Nov. 26, 1940. L. C. EDGAR, JR 2,223,062

LADLE STOPPER RIGGING

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Fig. 1.

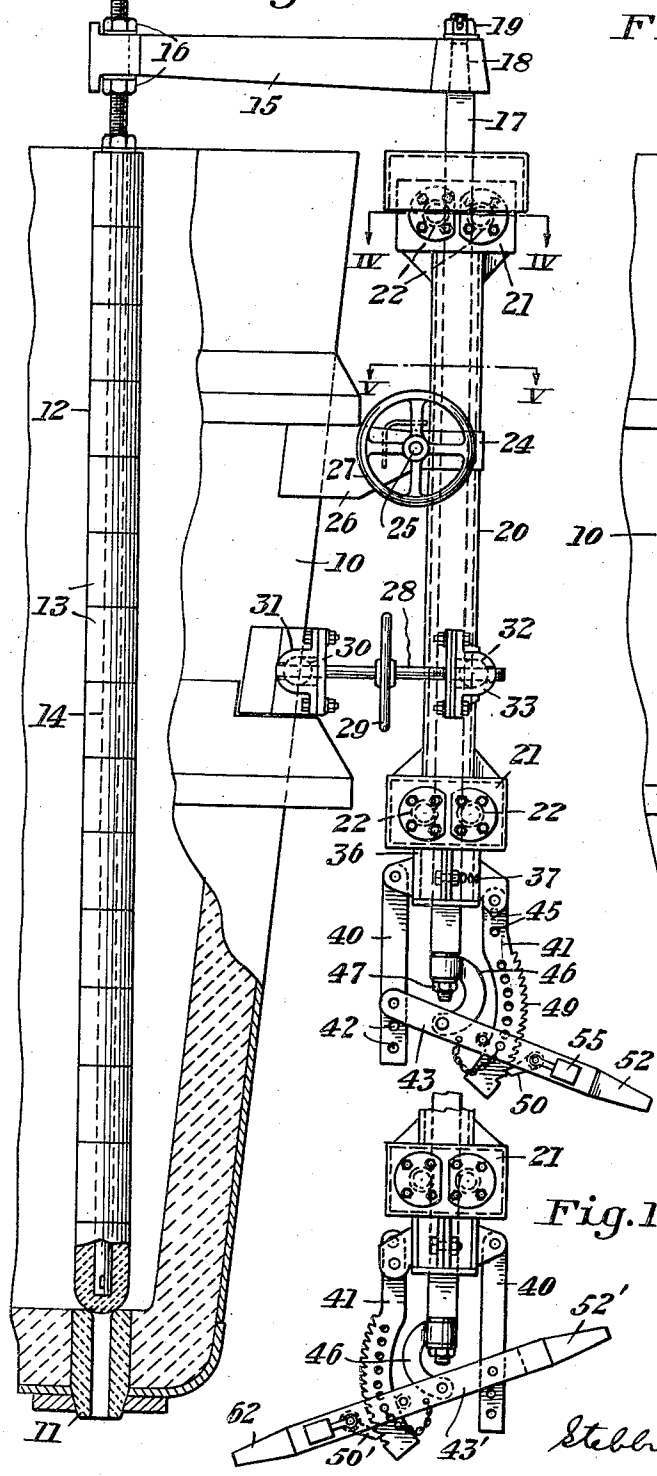


Fig. 2.

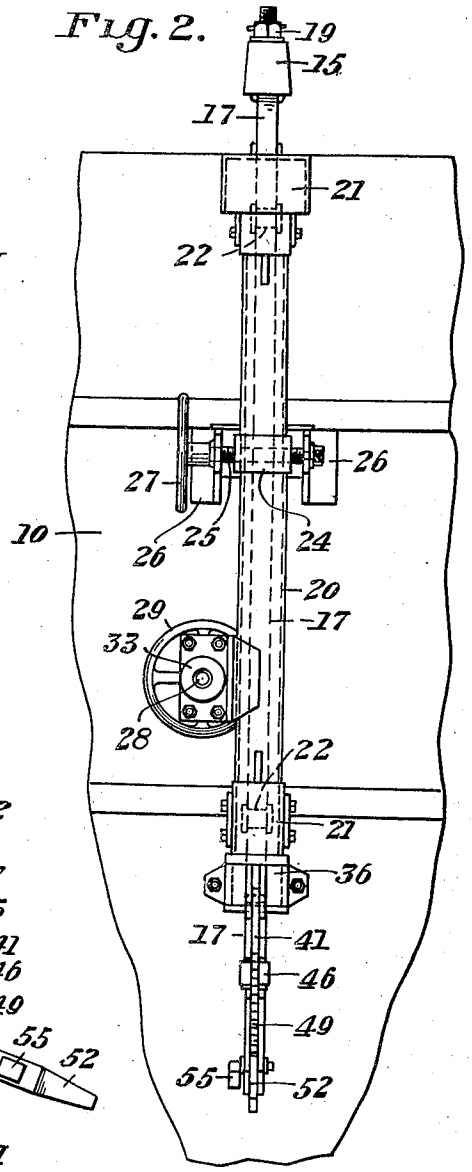


Fig. 12.

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Fig. 4.

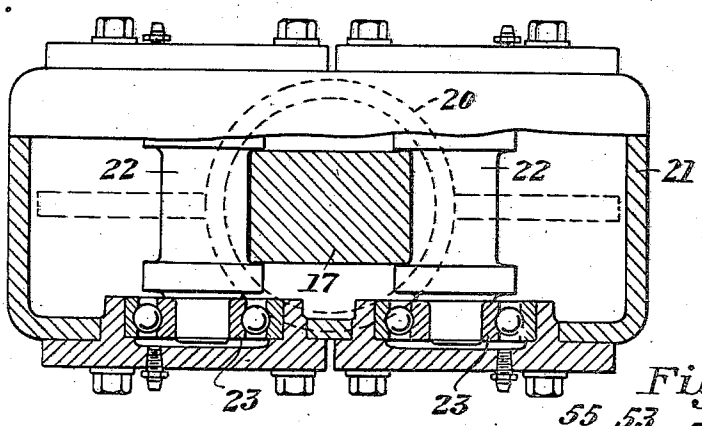


Fig. 3.

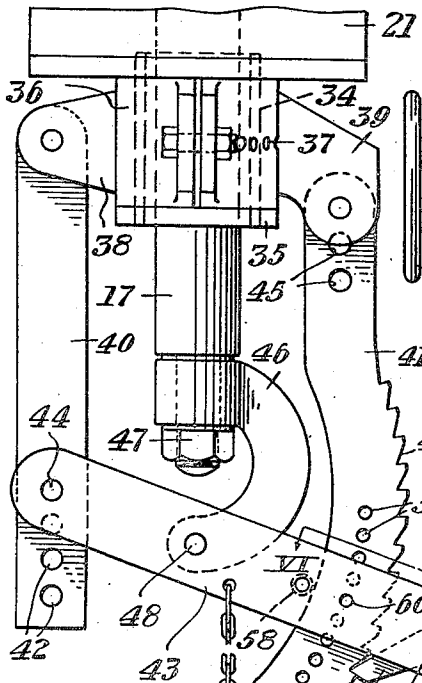


Fig. 5.

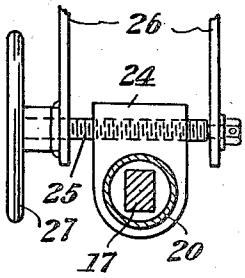


Fig. 7.

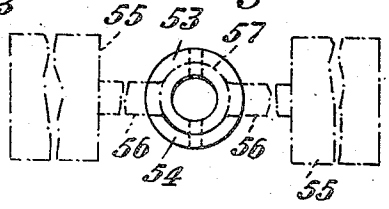


Fig. 8.

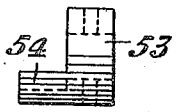


Fig. 6.

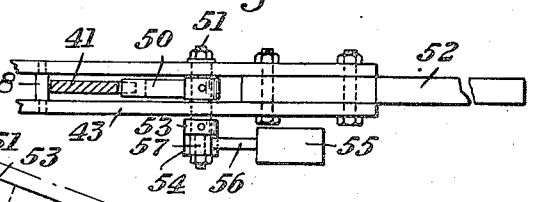
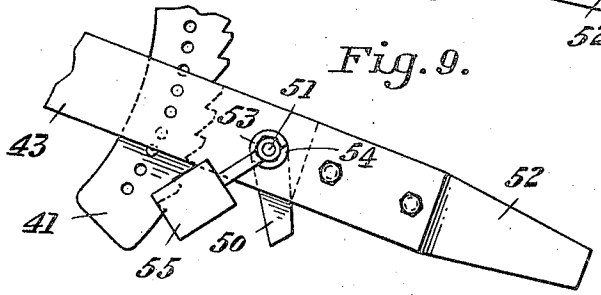


Fig. 9.



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Fig. 10.

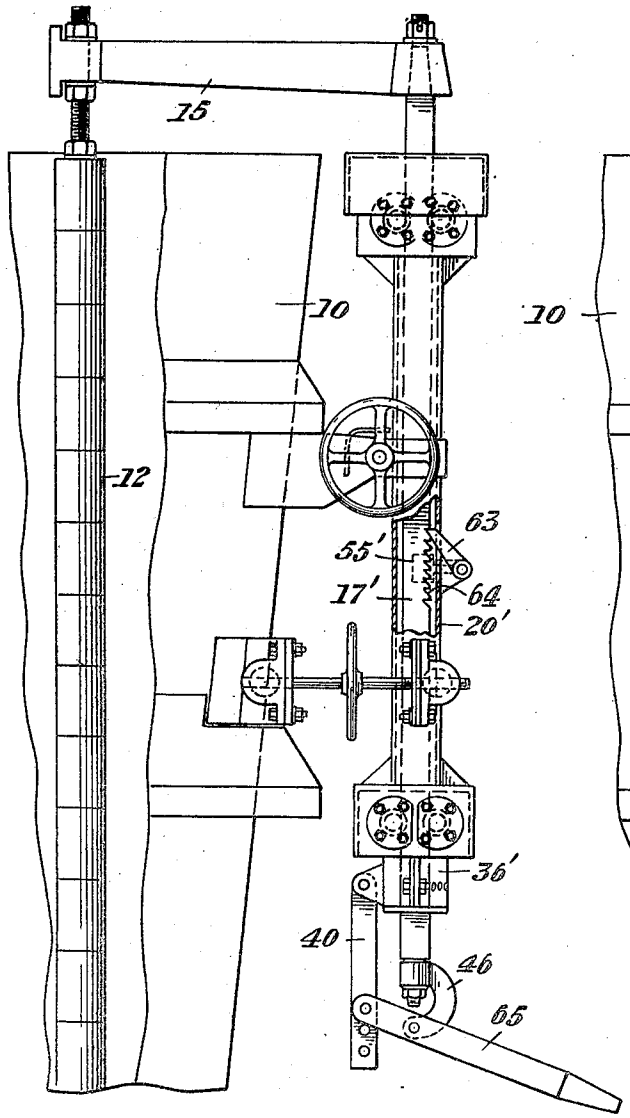
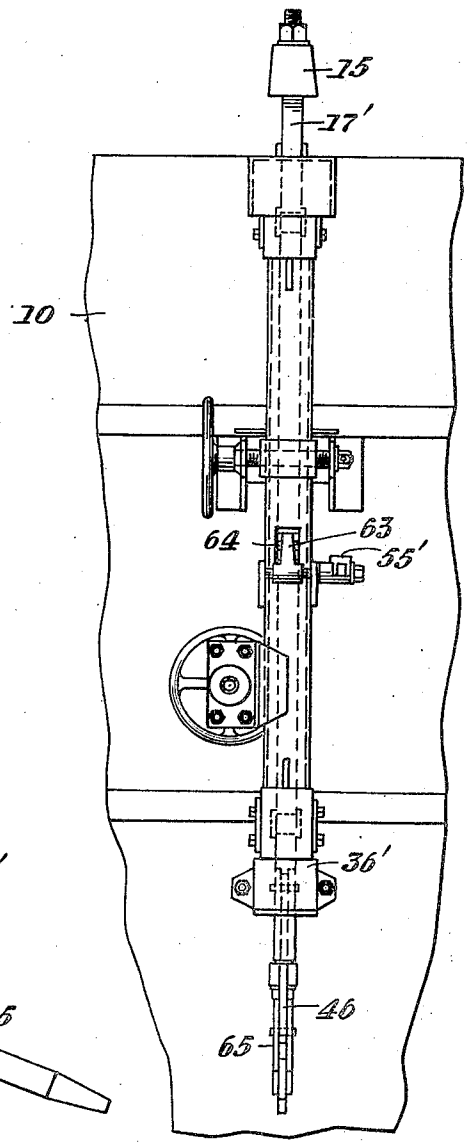


Fig. 11.



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UNITED STATES PATENT OFFICE

2,223,062

LADLE STOPPER RIGGING

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Application August 29, 1939, Serial No. 292,435

5 Claims. (Cl. 22—85)

This invention relates to mechanism for actuating the stopper of a bottom-pour ladle.

Stopper actuating mechanisms as known heretofore have been characterized by certain serious objections. In the first place, they have required considerable manual effort for their operation. Secondly, it has been necessary for the operator to hold the stopper open during the pouring operation which means that he must stand near the ladle. He has no choice of position, furthermore, as the usual operating lever is fixed relative to the ladle. It has been possible, furthermore, for the stopper to be retracted too far, thereby causing the pour to proceed at an excessive rate.

I have invented a novel form of stopper actuating mechanism which fully overcomes the aforementioned objections and is characterized by further advantages which will appear more clearly from the following detailed description. In a preferred form of the invention, a guide adapted to be adjustably mounted on a ladle has spaced anti-friction bearings in which a lift rod is movable longitudinally. An operating lever for the lift rod is movable to various positions as may be convenient for the operator. The mechanism of my invention, furthermore, is so constructed that the stopper can be raised by an uplift or a downpull on the operating lever. I also provide means for holding the stopper in various positions and for preventing excessive elevation thereof. This preferred embodiment is illustrated in the accompanying drawings to which reference is made in the following description. In the drawings:

Fig. 1 is a side elevation partly broken away and partly in section, showing one form of the invention;

Fig. 2 is an elevation taken at right angles to that of Fig. 1;

Fig. 3 is a partial elevation showing a portion of Fig. 1 to enlarged scale;

Fig. 4 is a view partly in section along the line IV—IV of Fig. 1;

Fig. 5 is a sectional view taken along the line V—V of Fig. 1;

Fig. 6 is a sectional view taken along the line VI—VI of Fig. 3;

Fig. 7 is an end view of a detail;

Fig. 8 is a side view thereof;

Fig. 9 is a view showing a portion of Fig. 3 with parts in alternative positions;

Fig. 10 is a view similar to Fig. 1 showing another form of the invention;

Fig. 11 is an elevation taken at right angles to that of Fig. 10; and

Fig. 12 is a partial elevation showing a modification.

Referring now in detail to the drawings, a bottom-pour ladle 10 of any desired construction has a pouring nozzle or spout 11 in the bottom thereof. A stopper 12 cooperating with the inner end of the nozzle 11 comprises a plurality of refractory sleeves 13 disposed on a stopper rod 14, the upper end of which is threaded. The stopper 12 is supported on an arm 15, the inner end of which is bored to receive the end of the rod 14. The rod is adjustable relative to the arm 15 by nuts 16.

The arm 15 is secured to the upper end of a lift rod 17, the rod end being tapered as at 18 and threaded at its extreme end to receive a holding nut 19. It will be apparent that the arm 15 is thus fixed securely to the rod 17. The adjustability of the stopper rod 14 relative to the arm 15 permits the stopper 12 to be so positioned that its lower end makes proper contact with the nozzle despite wear of the latter or expansion of the rod 14.

The rod 17 is slidably disposed in a housing or guide 20 which is preferably in the form of a tube. Bearing boxes 21 are secured to the guide 20 near opposite ends thereof and are provided with grooved rollers 22 journaled therein on anti-friction bearings 23. The rod 17 which is rectangular in section as shown in Fig. 4, is thus guided for axial movement between the opposed rollers 22 in the boxes 21. The rod 17 is operated by means to be described shortly, to cause axial movement of the stopper rod 14. A bearing block 24 secured to the guide 20 is carried on a screw 25 which is threaded therethrough. The screw is journaled in bearing brackets 26 secured to the ladle. A hand wheel 27 keyed to the screw 25 permits the latter to be rotated manually whereby the block 24 is shifted along the screw. This causes a movement of the guide 20 tangentially of the ladle and a corresponding movement of the stopper 12. This adjustment permits the stopper to be alined with the nozzle 11 in one direction. The screw 25 serves as a hinge pin pivotally mounting the guide 20. Angular movement of the guide about the screw 25 may be effected by a screw 28 having a hand wheel 29 thereon. One end of the screw 28 has thereon a ball 30 received within a socket 31 secured to the ladle. The other end of the screw is threaded through a ball nut 32 received within a socket 33 secured to the guide 20. This adjusting means permits the lower end of the stopper 12 to be alined with the nozzle 11 in a radial direction relative to the ladle.

A neck 34 comprising a short length of tube

is secured to the lower end of the guide 20 as by welding and is provided with a bottom flange 35. A yoke 36 is supported on the flange 35 and is rotatable about the neck 34. Radial holes 37 in the yoke are adapted to aline with similar holes in the neck 34 whereby a locking pin may be inserted through alined holes to secure the yoke in a selected position. The yoke may be adjusted about the neck by removing the pin.

The yoke 36 is provided with bearings 38 and 39 on opposite sides thereof to which a fulcrum link 40 and a ratchet link 41, respectively, are pivoted. The fulcrum link 40 is provided with a series of holes 42 adjacent its lower end whereby an operating lever 43 may be pivoted to a selected point thereon by a removable pin 44. The ratchet link 41 has a similar series of holes 45 whereby it may be pivoted in selected position to the bearings 39.

The lower end of the lift rod 17 is turned down to receive a curved link 46 in swiveled relation thereto, the link being held on the rod by a nut 47. The link 46 is pivoted to the lever 43 as at 48. The link 41 has ratchet teeth 49 formed thereon. A pawl 50 pinned to a shaft 51 journaled in the lever 43 cooperates with the teeth 49. As best shown in Fig. 6, the lever 43 comprises a pair of spaced bars having a tapered projection 52 adapted to enter the socket of an extension lever.

A collar 53 having a laterally projecting segment 54 is also pinned to the shaft 51 as shown in Fig. 6. A counterweight 55 has a supporting arm 56 and an eye 57 thereon adapted to receive the reduced end of the shaft 51 and to engage one or the other of the edges of the segment 54 projecting from the collar 53. When the counterweight 55 is in the position illustrated in Figs. 3 and 6, it tends to urge the pawl 50 into engagement with the toothed edge of the ratchet link 41. The counter-weight may easily be flipped over so that the arm 56 engages the opposite edge of the segment 54 and thereby urges the pawl 50 away from the toothed edge of the link 41, as shown in Fig. 9.

A pin 58 extending through the lever 43 holds the link 41 in proper relation to be engaged by the pawl 50. The link 41 has a series of holes 59 formed therein and the lever 43 has a hole 60 adapted to aline therewith. A pin 61 is secured to the lever 43 by a chain and is adapted to be inserted in alined holes 59 and 60 for a purpose which will appear shortly.

It will be clear that an upward force on the tapered end of the lever 43 will raise the lift rod 17 and the stopper 12. The pawl 50 cooperating with the toothed edge 49 of the link 41 serves to hold the lever 43 in elevated position so that the stopper is held open without effort on the part of the operator. The pin 61 is preferably initially inserted in one of the holes 59 above the lever 43 to limit the maximum elevation thereof. This, of course, prevents the stopper from being raised beyond a predetermined level. While pouring, the operator inserts the pin 61 through the hole 60 to lock the lever 43 up in correct open position, and shifts the pawl 50 from the position shown in Fig. 3 to that shown in Fig. 9. On completing the pour, the lever 43 may be lowered on removal of the pin 61.

It will be understood that the series of holes 42 and 45 in the links 40 and 41 permit the lever 43 to be adjusted to a convenient position corresponding to the lowermost position of the stopper 12. The swivel mounting of the yoke 36, furthermore, permits the lever 43 to be adjusted angularly about the axis of the lift rod 17 to any position which may be convenient for a given pouring operation. The swivel mounting of the yoke 36 permits this angular adjustment.

The form of apparatus shown in Figs. 1 through 9 is operated to raise the stopper by pulling up on the extension lever applied to the tapered end 52 of the lever 42. It may be desirable at times to raise the stopper by a downpull on the lever. Fig. 12 shows a modified structure whereby this may be done. As shown in Fig. 12, a lever 43' has a pawl 50'. The lever 43' is similar to the lever 43 and is pivoted to the links 40 and 46. In Fig. 6, the positions of the links 40 and 41 relative to the link 46 are opposite those in which they are shown in Figs. 1 and 3. This change is effected by merely rotating the yoke 36 through an angle of 180°.

The lever 43', in addition to the tapered end 52' adapted to receive an extension lever, also has its opposite end tapered for the same purpose, as indicated at 62. With this second tapered end, the lever 43' is reversible and may be disposed in the position shown in Fig. 12 or in that shown in Fig. 3. If the tapered end 62 is omitted, separate levers are required for the different relative positions of the links 40 and 41 as shown in Figs. 3 and 12, respectively. It will be clear that a downpull on the end 52' of the lever 43' will cause the lift rod 17 to be elevated. The pawl 50' cooperates with the ratchet link 41 in the same manner as the pawl 50 to hold the lift rod in any position to which it may be elevated.

Figs. 10 and 11 illustrate a further modification which is similar in most respects to that already described. The guide 20' thereof, however, is provided with a pawl 63 adapted to cooperate with ratchet teeth 64 formed on the lift rod 17'. This takes the place of the ratchet link 41. A lever 65 pivoted to the fulcrum link 40 and the swivel link 46 operates in the same manner as the lever 43 to raise the lift rod. This lever may be used without change in either of the two relative positions indicated in Figs. 3 and 12. That is to say, the yoke 36' may be rotated so that the link 40 is on the side thereof near the operator so as to give him a choice of the uplifting or downpulling strokes for raising the stopper. When the pour has been completed, the operator raises the lift rod 17 slightly and retracts the pawl 63 by flipping its counterweight 55' to its alternate position. The pawl 63 and its counterweight are similar in construction to the pawl 50 and its counterweight.

It will be apparent from the foregoing description that the invention provides a stopper actuating mechanism for pouring ladles characterized by numerous advantages over structures of the same general character which have been known heretofore. The stopper may be readily adjusted relative to the lift rod in order to keep the operating lever in a convenient position despite changes in the level of the top of the pouring spout resulting from wear or changes in the length of the stopper caused by expansion. The stopper may be raised by an uplift on the operating lever or a downpull. The operating lever may be swung at various angles to facilitate movement thereof in close quarters. The maximum elevation of the stopper may be

limited as desired. The stopper remains in elevated position until lowered by the operator so that he is not required to exert any continuous effort during pouring. A further advantage is that the lift rod moves easily between its bearing rollers and but little effort is required to raise or lower it in the guide. In addition, the guide may be easily adjusted so as to spot the end of the stopper in exact alinement with the pouring spout.

Although I have illustrated and described herein but a preferred embodiment of the invention with certain modifications, it will be understood that changes in the construction and arrangement disclosed may be made without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. In a pouring ladle, bearings secured to the ladle structure for supporting a screw horizontally and generally tangentially of the ladle, a generally vertical guide mounted on said screw for tilting movement thereon, said screw being effective on rotation to cause bodily movement of the guide tangentially of the ladle, a lift rod slidable in said guide, and a stopper carried on said rod and extending downwardly into the ladle.

2. Actuating mechanism for the stopper of a bottom-pour ladle comprising a guide tube disposed substantially vertically alongside the ladle, means mounting the tube for movement relative to the ladle and means securing the tube in adjusted position relative to the ladle, a lift rod slidably carried in said tube, a yoke mounted on the lower end of the tube for rotation about a substantially vertical axis, a fulcrum link pivoted to said yoke, a link swiveled on the lower end of said rod for rotation about an axis coincident with the axis of rotation of the yoke, and an operating lever pivoted to said links.

3. Actuating mechanism for the stopper of a bottom-pour ladle comprising a guide tube disposed substantially vertically alongside the ladle, means mounting the tube for movement relative to the ladle and means securing the tube in adjusted position relative to the ladle, a lift rod slidably carried centrally of said tube, a yoke mounted on the lower end of the tube for rotation about a substantially vertical axis, fulcrum and ratchet links pivoted to said yoke on opposite sides thereof, a link swiveled on the lower end of said rod on an axis coincident with the axis of rotation of the yoke, an operating lever pivoted to said fulcrum and swiveled links, and a pawl on said lever cooperating with said ratchet link.

4. Actuating mechanism for the stopper of a bottom-pour ladle as defined by claim 2 characterized by ratchet and pawl means on said tube and rod, respectively, adapted to hold the rod in elevated position until the pawl is disengaged.

5. Ladle-stopper operating mechanism comprising a lift rod to which the stopper is secured, a guide through which the rod is longitudinally reciprocable, a member swiveled on the lower end of the rod, an operating lever pivoted to said member, and a fulcrum bracket mounted adjacent the lower end of said guide for rotation on an axis coincident with that of said rod, said lever being also pivoted to said bracket and freely shiftable therewith to any desired position about said axis.

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