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[56] **References Cited**  
**UNITED STATES PATENTS**  
 3,352,465 11/1967 Shapland..... 222/512  
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[54] **OPERATING AND LOADING MECHANISM FOR SLIDABLE GATES**  
 4 Claims, 5 Drawing Figs.

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 [51] Int. Cl..... B67d 3/00  
 [50] Field of Search..... 222/504,  
 512, 343, 505, 509, 515

**ABSTRACT:** An operating mechanism for slidable gates used to control flow of material from a bottom-pour vessel. Mechanism includes a cylinder and reciprocable ram for shoving gates into vertical alignment with vessel outlet. Gate may be either a blank for closing the outlet, or provide a nozzle to permit pouring. As each gate is shoved into alignment with the outlet, it shoves the preceding gate on past. Cylinder is supported on pivoted links, whereby it can swing out of the way to facilitate loading a new gate into a "ready" position.

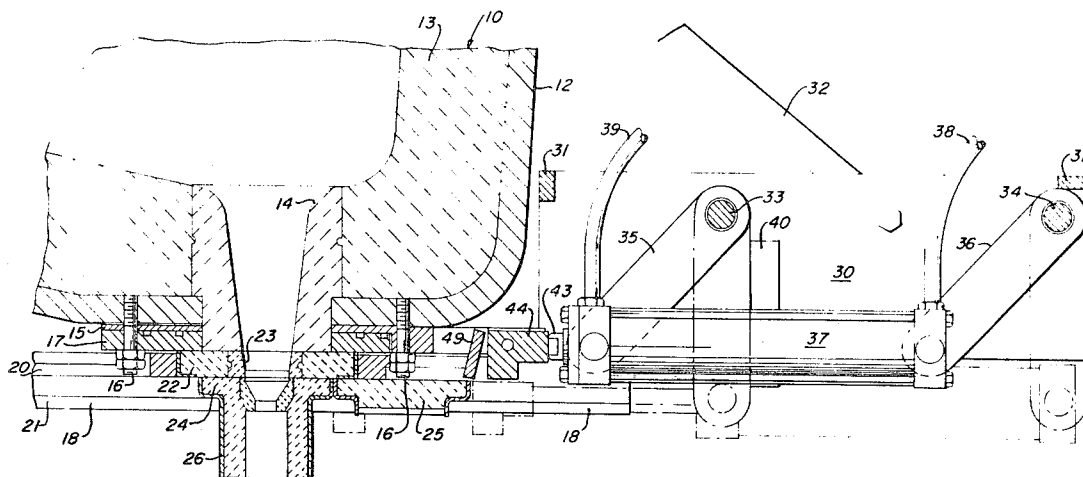
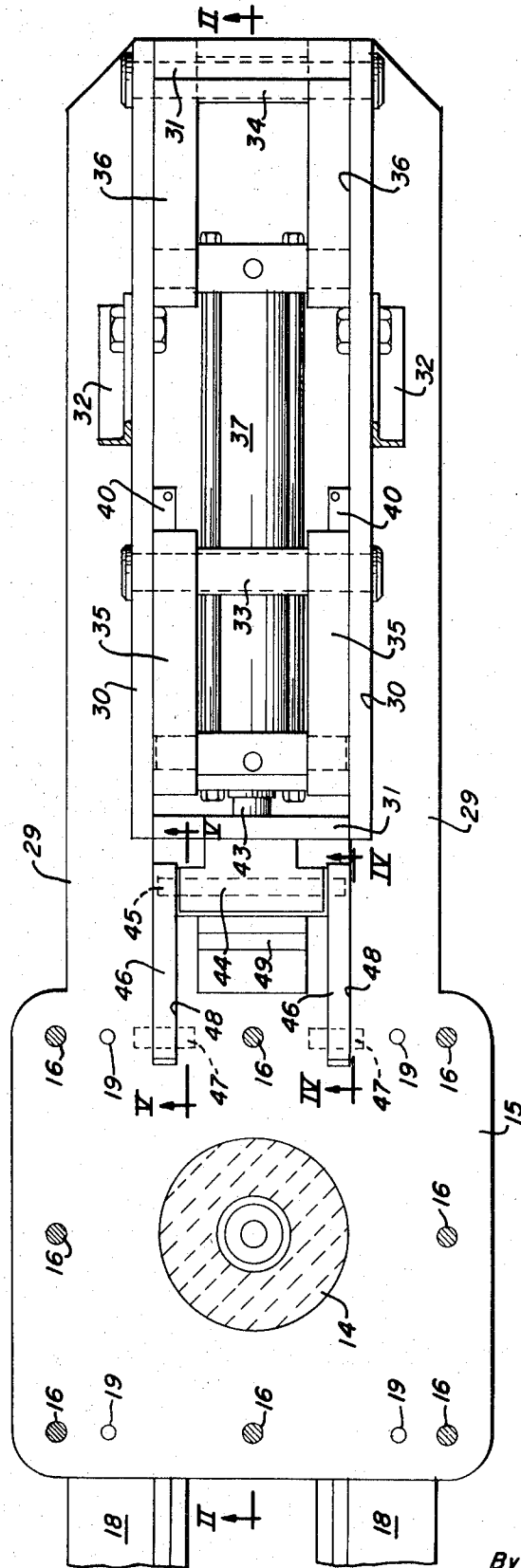


FIG. 1



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FIG. 3

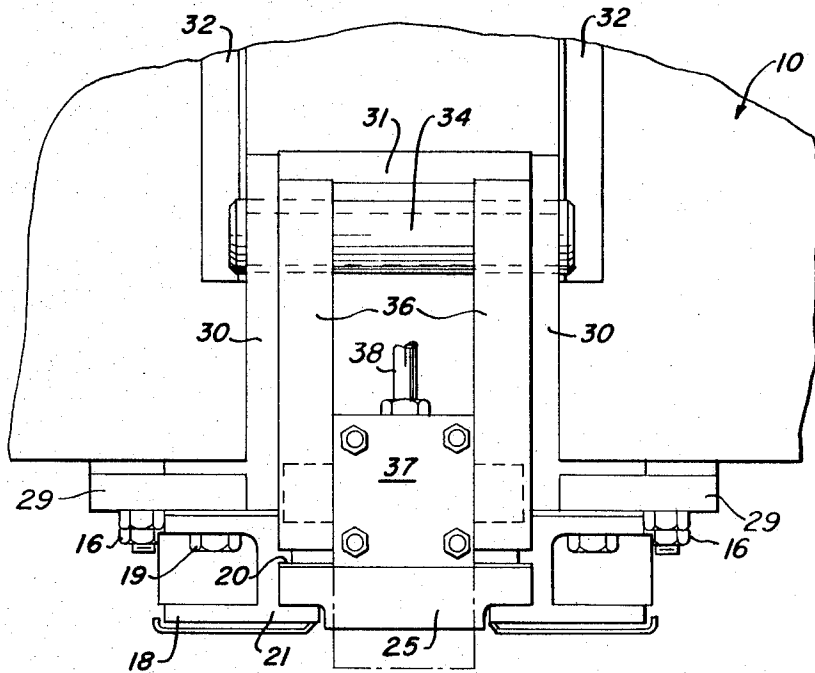


FIG. 4

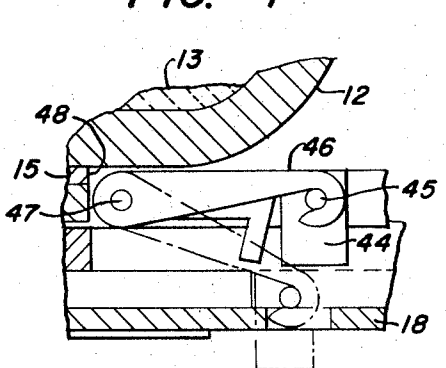
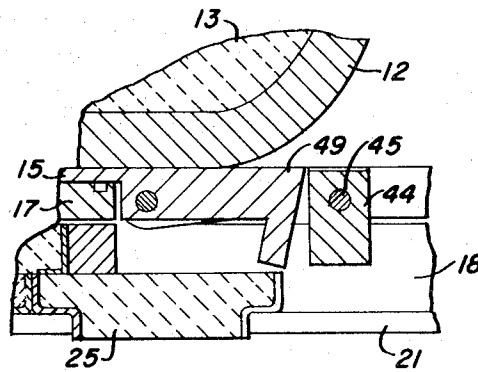


FIG. 5



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## OPERATING AND LOADING MECHANISM FOR SLIDABLE GATES

This invention relates to an improved operating and loading mechanism for slidably gates used as closures on bottom-pour vessels.

Although my invention is not thus limited, my operating and loading mechanism is particularly useful as applied to vessels for pouring molten metal, for example a ladle or tundish. Such vessels have an outlet in the bottom wall through which molten metal is poured into a receiving vessel. It is known to equip the pouring vessel with a slidably gate mounted on rails on the underside of the bottom wall for controlling flow of metal through the outlet, one example of which is shown in James To Shapland, U.S. Pat. No. 3,352,465. The arrangement usually preferred is to use a series of gates, each of which is either a blank for closing the outlet or provides a nozzle for permitting pouring. The vessel carries a hydraulic operating mechanism for shoving the different gates along the rails into vertical alignment with the outlet. As each new gate is shoved into position, it shoves the preceding gate past the outlet and ultimately off the rails.

The foregoing arrangement leads to a design problem that the hydraulic operating mechanism is located where it interferes with loading new gates into a "ready" position on the rails from which they can be pushed into alignment with the outlet. Heretofore it has been necessary to load new gates over the top of the operating mechanism or through one side of the rails. As a result, the pouring outlet had to be located near an edge of the vessel. The vertical dimension of the gate has been restricted so that gates with extended pouring tubes could not be used.

An object of my invention is to provide an improved operating and loading mechanism which overcomes the foregoing problems, that is, which does not interfere with loading of new gates and permits use of gates of greater vertical dimension.

A more specific object is to provide an improved hydraulic operating mechanism which shifts out of the way of the rails to enable gates to be loaded without interference. In the drawings:

FIG. 1 is a top plan view of my operating and loading mechanism;

FIG. 2 is a vertical section on line II—II of FIG. 1, but showing the mechanism installed on a vessel;

FIG. 3 is an end elevational view from the right as viewed in FIGS. 1 and 2;

FIG. 4 is a vertical section on line IV—IV of FIG. 1; and

FIG. 5 is a vertical section on line V—V of FIG. 1.

FIG. 2 shows a portion of a bottom-pour vessel 10 which has a metal shell 12 and a refractory lining 13. The bottom wall of vessel 10 has an outlet opening within which a nozzle 14 is mounted. My operating mechanism includes a submounting plate 15, which I attach to the bottom of the vessel with bolts 16. These same bolts serve also to attach a mounting plate 17 to the underside of the submounting plate. Plates 15 and 17 encompass the lower portion of nozzle 14 beneath shell 12. I attach a pair of opposed guide rails 18 to the underside of the mounting plate 17 with bolts 19 (FIG. 3). Rails 18 have upper and lower inwardly directed flanges 20 and 21. The upper flanges 20 support a refractory plate 22 which has an opening 23 forming a continuation of the nozzle opening. The lower flanges 21 support slidably gates 24 and 25. Gate 24 is a nozzle gate which carries an extended pouring tube 26. Gate 25 is a blank. FIG. 2 shows the nozzle gate 24 positioned in alignment with the nozzle 14 for pouring, and the blank gate 25 in the "ready" position. When pouring is to cease, my operating mechanism, hereinafter described, shoves the blank gate into vertical alignment with the nozzle. The blank gate shoves the nozzle gate along the rails 18 past the outlet and ultimately off the far ends of the rails.

The submounting plate 15 carries a pair of elongated parallel tongues 29 which extend horizontally over the rails 18 and therebeyond. The inner side edges of the tongues carry upright plates 30 which are braced at their upper edges by transverse bars 31. I further reinforce the structure with

diagonal braces 32 bolted at their ends to plates 30 and vessel 10. A pair of transverse shafts 33 and 34 extend between the two plates 30 near their upper edges. Shafts 33 and 34 carry pairs of links 35 and 36 respectively pivoted thereto at their upper ends adjacent plates 30 (FIG. 1). The lower ends of links 35 and 36 pivotally support a fluid pressure cylinder 37, which has flexible connections 38 and 39 for admitting and discharging fluid. The inner faces of plates 30 carry stops 40 which links 35 may abut to limit movement of the links in the counterclockwise direction, as viewed in FIG. 2. Cylinder 37 contains a reciprocable piston and piston rod 43. The outer end of the piston rod carries a ram block 44. Lugs 45 project from opposite sides of the ram block (FIGS. 1 and 4). A pair of hooks 46 are pivoted to the submounting plate 15 on pins 47. Plate 15 has slots 48 to accommodate the hooks. Plate 15 also carries a fixed stop 49 above rails 18 (FIG. 5).

Normally the piston rod 43 is retracted in cylinder 37, and hooks 46 engage lugs 45 on the ram block 44, as shown in solid lines in FIGS. 2 and 4. Thus the hooks hold cylinder 37 in a raised position above the inlet ends of rails 18. The ends of the rails are clear, and I can load gates 24 and 25 into the "ready" position on the rails without interference from the cylinder.

When I wish to push gate 25 from the "ready" position into vertical alignment with nozzle 14, I admit fluid to the right end of cylinder 37 via the connection 38. Engagement of the ram block 44 with the stop 49 prevents the piston rod 43 from moving to the left, whereby cylinder 37 moves to the right until links 35 abut stops 40. This motion lowers the cylinder and ram block to a position in which the ram block clears the lower edge of stop 49, as shown in dot-dash lines in FIGS. 2 and 4. Now the cylinder cannot move farther to the right, but the piston rod and ram block are free to move to the left. The ram block 44 is horizontally aligned with gate 25 and shoves it along the rails into vertical alignment with the nozzle 14 and shoves gate 24 on past. Lugs 45 disengage hooks 46.

After a new gate 24 or 25 is in place, I admit fluid to the left end of cylinder 37 through the connection 39. At first the piston rod 43 is retracted within the cylinder. The piston rod continues to move to the right until lugs 45 again engage hooks 46 (FIG. 4). Such engagement prevents further movement of the piston rod to the right, whereupon cylinder 37 commences to move to the left. Links 35 and 36 pivot clockwise and the cylinder returns to its original position.

From the foregoing description it is seen that my invention affords a simple mechanism for operating a slidably gate closure and overcoming the problems usually encountered. The operating mechanism is completely out of the way while I load gates on the rails. Consequently I can use gates of any vertical dimension, including gates which have extended pouring tubes. Such tubes are particularly useful in installations which require that the pouring stream be shielded from the atmosphere.

I claim:

1. The combination, with a bottom-pour vessel having an outlet opening in its bottom wall, a gate for controlling flow of material through said opening, and means on the underside of the bottom wall slidably supporting said gate, of an operating mechanism for said gate, said mechanism comprising a fluid-pressure cylinder, a reciprocable ram operatively connected with said cylinder for shoving said gate from a "ready" position into vertical alignment with said opening, and means on said vessel supporting said cylinder for movement between a raised position in which the gate-supporting means is clear to enable a gate to be loaded into the "ready" position without interference, and a lowered position in which said ram is horizontally aligned with the gate.

2. A combination as defined in claim 1 in which the supporting means for said cylinder includes a submounting plate fixed to said vessel, upright plates fixed to said submounting plate, and links pivoted to said upright plates and to said cylinder.

3. A combination as defined in claim 1 in which said mechanism comprises in addition stop means limiting the

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movement of said cylinder and ram in each direction, and hooks pivoted to said support means and normally engaging said ram to hold said cylinder and ram in said first-named position.

flanges, and said gate is either a blank for closing said opening or provides a nozzle for pouring, the different gates being loaded on said flanges in a "ready" position when said cylinder is in said first-named position.

4. A combination as defined in claim 1 in which the means supporting said gate includes rails having inwardly directed

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