April 12, 1938. T. D. LUCIER 2,113,894

FOUNDRY LADLE

Filed Nov. 1, 1935 2 Sheets-Sheet 1

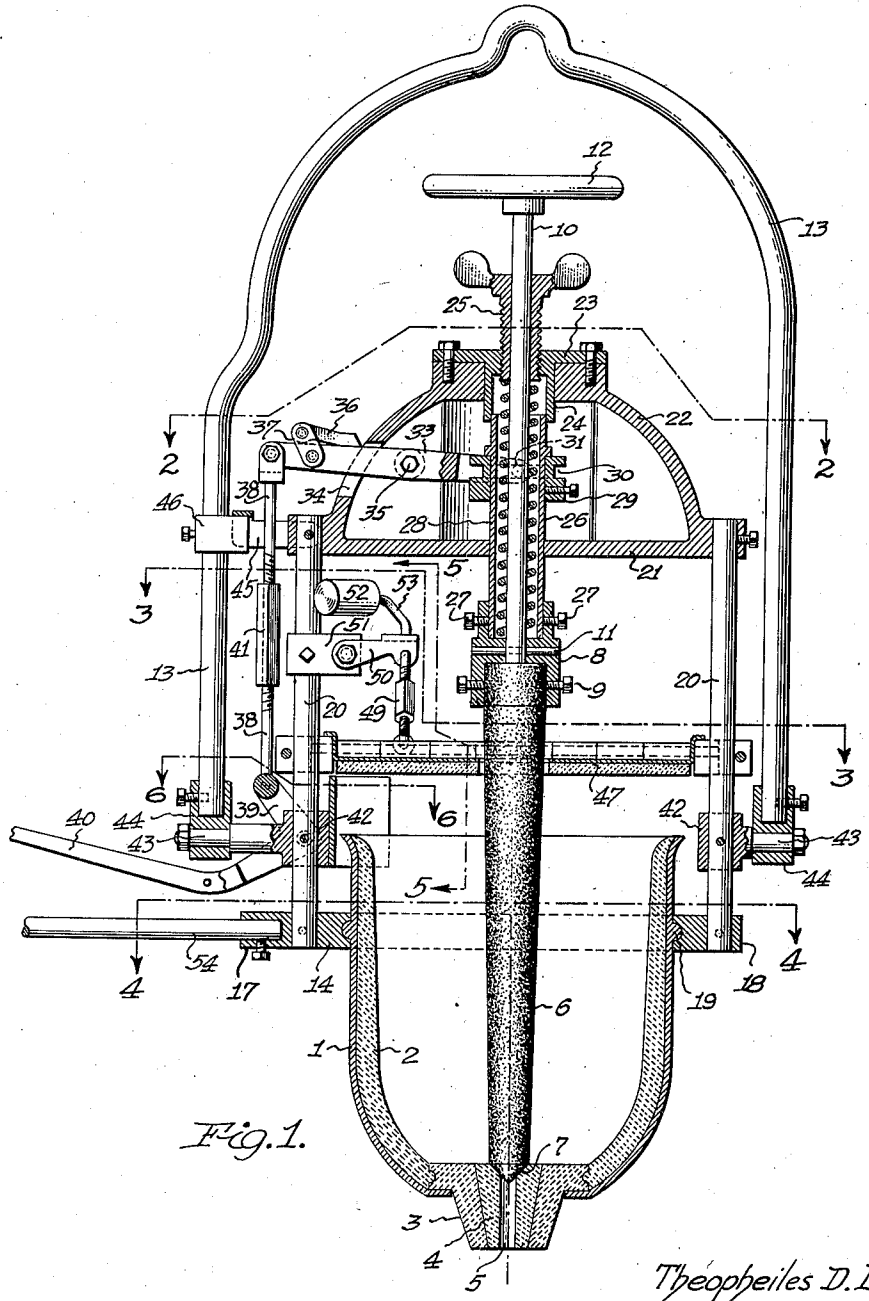


Fig. 1.

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FOUNDRY LADLE

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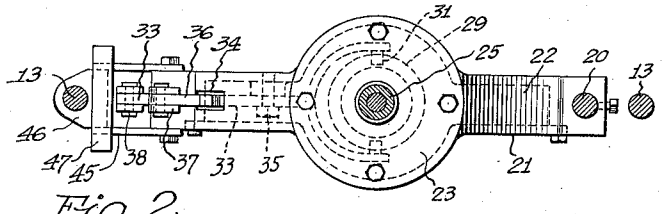


Fig. 2.

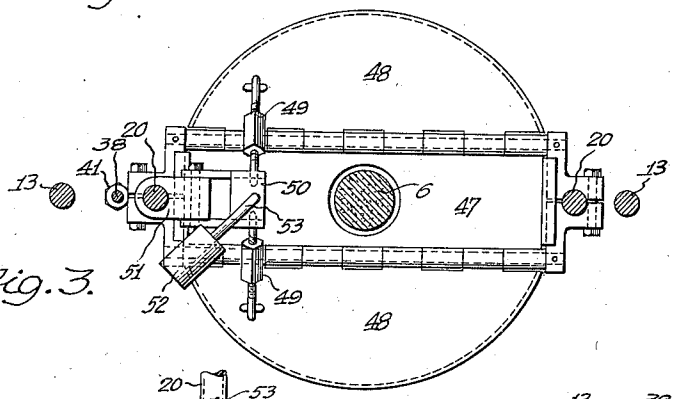


Fig. 3.

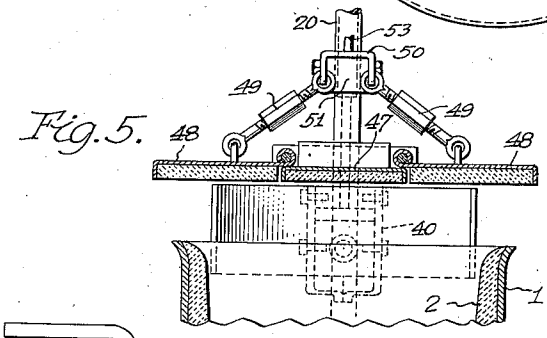


Fig. 5.

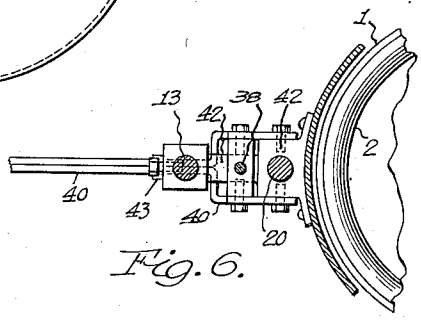


Fig. 6.

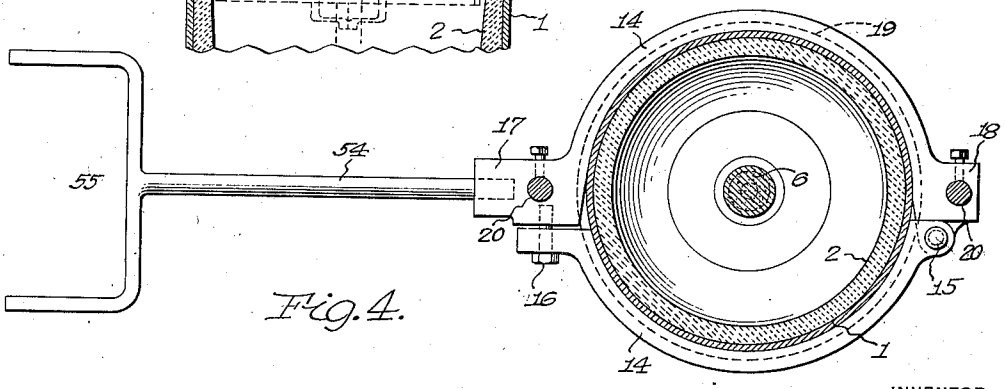


Fig. 4.

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2,113,894

FOUNDRY LADLE

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Application November 1, 1935, Serial No. 47,771

4 Claims. (Cl. 22—84)

This invention relates to devices known as ladles for use in transferring and pouring molten metal in casting operations, and more particularly to a ladle of comparatively large capacity adapted to be transported from place to place by a trolley conveyor or similar means.

An object of the present invention is to provide a ladle having a bottom outlet whereby the molten metal may be drawn off without tipping the ladle, and to provide a valvular member or stopper for controlling the bottom outlet, which member is so constructed and arranged as to insure its long life and provide a positive closure for the outlet to prevent leakage, said stopper being adjustable and manipulable to further insure against leakage.

A further object is to so support the ladle within a suspending bail that the same may be conveniently tilted independently of said bail for the purpose of dumping the ladle, and further to provide means for locking said ladle in an upright position within said bail to insure against accidental tipping during transportation.

It is also an object to provide a supporting framework for the ladle, which framework is pivotally attached to the lower ends of the bail and forms a guide for the stopper and place of support for adjusting and manipulating means for said stopper as well as for a protecting cover for said ladle, whereby the whole mechanism may swing within the bail with the tilting of the ladle, the parts being thus maintained in operative position regardless of the position of the ladle.

It is also an object to provide means whereby the ladle may be conveniently tilted within its supporting bail without danger to the operator, and to provide means carried by said framework and provided with a laterally extending lever handle for controlling said stopper, whereby the same may be positively manipulated as desired without danger of injury to the operator.

A further object is to provide certain other new and useful features in the construction, arrangement and combination of parts, all as hereinafter more fully described and as shown in the accompanying drawings wherein;

Figure 1 is a transverse vertical section of a device illustrative of an embodiment of the present invention;

Fig. 2 is a horizontal section substantially upon the line 2—2 of Fig. 1;

Fig. 3 is a similar section substantially upon the line 3—3 of Fig. 1;

Fig. 4, a similar section upon the line 4—4 of Fig. 1;

Fig. 5, a vertical section substantially upon the line 5—5, and

Fig. 6 is a section substantially upon the line 6—6 of Fig. 1.

As shown in the accompanying drawings, 1 indicates a ladle or cup for holding molten metal, this cup being lined with a suitable heat resisting lining 2 in the usual manner. The extreme bottom of the cup or ladle is formed with an opening in which opening is secured a discharge nozzle comprising an outer lining member 3 forming a continuation of the lining 2 and projecting through the opening. This nozzle lining is formed with a central tapered bore in which a removable lining portion 4 is inserted, this part 4 being provided with a discharge opening 5 formed at its inner end with a tapered seat leading to the bore. With this arrangement the inner lining of the discharge nozzle may be removed to replace the seat which in the operation of the device may become burned and roughened during the discharge from the ladle.

To close the discharge opening 5, a stopper 6 is provided, this stopper being formed with a solid body of refractory material of a carbon composition adapted to resist the extreme heat which is imparted thereto by the molten metal in the ladle and this stopper or carbon pencil is preferably of such a length that when its lower tapered end 7 is seated within the seat in the nozzle member 4, the upper end of the stopper will extend to a considerable distance above the upper open end of the ladle. Preferably this pencil-like stopper is longitudinally tapered, its upper end being of a considerably greater diameter than its lower seating end to add strength and rigidity to the stopper. The body of this stopper being formed entirely of a graphite composition or other refractory material, offers a very high resistance to the heating effect thereon of the molten metal within the ladle and therefore its lasting qualities are very much greater than they would be if this stopper were made up of separate sections held together by a central metal rod which would be effected by the extreme heat and be quickly warped or twisted out of shape thereby preventing it from seating properly to properly close the outlet.

To support the stopper 6, a socket member 8 is provided to receive the upper end of the stopper and set screws 9 extending through screw-threaded openings in the socket engage the sides of the stopper and firmly hold it seated within

the socket in perfect alinement with an operating rod 10 which is secured at its lower end with an axial bore in the socket member by means of a transverse pin 11, this rod extending upwardly for a considerable distance in axial alinement with the stopper 6 and being provided at its upper end with a hand wheel 12 by means of which the stopper and rod may be rotated for the purpose of clearing the seat at the upper end of the discharge opening 5 of any residue from the molten metal and to cause the seating end 7 of the stopper to conform to its seat in the discharge opening and prevent leakage of molten metal through the discharge. This construction and arrangement of stopper together with said means by which it may be rotated, accordingly increases the life of the stopper and insures against leakage of molten metal from the ladle through its bottom outlet.

The present construction is particularly adapted for application to a ladle of comparatively large capacity and to suspend and transport the ladle from place to place such as from the cupola to the molds, a supporting bail 13 is provided, said bail being adapted to be attached in any suitable manner to a suitable trolley conveyor chain or the like not shown, and to support the ladle from this bail, a ring 14 is provided to embrace the ladle adjacent its upper end, said ring 14 being preferably made in halves, one part being pivotally connected at 15 as shown in Fig. 4, to the other part at one end and at its opposite end by a screw bolt 16 passing through an ear on that part and engaging a boss or head 17 on one end of the other part, the opposite end of said part being formed with a lug or head 18 having an ear to which the end of the other part of the ring is connected by the pivot 15. The ladle 1 is formed with an exterior circumferential rib 19 and the ring member 14 is formed with a corresponding internal groove to receive this rib and when the ring is clamped about the ladle in engagement with the rib 19, the ring is firmly secured to the ladle and held in a position to form a support for the ladle.

To pivotally support the ladle within the bail 13, a suitable framework is provided, this framework including vertically extending rods 20 which are rigidly secured at their lower ends within openings in the lugs 17 and 18 on the ring 14. These rods extend upwardly a considerable distance within the bail 13 and in parallel relation to the side legs of the bail when the parts are in normal position, and to connect the upper ends of these rods 20, a bridge member or bar 21 is provided with its ends formed with openings to receive the upper ends of the rods 20 which are rigidly secured within these openings. The bar 21 is preferably formed hollow or with an upwardly extending dome 22 having a bore in its upper wall to receive a cap 23 formed with a sleeve portion 24 extending downwardly into the chamber formed by the dome, and this cap 23 is formed with a screwthreaded axial opening to receive an adjusting thumb screw 25 having an axial bore which forms a guide bearing for the upper end of the rod 10.

The socket member 8 is formed at its upper end with a socket to receive the lower end of a tube 26 which is rigidly secured within the socket by means of set screws 27 and the upper end of this tube 26 is adapted to engage and slide within the sleeve 24 on the cap 23, and mounted upon the rod 10 within this tube 26 is a coiled spring 28 which seats at one end upon the socket 8 and at its upper end against the inner end of the thumb screw 25. Therefore the expansive force of this spring 28 tends to move the tube 26 and the stopper member 6 connected thereto, in a downward direction to hold the seating end of the stopper firmly seated within its seat in the discharge nozzle of the ladle when the parts are in the position shown in Fig. 1 and this force exerted by the spring 28 may be increased or decreased by turning the thumb nut 25.

A collar 29 is secured in any suitable manner to the tube 26 within the chamber of the dome 22 and this collar is formed with a peripheral groove 30 to receive pins 31 shown in dotted lines in Fig. 2, upon the ends of a forked lever 33 which projects through an opening 34 in the wall of the dome and is pivotally supported intermediate its ends as at 35 so that upon operation of this lever, the tube 26 and the stopper 6 attached thereto may be moved vertically, the upper end of the tube sliding within the socket 24 of the cap 23, this movement being against the action of the spring 28 and therefore the stopper may be unseated by operating the lever 33 to open the discharge nozzle at the bottom of the ladle.

When said lever 33 is so operated to lift the stopper and open the discharge nozzle, said stopper may be held in this raised position by means of a latch 36 engaging the upper side of the lever and pivotally connected to the lever by means of links 37 so that said latch may be moved longitudinally of the lever and projected into the opening 34 between the upper end thereof and the upper side of the lever.

To operate the lever 33, an operating rod 38 is pivotally attached at its upper end to the outer or free end of the lever and extends downward to a suitable pivotal connection at its lower end with a pivoted arm 39 pivotally supported upon the framework and having an extended operating handle 40 projecting laterally outward away from the ladle, said rod 38 being formed of two parts which are connected by an adjusting nut 41 so that the length of this rod may be adjusted to adjust the throw of the hand lever 40 and thus limit the extent of upward movement of the stopper 6.

To pivotally support the ladle upon the lower ends of the side arms of the bail 13, stud members 42 are rigidly secured to the rods 20 substantially in a horizontal plane of the upper open end of the ladle and these stud members 42 are formed with trunnions 43 to engage bearings in heads or socket members 44 rigidly secured to the lower ends of the side arms of the bail 13 and therefore the ladle is supported for pivotal movement upon these trunnions 43 which have bearings in the members 44 on the lower ends of the arms of the bail, and the framework comprising the rods 20, bridge bar 21 and including the operating mechanism for turning and raising and lowering the stopper 6, is all carried by and movable with the ladle and supporting ring 14 so as to swing with the swinging movement of the ladle relative to the bail 13, and to hold this framework and ladle against swinging movement between the arms of the bail, a latch member 45 is pivotally attached at one end to one end of the bridge bar 21 and is adapted to engage at its opposite end a collar 46 secured to one of the legs of the bail. The ladle and supporting and guiding frame-

work thereabove, may be released for swinging movement upon the trunnions 43 between the legs of the bail, by swinging the latch 45 out of engagement with the member 46.

To protect the operating parts for the stopper 6 and also the framework above the ladle, a cover is provided above the upper open end of the ladle, this cover comprising a transverse rectangular support 47 provided upon its lower side with a refractory lining and supported at its ends in any suitable manner upon the rods 20 of the supporting framework, said member being formed with a central opening through which the stopper 6 extends and also formed with hinges along its opposite sides for connecting pivotal side wings or sections 48 thereto, these side pivoted parts of the cover being adapted to be turned upwardly to afford greater area of opening into the upper end of the ladle when it is desired to fill the same with molten metal and to so swing the parts 48 of the cover upwardly toward each other, a link 49 is pivotally attached to each cover section and these links are pivotally attached at their upper ends to a lever 50 which is pivotally attached to a block 51 secured to one of the rods 20 and thus by the upward swinging movement of this lever 50 the free end of which is connected by the links 49 to the pivoted wings 48 of the cover, said wings will be swung upwardly and toward each other over the supporting member 47 therefor, and when so swung they will be held in that position by means of a counterbalancing weight 52 mounted upon an upwardly extending arm 53 secured to the free end of the lever 50, the weight swinging downwardly as the lever swings upwardly and thus counterbalancing the weight of the pivoted wings of the cover to hold them in open position and permit free access to the open upper end of the ladle at each side of the central stopper therein.

To swing the ladle and its supporting frame within the bail upon the trunnions 43 on the lower ends of the bail arms, an operating arm or rod 54 is secured at one end within a socket in the lug or head 17 on the supporting ring 14 of the ladle and extends laterally therefrom normally in the vertical, longitudinal plane of one of the said trunnions, and adjacent and below the handle 40 for raising the stopper 6. The free end of this arm 54 is provided with a T-handle 55 so that a twisting motion applied to said handle will swing the ladle about its trunnion supports to dumping position and said handle may be used to direct the ladle and steady the same during its travel along a conveyor from which the bail is supported and to accurately position the ladle outlet relative to a mold.

In operation, with the device in the position shown in Fig. 1, the cover wings 48 will first be turned upwardly to open position by operating the weighted arm 53 so that the ladle may be conveniently filled at the foundry cupola. These cover wings are then again lowered to protect the operator and the operating parts of the device from the extreme heat, and the ladle is then transported by the conveyor to a point above the mold, the operator steadying and directing the ladle by means of the handle 55 to position its bottom outlet 5 directly above and in position to discharge directly into the mold, the ladle being locked in an upright position within the bail 13 by the latch 45. He will then press the lever 40 to raise the stopper against the action of the spring 28 and open the discharge and when that mold is filled he will release said lever permitting said spring to seat said stopper and close the outlet.

This operation will be repeated to fill each of several molds until all of the molten metal, except the slag which rises to the top of the metal in the ladle, is drawn off. The operator will then release the latch 45 and by means of the handle 55, will tilt the entire device within the bail to dump the residue from the ladle, and will then swing it back to upright position and see that the stopper is properly seated, and if not, due to accumulation on said seat or burning of said seat or seating end of said stopper, he will rotate said stopper in its seat by means of said hand wheel 12 to grind said seat and stopper end to give perfect seating and insure against leakage when the ladle is again filled.

With this arrangement the device may be quickly and conveniently operated, the operator and operating parts are protected and a tight closure of the ladle outlet is insured. Further, the provision of a stopper comprising a solid body of refractory material together with a renewable discharge nozzle lining and means for manipulating said stopper, insures extended life of the stopper, and the manner in which said stopper is mounted and guided insures its alinement with the discharge opening and proper seating therein.

Obviously changes may be made in the construction, arrangement and combination of parts without departing from the spirit of the invention and such changes are contemplated.

Having thus fully described my invention what I claim is:

1. Stopper means for a ladle having a bottom outlet, said means including a stopper comprising an elognated body formed entirely of carbonaceous material having a lower end to seat in and close said bottom outlet of said ladle, means above said ladle for guiding and supporting said stopper, a spring housed within said guiding means and normally acting to hold said stopper seated, and a rod passing through said guiding means and spring and having a hand wheel on its upper end for rotating said stopper.

2. Means for closing the bottom outlet of a ladle having an open top and supported within a frame for swinging movement within a supporting bail, said closure means including a stopper having an elongated body of carbonaceous material adapted to seat at its lower end within the outlet of said ladle and to extend through the upper end of the ladle to a point well thereabove, means detachably attached to the upper end of said stopper and including a head to receive the upper end of the stopper, and a sleeve guided within said supporting frame for said ladle, a coiled spring housed within said sleeve and acting to hold said stopper seated, and means carried by the supporting frame for the ladle and adapted to move said sleeve longitudinally against the action of said spring and unseat said stopper.

3. A device as characterized in claim 2, and further characterized in that said stopper is provided with a rod extending upwardly from its upper end and attached thereto and extending through said sleeve and provided with a hand wheel on its upper end above the supporting frame for said ladle, for rotating said rod and said stopper.

4. Means for closing a bottom outlet of a ladle which ladle is supported by a supporting frame and is provided with a cover for said ladle carried by said frame and having a central opening,

said means for closing said bottom outlet of said ladle comprising a stopper formed entirely of carbonaceous material of a cylindrical form in cross section and tapered downwardly in the direction of its length to seat at its lower end within the outlet of the ladle and to extend at its upper end through said central opening of said cover, and means for supporting and manipulating said stopper which means includes a head detachably engaging the upper end of said stopper above said cover, said head being connected to the lower end of a tube guided within said supporting frame for said ladle for longitudinal and rotative movement, a rod secured at its lower end to said head and extending upwardly through said tube and provided with a hand wheel on its upper end, and means carried by said frame for moving said tube longitudinally and comprising a forked lever and a hand operated lever and a connecting rod connecting said levers, said levers being pivotally supported by said frame for supporting said ladle.

THEOPHEILES D. LUCIER.