the link between said elements and a bolt manually removably mounted in said bracket at a location to support the shank in the bracket at an angle at which the eyelet is maintained in position to be readily grapsed by said hoisting hook solely by manipulation of its hoisting strand from a point above the ladle, said bolt being manually movable out of the path of the shank when in the bracket to free the link to permit it to be pulled out straight with the lever to tilt the ladle, 180°, when the link is hoisted by the hoisting hook to completely turn over the ladle for dumping.

No references cited.