Jan. 16, 1940. H. E. McWANE 2,186,938

APPARATUS FOR CASTING ARTICLES

Original Filed Oct. 11, 1934 2 Sheets-Sheet 1

FIG. 1.

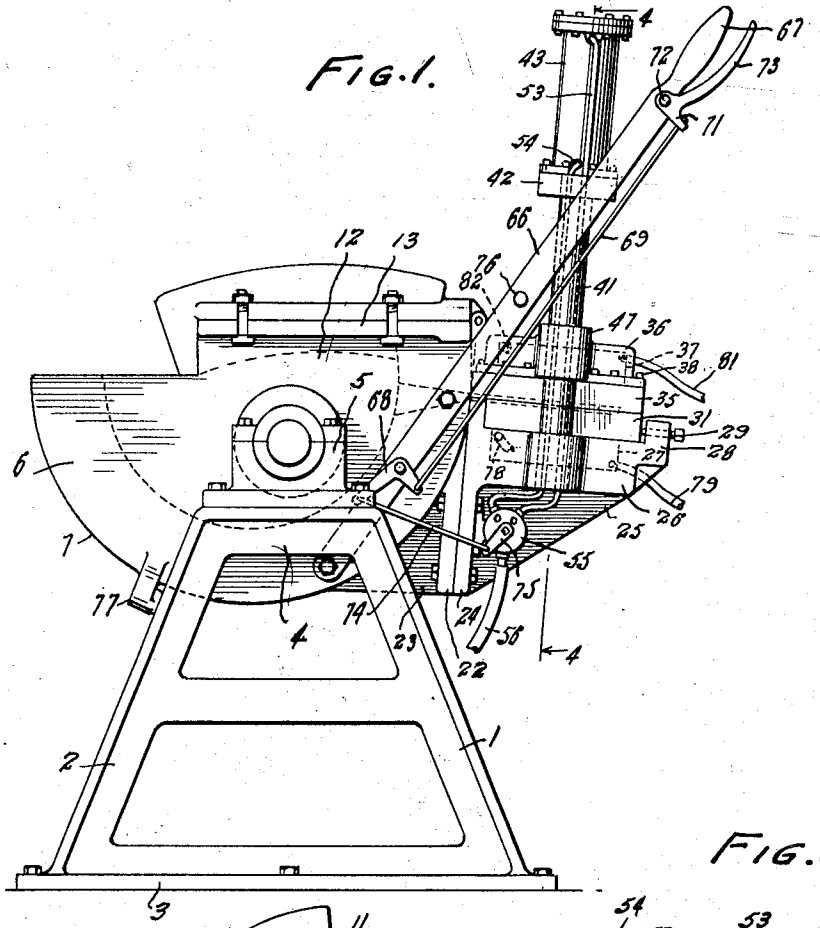


FIG. 6.

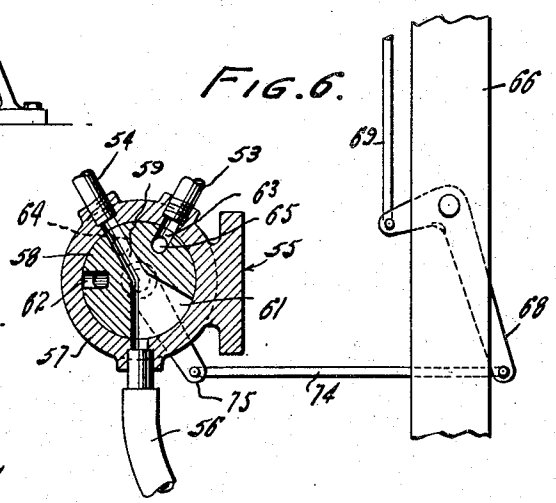
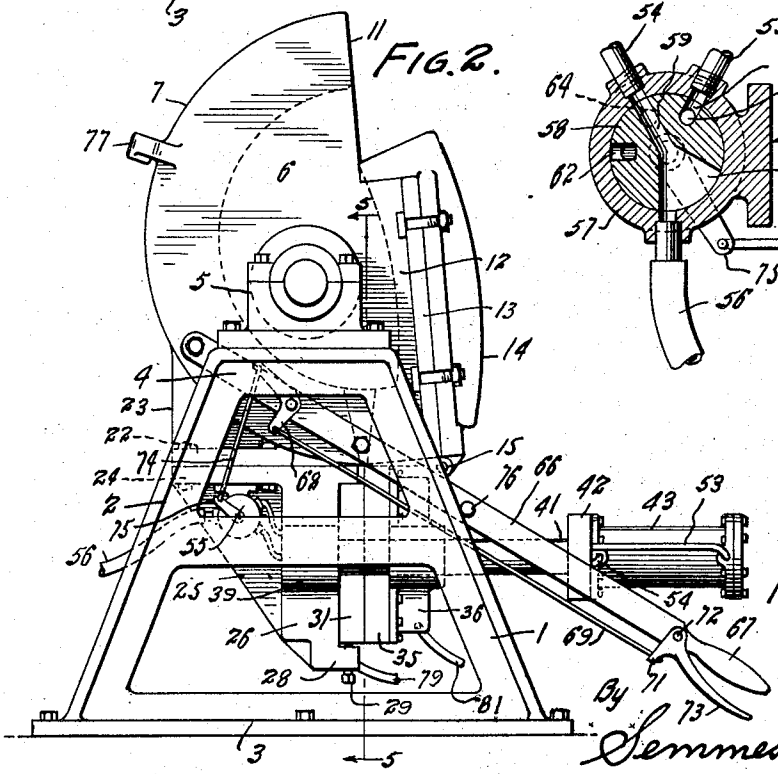


FIG. 2.



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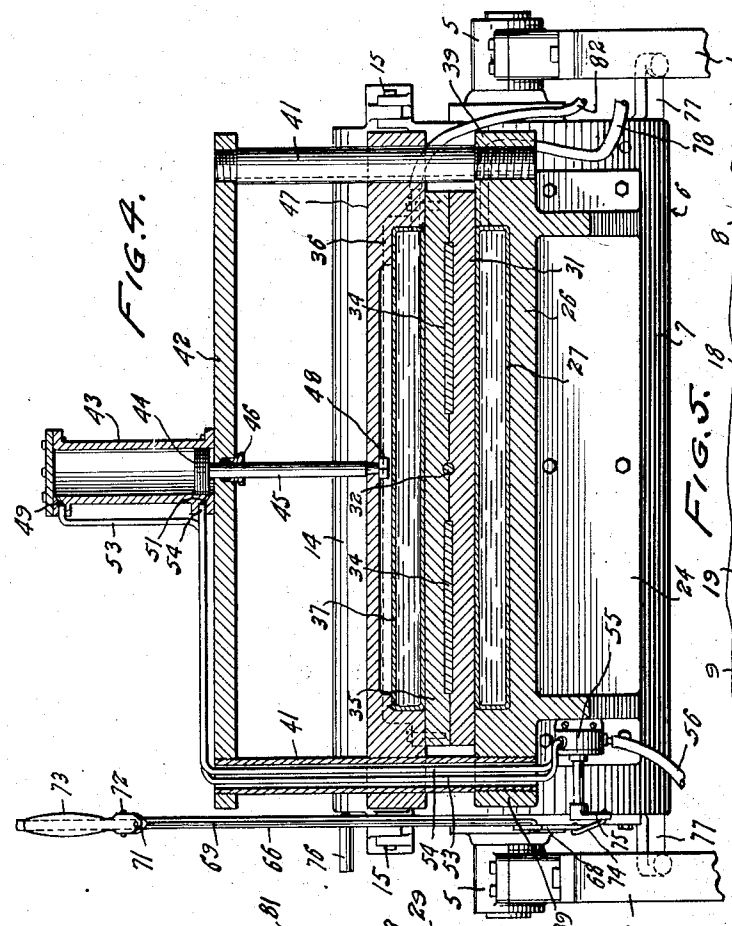


FIG. 4.

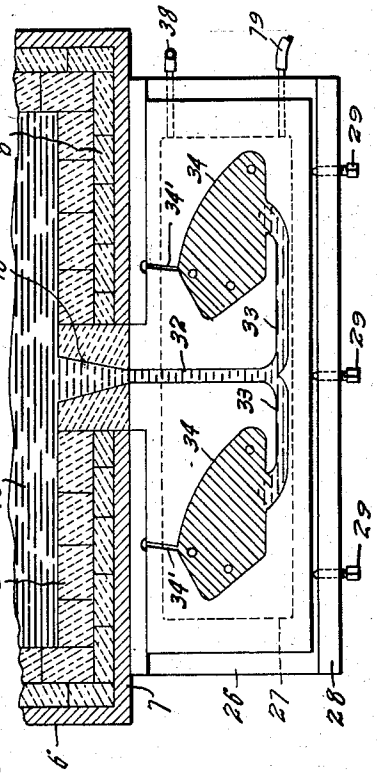


FIG. 5.

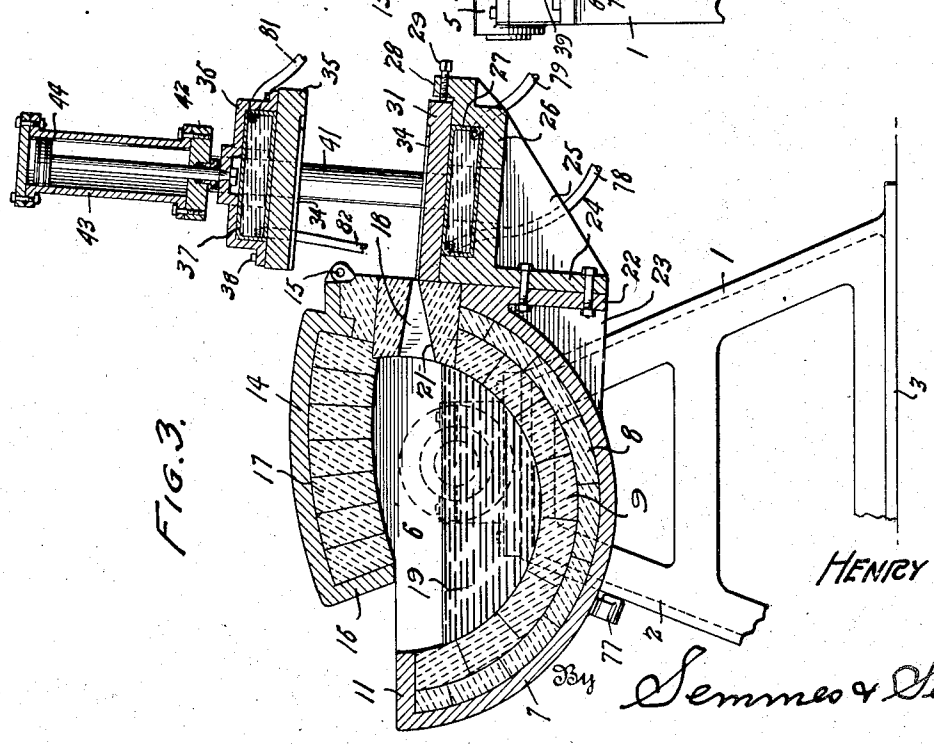


FIG. 3.

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UNITED STATES PATENT OFFICE

2,186,938

APPARATUS FOR CASTING ARTICLES

Henry E. McWane, Lynchburg, Va.

Application October 11, 1934, Serial No. 747,956

Renewed February 18, 1939

4 Claims. (Cl. 22—79)

This invention relates to casting, and more particularly has reference to a ladle and mold and associated mechanism.

The present invention relates generally to a tiltable ladle and a mold secured thereto. Molds of this type that have been heretofore used have presented certain disadvantages. In general, they have been expensive to manufacture and difficult to operate. Furthermore, the results obtained by the use of such molds have not been entirely satisfactory.

To overcome the above disadvantages is one of the objects of my invention.

Another object of my invention is to provide a tiltable ladle and attached mold in which there is little danger of communicating ports between such elements being obstructed.

Yet another object of my invention is to provide a tiltable ladle in which the metal flows upwardly into the cavity of an attached mold.

A still further object of my invention is to provide a tiltable ladle and an attached segmental mold in which the segments may be readily assembled and separated.

With these and other objects in view which may be incident to my improvements, the invention consists in the parts and combinations to be hereinafter set forth and claimed, with the understanding that the several necessary elements comprising my invention may be varied in construction, proportions and arrangement, without departing from the spirit and scope of the appended claims.

In order to make my invention more clearly understood, I have shown in the accompanying drawings means for carrying the same into practical effect, without limiting the improvements in their useful applications to the particular constructions which, for the purpose of explanation, have been made the subject of illustration.

In the drawings:

Figure 1 is an end elevation of a device embracing my invention, the ladle and mold being in inoperative position.

Figure 2 is an end elevation of the device shown in Figure 1, but with the ladle and mold in operative position.

Figure 3 is a cross sectional view of the ladle and mold shown in Figures 1 and 2.

Figure 4 is a sectional view taken along the line 4—4 of Figure 1, looking in the direction of the arrows.

Figure 5 is a view taken along the line 5—5 of Figure 2.

Figure 6 is a detail view partly in elevation and partly in section of the valve for controlling fluid pressure.

As shown in Figure 1, I provide a suitable standard for supporting the ladle and mold. This standard may be composed of converging legs 1 and 2 mounted upon a base 3 which is suitably secured to the floor or ground. Cross bar 4 at the top of the legs 1 and 2 supports a suitable bearing member 5 in which trunnions are journaled. The trunnions support the ladle, which is made up of end walls 6 and a substantially semi-cylindrical body 7, as best shown in Figure 3. The interior of the ladle may be lined with insulating brick 8 upon which may be superimposed fire brick 9. A flanged lip 11 serves, in association with the other elements, to maintain the insulating and fire bricks in position.

As best shown in Figure 1, a portion of the end walls 6 extends above the lip 11, as indicated at 12, such extension being provided with a flange 13. A cover or lid 14 extends part way across the ladle and is hinged to the body of the ladle as at 15 and suitably secured along the end walls to the flange 13. The cover 14 is provided with a downwardly extending flanged lip 16, and is lined with fire brick 17. It will be noted that the cover 14 is slightly arcuate and that the flange 16 serves to securely hold the fire brick in position.

An egress port 18 is provided at a point on the periphery of the ladle which is slightly above the normal level of the molten metal 19. It will be noted that the lower wall 21 of the egress port slopes upwardly from the interior of the ladle. Therefore, any metal which may remain in the egress port after a pouring operation flows back to the molten mass within the ladle. In this connection it is to be noted that the egress port is suitably insulated in order to prevent the loss of heat from the metal, and thereby maintain it in a liquid condition.

A mold is secured to the ladle adjacent the egress port 18. The shell 7 of the ladle is provided with a downwardly extending flange 22 which receives certain support by virtue of radially extending webs 23 from the ladle. A corresponding flange 24 and webs 25 support the mold, and are suitably secured to flange 22 by means of bolts or other appropriate securing means.

Either integrally cast with flange 24 and web 25, or otherwise suitably secured thereto, is a shelf member 26. Removably seated in the shelf 26 in order to present an exposed face, is a cooling chamber 27 serving as a reservoir for a cool-

ing medium. A flanged lip 28 extends from the shelf 26, through which set screws 29 are enthreaded.

The set screws 29 are adapted to bear against the lower half 31 of a mold and to maintain the same in firm contact with the ladle. The mold section 31 is so positioned that a gate 32 in the section communicates with the egress port 18, as best shown in Figure 5. I have shown by this figure the gate 32 in communication with two independent gates 33 which in turn empty into the mold cavity 34. As will be apparent hereinafter, the mold gates 33 are located below the mold cavities 34 and consequently the molten metal flows upwardly into the cavities. Suitable risers 34' extend from the mold cavity. The provision of gates which empty into the cavities from below is especially desirable, for it insures a better casting, free from blow holes and other imperfections.

An upper segment 35 is provided which has corresponding channels and mold cavities cut therein which are adapted to cooperate with the channels and cavities in the lower mold section. The segment 35 is supported from a shell 36 in which is removably positioned a reservoir 37 for a cooling medium. It will be noted that the reservoir 37 is in heat exchange relationship to the segment 35 in the same way that reservoir 27 is to 31, and the two segments may therefore be cooled to the desired extent to solidify the casting. The section 35 is secured to shell 36 by bolts 38, and is therefore removable as desired.

It will be appreciated that the mold sections 31 and 35 may be replaced when necessary. This is desirable, for the molds wear out over a period of operation, and their removability also permits of the interchange of molds for different castings. Furthermore, the reservoirs 27 and 37 may be replaced as occasion demands. All of this results, of course, in an economy of operation.

Sockets 39 are cast on the shelf 26 and are interiorly threaded as disclosed in Figure 4. Cylindrical supports 41 are adapted to be enthreaded into the sockets 39, and at their opposite ends the supports 41 are threaded to a bar 42. The bar 42 supports a cylinder 43 which is provided with a piston 44. A piston rod 45 extends through an aperture in the bar 42 and a suitable gland 46 may be provided to maintain the cylinder fluid tight.

The shell 36 is provided with arms 47 at each end and in these arms are drilled apertures through which the supports 41 extend. The shell 36, therefore, together with the mold section 35, is adapted to be raised and lowered and to be guided by the supports 41. The piston rod 45 is secured to the shell 36 at its lower end and securely bolted thereon as at 48. It will therefore be observed that reciprocation of the piston 44 results in a raising or lowering of the mold section 35.

A port 49 is drilled into the upper part of the cylinder and a similar port 51 is drilled into the lower part. The port 49 is in communication with a conduit 53 and port 51 is in communication with a conduit 54.

Both of the conduits 53 and 54 pass down through one of the supports 41 and lead to the valve 55, mounted on the flange 24. The valve 55 is a three-way valve and is connected by way of conduit 56 with a suitable source of fluid under pressure. As shown, the valve is adapted for compressed air, but it will be appreciated that a compressed liquid may be employed if desired.

Referring particularly to Fig. 6, it will be noted that the valve 55 is made up of a casing 57 and a valve block 58. A channel 59 is drilled in the valve block which is flared as at 61, for the purpose to be described. There are also drilled into the block 58 exhaust channels 62 and 63. The block 58 is rotatably mounted in the casing 57 in a fluid tight fit. Also drilled into the casing are exhaust ports 64 and 65 which are adapted to register with the exhaust channels 62 and 63, respectively, of the valve block.

As seen in Fig. 6, the block is adapted to be positioned so that the channel 59 registers with the conduits 56 and 54. When the block is in this position, the exhaust channel 63 registers with the conduit 53 and exhaust port 65. With such a positioning, compressed air is forced into the lower part of the cylinder 43 and at the same time any air in the upper part of the cylinder is exhausted. The mold section 34 is thereby raised.

It will be appreciated that the mold section 35 may be lowered by rotating the valve block 48 clockwise so that channel 59 registers with conduit 53 and supply conduit 56. When in this condition, exhaust channel 62 will register with conduit 54 and exhaust port 64 to permit of the exhaust of the lower part of the cylinder. The two mold sections 31 and 35 will therefore be clamped tightly together.

An arm 66 is riveted or screwed to an end wall 6 as shown in Figure 1. A suitable handle 67 is provided in the free end of arm 64. A crank 68 is pivoted to the arm 66, and to one arm there is connected a rod 69. The opposite end of the rod is connected to an arm 71 of a bell crank pivoted to the arm 66 as at 72. The other arm 73 of the bell crank is shaped to fit the palm of an operator's hand.

A rod 74 is secured to the other arm of bell crank 68 and also to a lever 75 which is secured to the valve block 58 to rotate the same. It will therefore be observed that when arm 73 is compressed with handle 67 the valve block is moved to one position whereby air is admitted to one end of cylinder 43. When arm 73 is released and moved away from handle 67, the valve block 58 is rotated so that compressed air is admitted to the opposite end of the cylinder 43.

It will be obvious that the ladle may be tilted to a pouring position by means of arm 66. I prefer that the ladle be rotated so that the mold lies in substantially a vertical plane beneath the ladle and mold. To determine this position during the tilting of the ladle, I provide a stop 76 on the arm 66 which is adapted to engage leg 1 of the support as shown in Fig. 2. Further rotation of the ladle is thereby prevented.

As best shown in Figure 3, the lower surface 21 of egress port 18 slopes downwardly toward the interior of the ladle when the ladle is in inoperative position. As also shown by this figure, the mold and gate 32 incline downwardly at a slight angle from the periphery of the ladle. I prefer that this angle be about 10° to the horizontal. The purpose of this angularity is to insure that any molten metal which may remain in egress port 18 upon the termination of a pouring cycle shall flow back into the interior of the ladle. At the same time, I desire to prevent any metal in the gate 32 from flowing back into the ladle, inasmuch as this might possibly impair the casting. As heretofore stated, the egress port 18 is insulated and the metal therein remains in a molten state; and, even though any

metal in gate 32 would probably be solidified upon the return of the mold to the inoperative position, and therefore there would be no possibility of such metal flowing back into the ladle, I nevertheless provide the slant to the mold in order to prevent the possibility of any such return.

In order to determine the exact point at which this desired angularity shall obtain, I provide a stop 77 upon the periphery of the ladle, such stop being adapted to contact with leg 2 of the supporting standard and thereby prevent further rotation of the ladle in a counter-clockwise direction.

As best shown in Figure 3, reservoir 27 is provided with flexible conduits 78 and 79 for the introduction and withdrawal of the cooling medium. Corresponding conduits 81 and 82 are provided for reservoir 37.

The operation of my device is believed to be apparent from the foregoing. Molten metal is poured into the ladle to fill it to the desired extent. As best shown in Figure 3, I prefer that this be at a point just below the egress port 18. The arm 73 is manipulated so that air is forced into the upper part of the cylinder 43 and the mold section 35 is thereby securely clamped upon mold section 31. The ladle is then rotated by means of arm 66 until stop 76 abuts against leg 1 of the supporting standard. At this position the molten metal flows into the mold through gates 32 and 33 and thence upwardly into mold cavities 34.

When the cavities have been filled, the arm 64 is moved to rotate the ladle back to its inoperative position which is determined by stop 77 abutting against the supporting leg 2. At this inoperative position, any molten metal in egress port 18 will flow back into the ladle, but the angular disposition of the mold will prevent any metal in gate 32 from receding into the ladle.

Arm 73 is then moved so that air is forced into the base of cylinder 43 and the mold section 35 is thereby withdrawn from the lower section 31. The casting may then be removed from the mold, and upper section 35 returned to its pouring position.

It will be appreciated that I have provided an inexpensive mold and ladle which may be easily operated. Provision has been made for automatically determining the pouring and inoperative positions, and manual operation of the device in general has been reduced to a minimum. In this connection, it will be observed that only a single hand of the operator may be used for tilting the ladle and also for opening and closing the mold. I have found that by an apparatus of this character, castings of a uniformly high grade may be obtained and slight losses resulting from imperfect castings have been incurred.

While I have shown one specific embodiment of my invention, it is of course obvious that various modifications may be made therein by persons skilled in the art and I wish it to be distinctly understood that my invention is to be determined merely by the scope of the appended claims.

I claim:

1. A casting apparatus comprising a tiltable ladle and a mold secured thereto, tilting means for the ladle, said mold being sectional and one of said sections movable to and from the other, hydraulic means for actuating said movable section, and control means for the hydraulic means separately located upon the tilting means.

2. A casting apparatus comprising a tiltable ladle, a sectional mold secured thereto, said mold being opened by movement of one of said sections from the other, fluid pressure means for moving said movable section, an arm extending from the ladle and adapted to tilt the same, and control means for the fluid pressure means mounted upon said arm.

3. A casting apparatus comprising a tiltable ladle, a sectional mold secured thereto, said mold being opened by movement of one of said sections from the other section, an operating lever extending from the ladle and adapted to tilt the ladle and additional means on the lever to control the movement of one of said sections.

4. A casting apparatus comprising a tiltable ladle, a sectional mold secured thereto, said mold being opened by movement of one of said sections, fluid pressure means for moving said movable section, an arm extending from the ladle and adapted to tilt the same, and control means for the fluid pressure means mounted upon said arm.

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