April 17, 1934. C. W. HAZELETT 1,955,459

CASTING APPARATUS

Original Filed Aug. 20, 1928 2 Sheets-Sheet 1

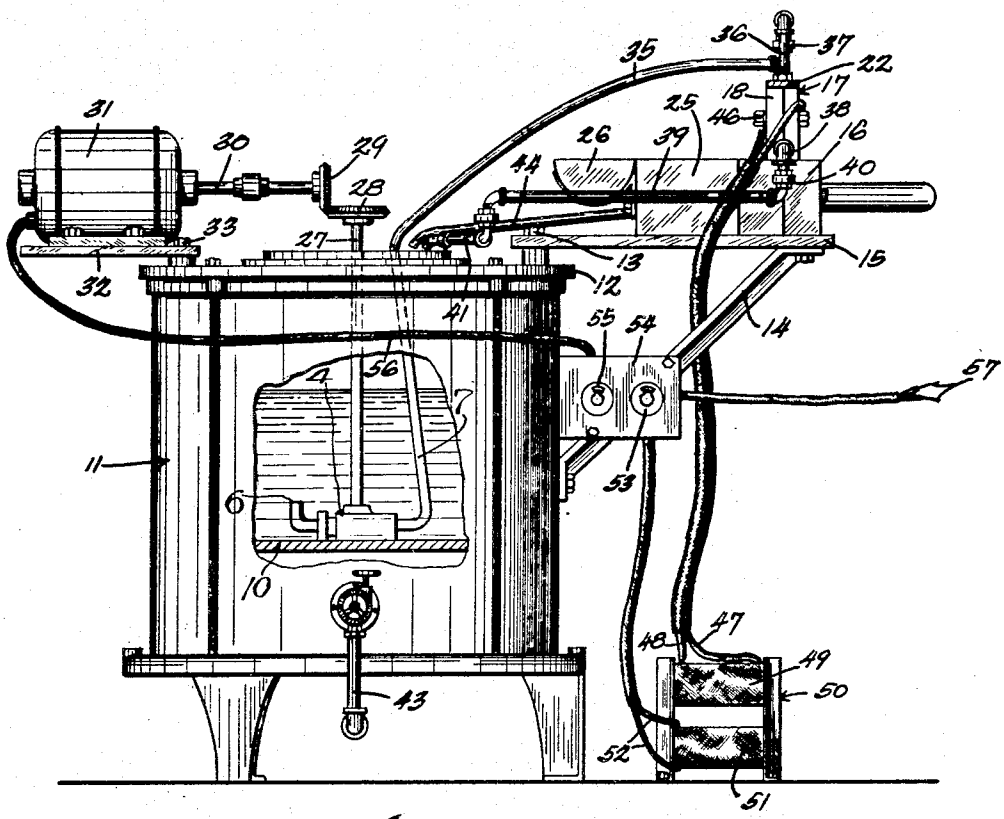


Fig. 1

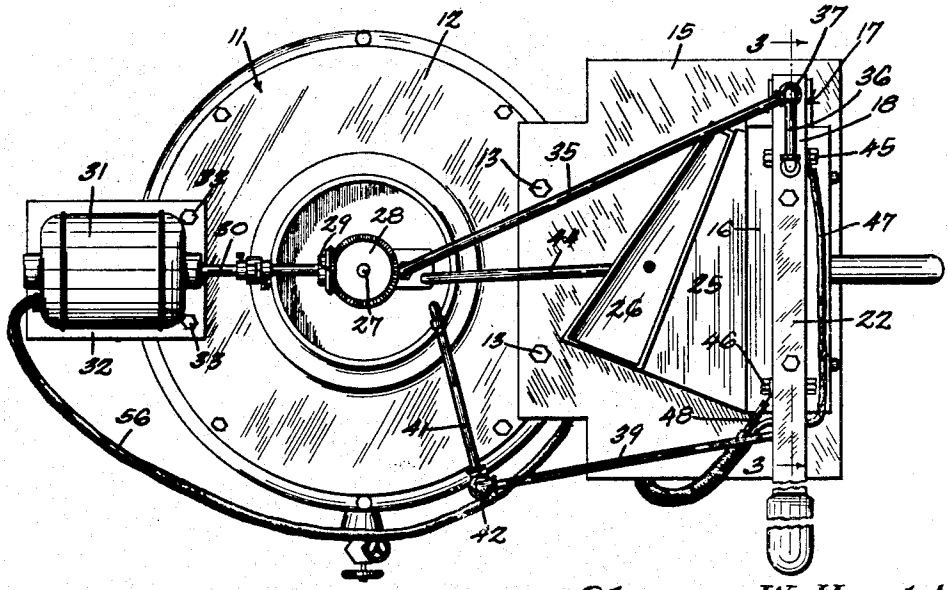


Fig. 2

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CASTING APPARATUS

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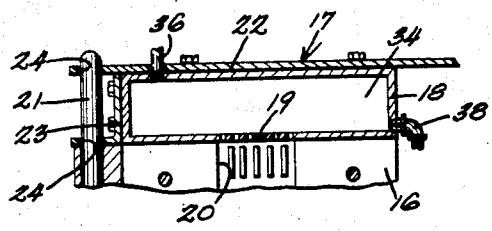


Fig.3

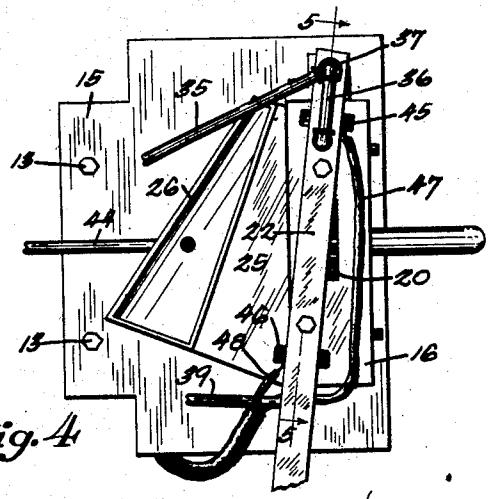


Fig.4

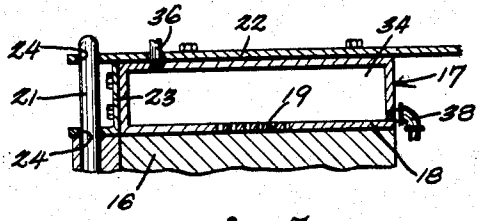


Fig.5

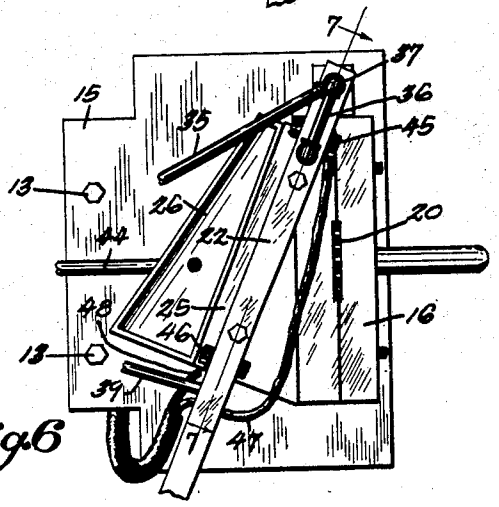


Fig.6

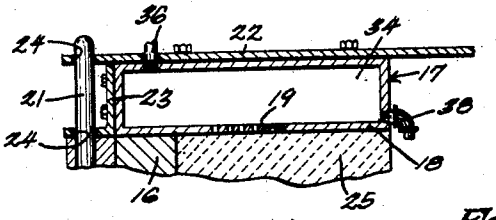


Fig.7

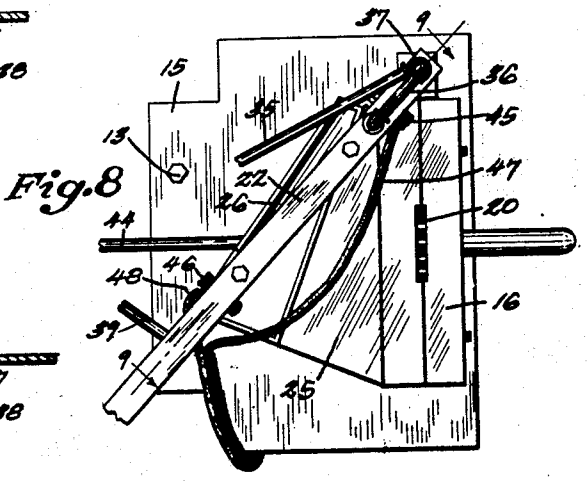


Fig.8

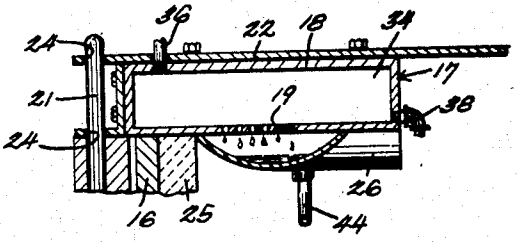


Fig.9

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UNITED STATES PATENT OFFICE

1,955,459

CASTING APPARATUS

Clarence W. Hazelett, Rocky River, Ohio

Application August 20, 1928, Serial No. 300,755
Renewed September 7, 1933

12 Claims. (Cl. 22—57)

My invention relates to casting, and the principal object of my invention is to provide a new and improved method for casting, and apparatus by which this method may be performed. In the drawings accompanying this specification and forming a part of this application I have shown, for purposes of illustration, one form which my invention may assume, and in these drawings:

Figure 1 is a side elevation of the embodiment of my invention herein disclosed,

Figure 2 is a top plan view of the mechanism of Figure 1,

Figure 3 is a fragmentary section through the gate taken on the line 3—3 of Figure 2,

Figure 4 is a fragmentary top plan view of the gate and adjacent parts, showing the gate in a second position,

Figure 5 is a section on the line 5—5 of Figure 4,

Figures 6 and 7 are views similar to Figures 4 and 5 but showing the gate in a third position, while

Figures 8 and 9 are views similar to Figures 4 and 5 but showing the gate in a fourth position.

The embodiment of my invention herein shown comprises a melting furnace 11 which may be of any suitable design and is provided with a bottom plate 10 and top plate 12 supporting by means of bolts 13 and a bracket 14 a base plate 15 on which may be positioned the mold 16 into which material is to be cast, and provided for casting the material into the mold 16 is a gate 17 comprising a hollow block 18 provided with sprue aperturing 19 adapted to register with the aperturing 20 of the mold 16, and pivotally supported, upon a pin 21 rising from the base plate 15, by means of a top plate 22 and a side plate 23 bolted to the hollow block 18 and provided with apertures 24 receiving the pivot pin 21, thus to permit pivotal movement of the gate 17 between the position shown in Figures 1 through 3 wherein it is disposed over the mold 16 with its sprue aperturing 19 in register with the mold aperturing 20, the position shown in Figures 4 and 5 wherein the gate 17 is still positioned on the mold 16 and the sprue aperturing 19 has been moved out of register with the mold aperturing 20 but is blocked by the upper face of the mold 16, the position shown in Figures 6 and 7 wherein the gate 17 has been moved from the mold 16 onto a block 25 supported on the base plate 15 and the sprue aperturing 19 of the gate 17 is closed by the upper face of the block 25, and the position shown in Figures 8 and 9 wherein the gate 17 has been moved to a fourth position over-lying a trough 26 adapted to receive the material flowing from the now unblocked sprue aperturing 19.

Casting material is supplied to the gate 17 by means of a pump 4 mounted on the bottom 10 of the furnace 11. This pump is preferably of the rotary type, herein shown as comprising a casing 5 having inlet and outlet pipes 6 and 7 respectively, operated by means of a shaft 27 driven through cooperating bevel gears 28 and 29 from the shaft 30 of an electric motor 31 mounted on a platform 32 secured to the furnace 11 by means of bolts 33, connected into the chamber 34 of the hollow block 18 of the gate 17 through a stationary duct 35 extending from the pump to a point in line with the pivot pin 21 of the gate 17, a stationary duct 36 extending from a point in line with the pivot pin 21 into the chamber 34 of the hollow block 18 through the top wall thereof, and a swivel joint 37 pivotally connecting the ducts 35 and 36 in line with the pivot pin 21.

In the embodiment of my invention herein shown I contemplate supplying at least part of the heat required at the gate 17 to maintain the gate 17 at proper temperature by supplying to the gate 17 a quantity of hot casting material greatly in excess of that cast through the sprue aperturing 19 thus to super-impose upon the stream of casting material pumped into the chamber 34 of the hollow block 18 of the gate 17 for casting through the sprue aperturing 19 a second stream of hot casting metal circulating between the furnace 11 and the gate 17 returning from the gate 17 to the furnace 11 through a return duct comprising a first duct 38 connected to the chamber 34 of the gate 17 at the bottom of the end opposite that at which is connected the inlet duct 36, a duct 39 extending rather tangentially of the furnace 11 and swiveled to the end of the duct 38 at 40, a duct 41 swiveled to the end of the duct 39 at 42 and extending from the end of the duct 39 to the melting pot of the furnace 11.

For the purpose of additionally heating the gate 17 particularly for preheating the gate 17 before the apparatus is placed in operation, I form the walls of the hollow block 18 of electrically conductive material of some resistance and then connect to these plates at opposite ends and by means of bolts 45 and 46 the terminals of conductors 47 and 48 leading from the secondary winding 49 of a transformer 50 having its primary winding 51 energized through conductors 52 under control of a switch 53 mounted in a panel

54 with a switch 55 controlling the motor 31 through conductors 56, both switches 53 and 55 deriving their energy from conductors 57 connected to a suitable source of power. It will be understood, however, that the current may be passed through the gate otherwise, for example through a resistance plate facing the gate, or through the casting material within the gate, or through the casting material emerging through the sprue aperturing of the gate, so that in this respect the term gate includes the entire gate assembly and contents.

Fuel for furnace 11 may be supplied through a duct 43, and material flowing into the trough 26 may return into the melting pot of the furnace 11 through a suitable duct 44.

In operation a mold 16 is placed upon the base plate 15, and the gate 17 is placed thereover with the sprue aperturing 19 in register with the mold aperturing 20, whereupon material is cast into the mold 16 to fill the mold cavity therein, and the parts are permitted to remain in this position until the material cast into the mold cavity has set beyond the point of solidification change in volume, after which the gate 17 is moved into any one of the three positions shown in Figures 4 and 5, Figures 6 and 7, and Figures 8 and 9, respectively, or under certain circumstances first into one of these positions and then into another.

If the gate 17 remains upon the mold 16 the relatively cool mold tends to chill the material within the gate 17, but the gate 17 is then maintained at such temperature that this material will solidify only as a temporary thin skin at the outlet of the sprue aperturing 19 and which will persist only for a short period of time after the mold 16 is removed, in practice only for sufficient time to permit removal of the mold 16 from the base plate 15 and the substitution of another mold ready for a second casting operation. If the gate 17 is moved onto the block 25 one of two results may occur, depending upon whether the block 25 is chilled or heated. If the block 25 is relatively cool then with the gate 17 maintained at the proper temperature there will form at the outlet of the sprue aperturing 19 a thin skin which will serve to seal the sprue aperturing 19 so long as it is backed by the block 25, and will give way, and open the sprue aperturing 19, as soon as it is unblocked by movement over the mold aperturing 20 of the succeeding mold 16. If the block 25 remains hot of course no skin will form, the material will not solidify at all anywhere within the gate 17, and the contact of the block 25 with the lower face of the gate 17 is relied upon to seal the sprue aperturing 19 during the interval until the gate 17 is again positioned above the mold 16. Of course if the gate 17 is moved into position over the trough 26 there is no skin formed, and the sprue aperturing 19 is entirely unblocked, so that the material delivered to the gate 17 continues to flow from the sprue aperturing 19 and is received in the trough 26 and returned to the melting pot of the furnace 11 by means of the duct 44 thus to form an additional circulatory current of metal through the gate 17. The term "aperturing" as employed in the appended claims is intended to cover either a single aperture or a plurality of apertures of any suitable dimensions or configuration through which the molten metal may flow from the gate 17.

Necessarily the dimensions of the parts, the degree to which the material is heated, the speed of the pump, the amount of material circulated, the extent of use of the electric heat, and in general the entire coordination of the entire mechanism, all will vary according to the manner in which the mechanism is to be employed, varying in accordance with the principles hereinabove indicated, also other modifications and changes may be made, also there are embodied in my invention, either with or without such modifications and changes, various advantages other than those specifically pointed out or suggested herein, and all of these variations and modifications and changes may be made, and these advantages realized, without departing from the spirit of my invention, wherefore it will be understood that the disclosure herein is illustrative only, and that my invention is not limited thereto.

I claim:

1. Gate means, for casting into a relatively cool mold, material normally solid, comprising: a gate having a sprue aperture adapted to register with a sprue aperture of said mold, said gate and said mold being relatively operable to position said gate aperture in register with said mold aperture in one position and removed from said mold in another position; heated means adapted to close said gate sprue aperture when said gate is removed from said mold; and means for maintaining said gate at such heat that such material within said gate when in engagement with heated means will not solidify even at the outlet of said gate sprue opening.

2. A casting apparatus comprising: a source of supply of molten metal, a gate communicating with said source of supply, and having a sprue aperture adapted to register with a sprue aperture of a mold, means for delivering molten metal to said gate from said source of supply, said gate being adapted to contain molten metal adapted to intermingle with molten metal supplied thereto from said source of supply, and means for effecting circulation of molten metal between said source of supply and said gate, whereby molten metal in said gate is maintained at casting temperature during operation of said apparatus.

3. A casting apparatus comprising: a source of supply of molten metal, a gate communicating with said source of supply, and having a sprue aperture adapted to register with a sprue aperture of a mold, means for delivering molten metal to said gate from said source of supply, said gate being adapted to contain molten metal adapted to intermingle with molten metal supplied thereto from said source of supply, and means operating in an inoperative position of said gate to return excess molten metal through said sprue aperture to said source of supply, whereby circulation is maintained in an inoperative position of the gate and casting temperature thus preserved.

4. A casting apparatus comprising: heating means for rendering fluid a material normally solid; a stationary mold having a sprue aperture; a sprue closing member positioned laterally of said mold; a gate having a sprue aperture and mounted for movement between a position in which the sprue aperture therein registers with the sprue aperture in said mold and a position in which the sprue aperture therein is out of register with the sprue aperture in said mold and closed by said sprue closing member; means for supplying fluid material from said heating means to said gate; and means for maintaining said gate in both of said positions at a temperature sufficient to prevent the material therein from solidifying more than a temporary skin at the outlet of the sprue aperture in said gate.

5. A casting apparatus comprising: heating means for rendering fluid a material normally solid; a stationary mold having a sprue aperture; material return means disposed laterally of said mold and in communication with said heating means; a gate having a sprue aperture and mounted for movement between a position in which the sprue aperture therein registers with the sprue aperture in said mold and a position in which the sprue aperture therein is in register with said return means; means for supplying fluid material from said heating means to said gate; and means for maintaining said gate in both of said positions at a temperature sufficient to prevent the material therein from solidifying more than a temporary skin at the outlet of the sprue aperture in said gate.

6. A casting apparatus comprising: heating means for rendering fluid a material normally solid; a stationary mold having a sprue aperture; a gate of electric current conducting material having a sprue aperture and mounted for movement between a position in which the sprue aperture therein registers with the sprue aperture in said mold and a position in which the sprue aperture therein is out of register with the sprue aperture in said mold; means for supplying fluid material from said heating means to said gate; and means for passing through said gate an electric current of a value sufficient to maintain said gate at a temperature sufficient to prevent the material therein from solidifying more than a temporary skin at the outlet of the sprue aperture in said gate.

7. A casting apparatus comprising: heating means for rendering fluid a material normally solid; a mold having a sprue aperture; a gate having an inlet and an outlet both communicating with said heating means and also having a sprue aperture adapted to register with the sprue aperture in said mold; and means for supplying a volume of fluid material from said heating means to said gate through said inlet in excess to that required for casting, said outlet permitting the escape of said excess material from said gate to said heating means, thus providing a circulating current of material within said gate for maintaining said gate at a temperature sufficient to prevent the material therein from solidifying more than a temporary skin at the outlet of the sprue aperture in said gate.

8. A casting apparatus comprising: heating means for rendering fluid a material normally solid; a mold having a sprue aperture; a gate having an inlet and an outlet both communicating with said heating means and also having a sprue aperture adapted to register with the sprue aperture in said mold; means for supplying a volume of fluid material from said heating means to said gate through said inlet in excess to that required for casting, said outlet permitting the escape of said excess material from said gate to said heating means, thus providing a circulating current of material within said gate for maintaining said gate at a temperature sufficient to prevent the material therein from solidifying more than a temporary skin at the outlet of the sprue aperture in said gate; and means for additionally heating said gate.

9. A casting apparatus comprising: heating means for rendering fluid a material normally solid; a mold having a sprue aperture; a gate of electricity conducting material having an inlet and an outlet both communicating with said heating means and also having a sprue aperture adapted to register with the sprue aperture in said mold, means for supplying fluid material from said heating means to said gate; in excess to that required for casting, said outlet permitting the escape of said excess material from said gate to said heating means, thus providing a circulating current of material within said gate for maintaining said gate at a temperature sufficient to prevent the material therein from solidifying more than a temporary skin at the outlet of the sprue aperture in said gate; and means for passing through said gate an electric current of a value sufficient to heat said gate and said material sufficiently to prevent solidification of said material in said sprue independently of said circulating current of material.

10. Means for feeding molten metal comprising: a feeding receptacle adapted to contain molten metal and having an outlet for venting any excess of molten metal supplied thereto; a source of supply of freshly heated molten metal; and means connected with said feeding receptacle and with said source of supply, operable to maintain an excess supply of freshly heated molten metal in the feeding receptacle.

11. Means for feeding molten metal comprising: a feeding receptacle having a feeding opening and adapted to contain molten metal, and having an outlet independent of said feeding opening for venting any excess of molten metal supplied thereto; a source of supply of freshly heated molten metal; means connected with said feeding receptacle and with said source of supply, operable to maintain an excess supply of freshly heated molten metal in the feeding receptacle; and a conduit communicating with the independent outlet of said receptacle for carrying away excess metal vented through said outlet.

12. Means for feeding molten metal comprising: a feeding receptacle adapted to contain molten metal and having an outlet for venting excess of molten metal supplied thereto; a source of supply of freshly heated molten metal; means connected with the feeding receptacle and with the source of supply, operable to maintain an excess supply of molten metal in said feeding receptacle; and means connected with the outlet of said feeding receptacle and the source of supply to return the excess metal.

CLARENCE W. HAZELETT.