Aug. 8, 1933. T. C. KORSMO 1,921,681

DIE CASTING METHOD

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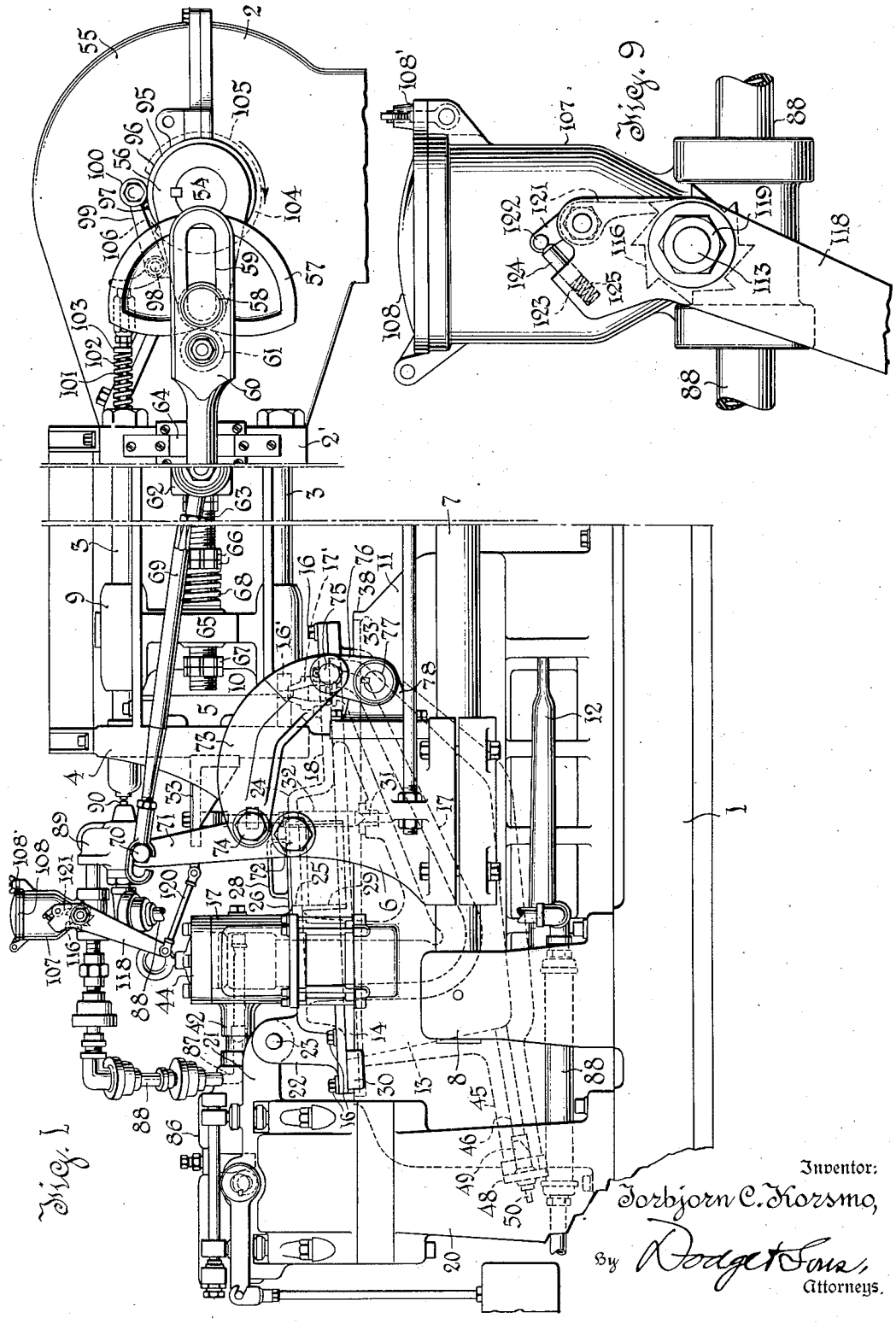


Fig. 1

Fig. 9

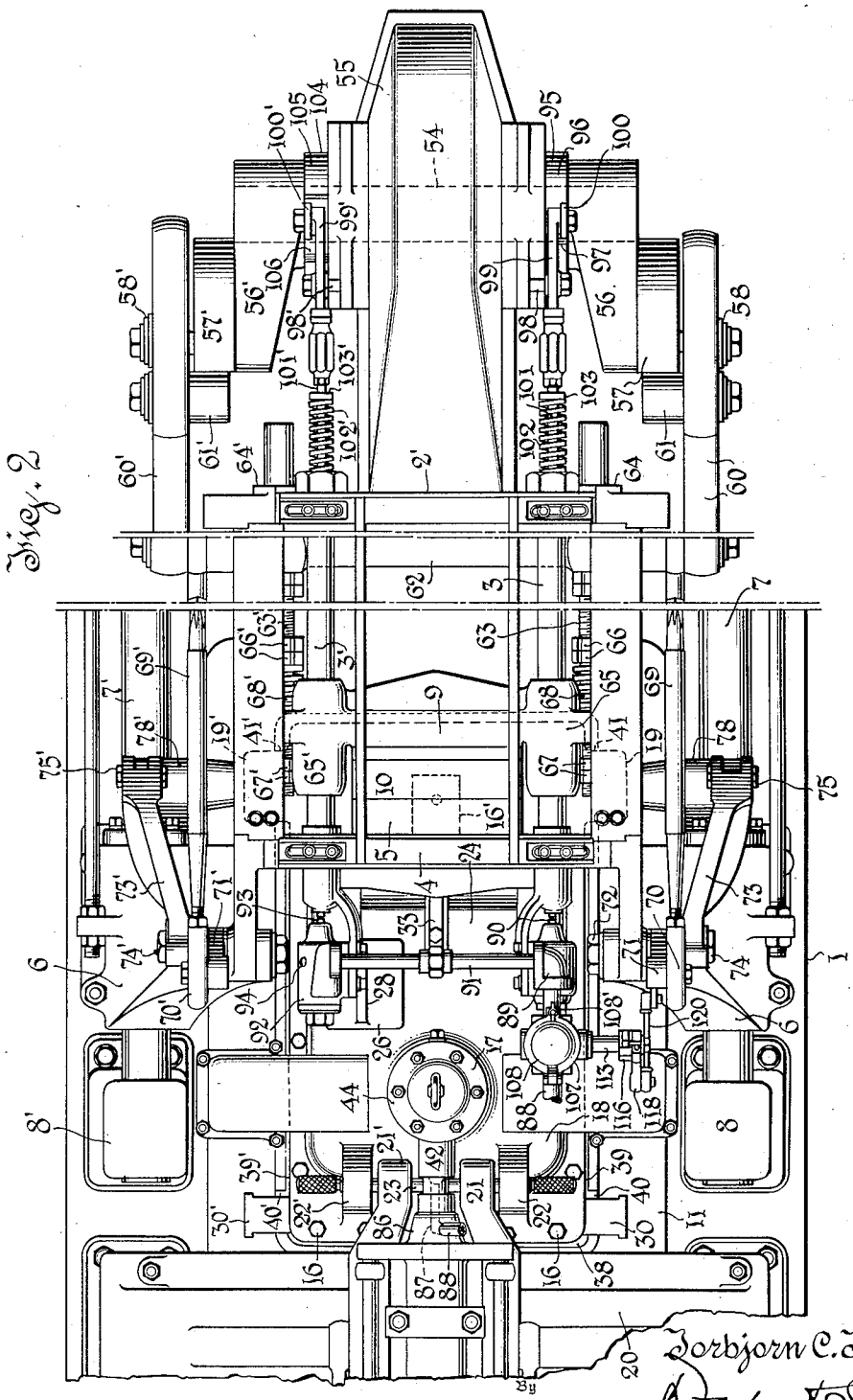
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Fig. 2



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Fig. 3

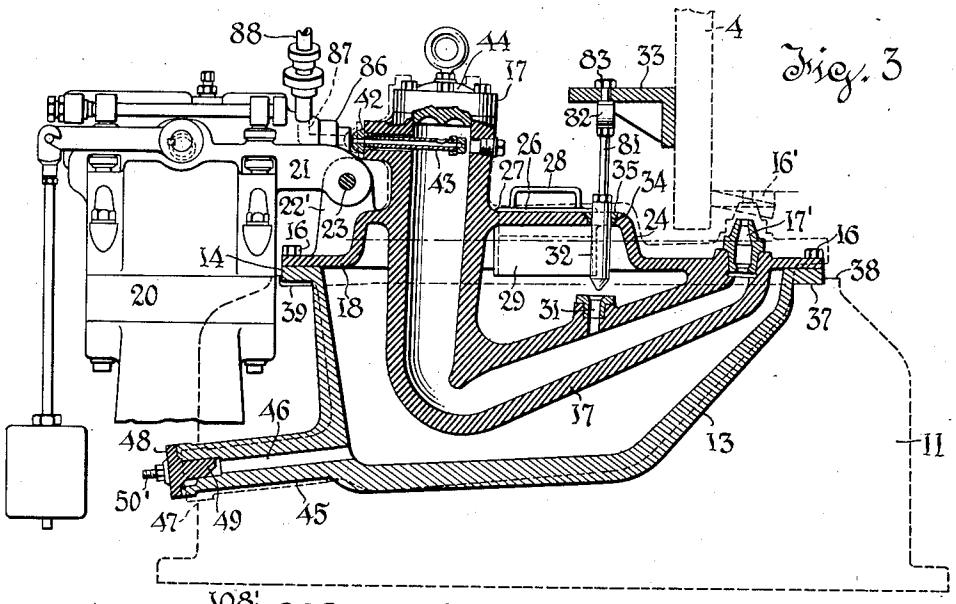


Fig. 10

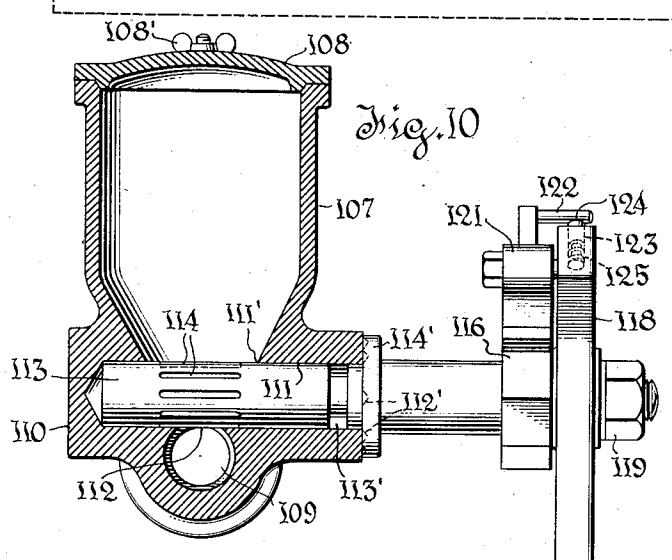


Fig. 7

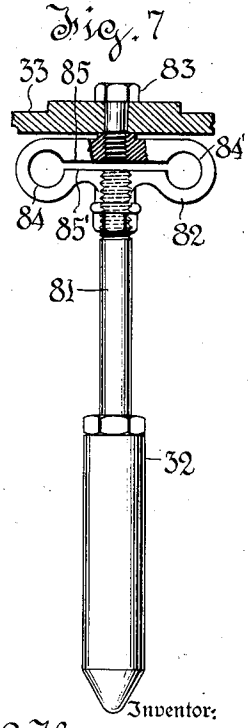
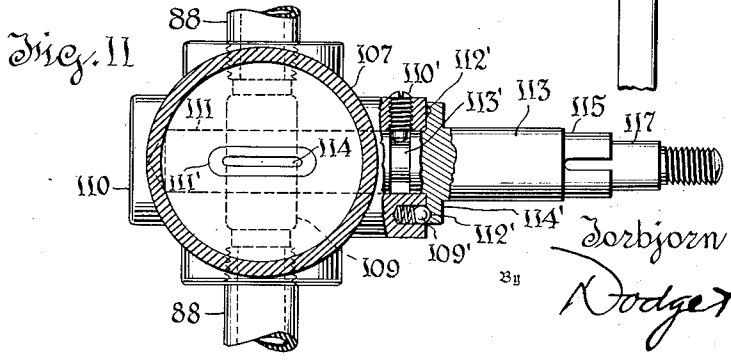


Fig. 11



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Fig. 4

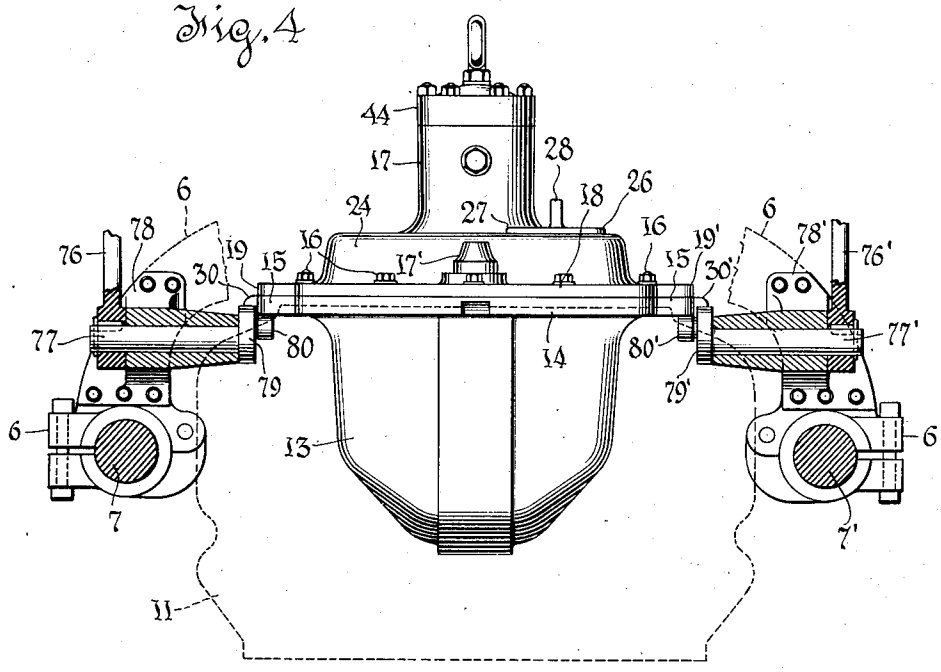
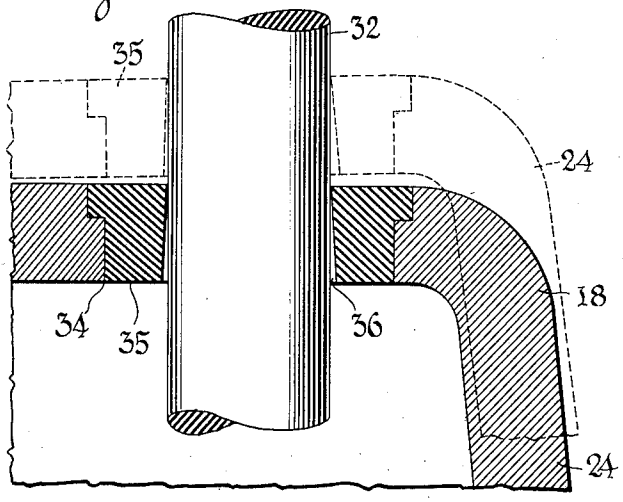


Fig. 8



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Fig. 5

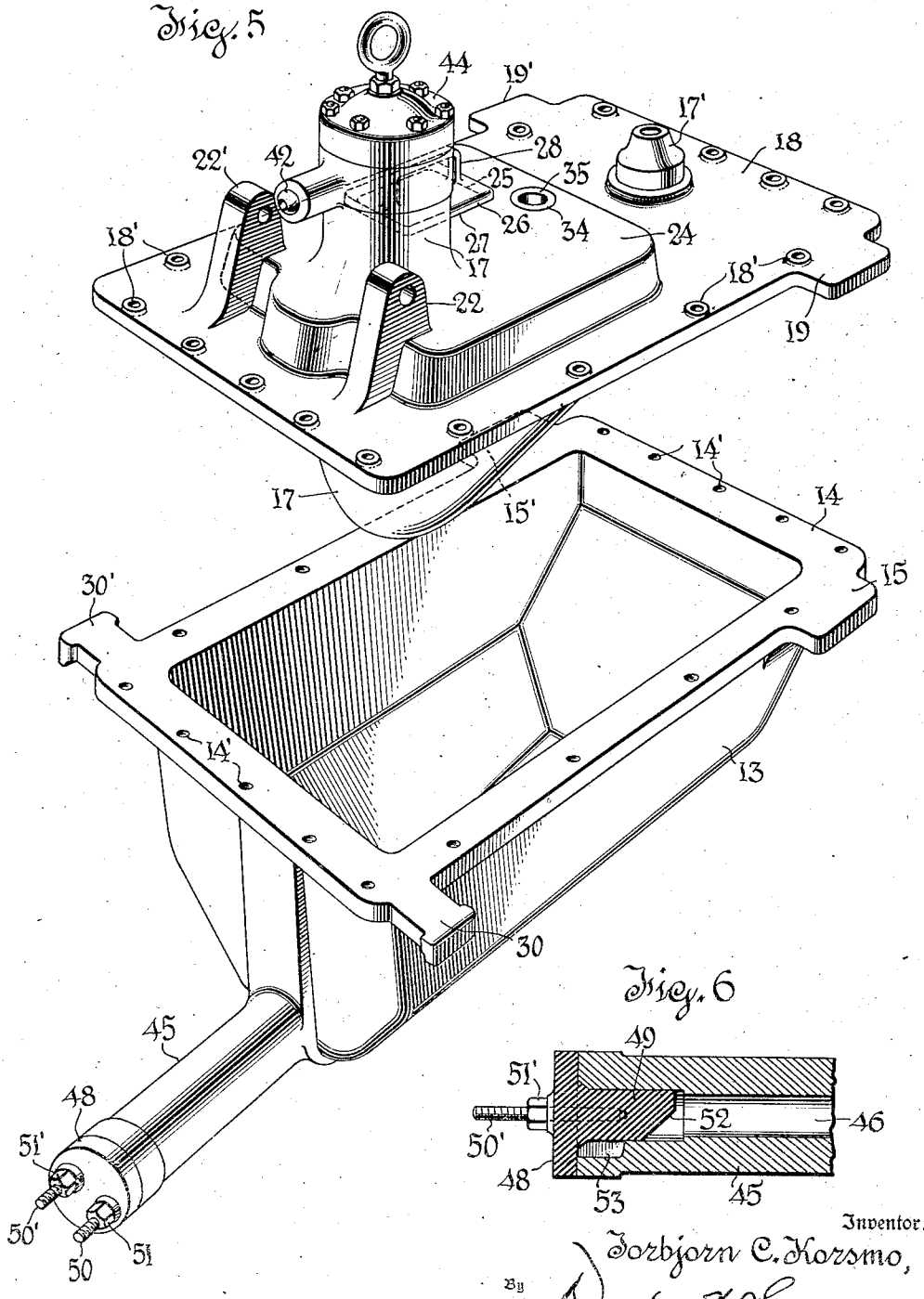


Fig. 6

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UNITED STATES PATENT OFFICE

1,921,681

DIE-CASTING METHOD

Torbjorn C. Korsmo, Madison, Wis., assignor to Madison-Kipp Corporation, Madison, Wis., a Corporation of Wisconsin

Application June 29, 1931. Serial No. 547,737

6 Claims. (Cl. 22—209)

This invention pertains to die-casting methods, and more particularly to a method for the manufacture of die-castings from magnesium and similar metals.

In die-casting with certain metals, such as magnesium, for example, it has been found that exposure of the molten metal to the atmosphere or to any other combustion-supporting medium, causes the metal to burn. This results in the production of defective castings, and also occasions numerous time-consuming and annoying delays in the operation of the casting apparatus.

It is the primary purpose of the present invention to devise a casting method, whereby such undesirable burning of the molten metal is prevented and production of high-class die-castings at a rapid rate is accomplished. In general, this is effected by excluding the surrounding atmosphere, and any other combustion-supporting medium, from contact with the metal while it is in a molten state. At the same time, the method is designed to permit direct application of fluid-pressure to the molten metal for the purpose of forcing it into the die-cavity.

In one of the more common types of die-casting machines, a pressure chamber or goose neck receives molten metal from a melting pot, and then a pressure-fluid, such as compressed air, is released into direct contact with the metal to force it from the goose neck into the die. It is one of the particular objects of the present invention to devise a method whereby the die-casting of magnesium and similar metals may be accomplished in this type of machine.

In practicing my improved method, use is made of the specially designed machine illustrated in the accompanying drawings. While a disclosure of this machine and its operation is essential to a full understanding of the method, no claim is made herein to the machine, the same being covered fully by my application Serial No. 605,756, filed April 16, 1932, as a division of the present case.

Fig. 1 is a fragmentary side elevation of the machine with the combined melting pot and goose neck unit in die-charging position ready for the pressure-fluid to be released to the goose neck to force molten metal therefrom into the closed die;

Fig. 2, a plan view with the parts in the positions of Fig. 1;

Fig. 3, a fragmentary side elevation, similar in part to Fig. 1, the combined melting pot and goose neck being shown in section in the charge-receiving position of the goose neck, the die-charging position thereof being indicated in dotted lines;

Fig. 4, an elevational view of the nozzle end of the combined goose neck and melting pot unit and its actuating means, the unit being in its raised position;

Fig. 5, a composite, perspective view of the combined melting pot and goose neck with the two parts disconnected and separated to show the details thereof;

Fig 6, a fragmentary longitudinal section of the drain spout and valve for the melting pot;

Fig. 7, an end elevation of the valve for controlling communication between the melting pot and the interior of the goose neck;

Fig. 8, a fragmentary, vertical section showing the relation of the metal control valve of Fig. 7 and the melting pot cover both in the raised and lowered positions of the melting pot;

Fig. 9, a side elevation of a distributor unit for feeding predetermined quantities of powdered material to the pressure-fluid line leading to the goose neck;

Fig. 10, an elevation of the distributor unit and its actuating mechanism looking from the left end of the machine as shown in Fig. 1, the powder-receiving hopper being shown in section; and

Fig. 11, a plan of the distributor with the pawl-and-ratchet operating mechanism removed and the hopper shown in section.

In order to disclose the invention fully, it is not necessary to illustrate the complete die-casting machine by which my improved method of casting is practiced; nor to describe in detail the construction and operation of the means for opening and closing the die. However, such reference will be made to all parts and their mode of operation as is essential to a complete understanding of the method of casting. Details of construction and operation of the devices referred to are fully set forth in my earlier Patents Nos. 1,607,677, November 23, 1926 and 1,631,686, June 7, 1927, to which reference is made for this purpose.

The machine used comprises a bed 1 supporting a gear housing 2. The ends of a series of guide rods 3, 3, 3', 3' are secured in the left hand wall 2' of housing 2 and their opposite ends find support in hot plate 4. This hot plate, to which is attached the stationary die part 5, is mounted in the upper part of a frame member 6, the latter being supported above the bed of the machine by rods 7, 7' and their bearing blocks 8, 8' (the right hand set of blocks not being shown). Attached to die carriage 9, which is slidably mounted on guide rods 3, 3, 3', 3', is the movable die part 10.

An open top furnace 11, provided with gas burners or other suitable heating means 12, is secured to the bed of the machine beneath frame member 6. Pivotally supported at its left end for movement in the upper part of furnace 11 is a combined melting pot and goose neck unit for supplying molten metal to the die. Melting pot 13, which comprises the lower part of the unit, is formed about its upper edge with a flange 14 having threaded openings 14' and side extensions 15, 15', with which latter certain operating means coact, as hereinafter described, to raise and lower the free end of the unit. Secured by screws 16 to the top of melting pot 13 is a casting which serves to cover tightly the otherwise open top of the melting pot and protect the molten metal therein from the surrounding atmosphere. This casting comprises a goose neck or pressure chamber portion 17 and a cover portion 18, the edges of the latter being perforated, as indicated at 18', to receive screws 16, which extend therethrough into openings 14'. Cover portion 18 also is provided with side extensions 19, 19' corresponding to extensions 15, 15' on melting pot 13. A removable discharge nozzle 17' fitted to the outer end of goose neck 17, is adapted to communicate with the die cavity through a perforated nipple plate 16' pivoted on hot plate 4, when the parts are in the die-charging position of Fig. 1.

A standard 20 on the bed of the machine provides pivotal support for the left end of the goose neck and melting pot units, whereby the free or nozzle end thereof may swing towards and from the die. Standard 20 and melting pot cover 18 are provided for this purpose with pairs of perforated lugs 21, 21' and 22, 22', respectively, while a pivot pin 23 extends through the lugs to support the unit in place.

Cover 18 is formed centrally with a dome-shaped portion 24 surrounding the upright leg of goose neck 17 (see Fig. 3). An opening 25 is provided in this portion of the cover through which metal ingots are fed to the melting pot. This opening is closed by a plug-type cover 26 having a supporting flange 27 about its edges and a handle 28. A skirt 29, the purpose of which will appear later, is formed on the underside of cover 18 about opening 25. Trunnions 30, 30', formed on the outer corners of melting pot 13, are to assist in removal of the melting pot unit, when this is desired.

Molten metal is supplied to goose neck 17 from the melting pot through a port 31 in the inclined arm of the goose neck. Port 31 is controlled by a stationary, plug-type valve 32 mounted on a bracket 33 attached to hot plate 4 and extending through an opening 34 in the melting pot cover 18. With this arrangement, port 31 is opened when the goose neck is lowered and automatically closed as the nozzle 17' moves towards the closed die.

A bushing 35 is secured in opening 34, the passage 36 through the bushing being of sufficient size to fit snugly about valve 32 at its upper end, while the passage flares downwardly to allow for the swinging movements of the melting pot and goose neck unit toward and from the die. This is clearly shown in Fig. 8, where the melting pot cover appears in full lines in its lowered position and in dotted lines in the die-charging position. This arrangement completely prevents entrance of air to the molten metal at this point.

It will be noted from Fig. 3 that furnace 11 is formed with a rabbet 37 in its upper edge 38 to receive the flanged edge of melting pot 13. Rabbet 37 is inclined at 39 and 39' to permit swinging of melting pot 13 about pivot pin 23. Slots 40, 40' in the upper edge of the furnace freely receive trunnions 30, 30', while similar slots 41, 41' normally accommodate lifting extensions 15, 15' at the swinging end of the melting pot.

As hereinafter described, compressed air is admitted to goose neck 17 through nipple 42 and perforated pipe 43 (Fig. 3), striking against cap 44 and acting downwardly to force the molten metal from the goose neck into the die.

Melting pot 13 is provided with a drain spout 45 having a passage 46 therethrough, the spout projecting freely through opening 47 provided for this purpose in the end wall of furnace 11. Mounted on the outer end of spout 45 is a plate 48 having a cylindrical extension 49 formed thereon and projecting into the outer end of passage 46, whereby the escape of metal is normally prevented. Plate 48 is supported by a pair of stud bolts 50, 50' fixed in the end of spout 45 and extending freely through openings in the plate. Nuts 51, 51' serve to secure the plate 48 in closed position, as shown in Fig. 6.

Extension 49 of plate 48 is chamfered at 52, while the wall of passage 46 is formed at its outer end with a groove 53. Groove 53 is open at its outer end, but normally closed by plate 48. When it is desired to drain molten metal from the melting pot into ingot molds, or for other purposes, it is necessary merely to back off nuts 51, 51', whereby plate 48 and its extension 49 may be moved outwardly sufficiently to bring passage 46 into communication with groove 53. Since the outer end of groove 53 is now open, free passage for draining of the metal is provided. The flow may be stopped immediately by simply pushing the plate 48 back into position, after which nuts 51, 51' are screwed up.

The mechanism for opening and closing the die and for raising the melting pot and goose neck unit into die-charging position will now be described. A drive shaft 54 is journaled at its ends in the sides of housing 2. A cover 55 is provided for the housing and conceals the gearing for drive shaft 54. The die operating parts and the goose neck and melting pot unit operating parts about to be described being duplicated on either side of the machine, only the forward set will be referred to in detail. The corresponding parts at the rear are indicated by primed numbers. A crank 56 fixed to the front end of shaft 54 has a cam 57 secured fast thereto. This cam carries a roller 58 engaging a slot 59 in the end of connecting rod 60. A roller 61 mounted for rotation on the inner face of connecting rod 60 engages at all times with the edge of cam 57.

At their opposite ends, the two connecting rods 60, 60' are joined together by a cross member 62. This cross member is fixedly secured on die carriage pusher rods 63, 63' intermediate their ends, the rods being extended on either side of the cross member and at the right side thereof passing through suitable guideways 64, 64' provided for this purpose on the inner wall 2' of housing 2 (see Figs. 1 and 2). Split bearings 65, 65' on die carriage 9 slidably connect the carriage to pusher rods 63, 63' for a purpose explained later.

On each side of die carriage 9, pusher rod 63 is threaded to receive a pair of nuts 66 to the right and a pair of nuts 67 to the left of the die carriage. A spring 68 located between nuts 66 and the die carriage serves to urge the carriage towards the left and against nuts 67.

Also pivotally connected at one end to cross member 62 is an elevator pusher rod 69. The left hand end of this rod has a pin-and-slot connection at 70 with the upper end of a lever 71 pivotally supported at its lower end by a pin 72 carried by frame member 6. A link 73 is pivotally connected to lever 71 at 74, while the opposite end of the link is bifurcated to receive a pivot pin 75. Pin 75 pivotally connects link 73 with the upper end of a crank 76, which is fixed to the outer end of a short shaft 77 mounted for oscillation in a bracket 78 secured to frame member 6. An eccentric is provided on the inner end of shaft 77 which is adapted to coact with the side extensions 15, 15' on the melting pot and goose neck unit to effect raising and permit lowering of the unit in the operation of the machine. As shown, this comprises a disc 79 formed integrally with shaft 77 and an integral eccentrically arranged stud 80, which latter engages directly with melting pot extensions 15, 15', as appears most clearly in Fig. 4.

Such of the mechanism so far described as is not claimed hereinafter is covered by my prior Patents Nos. 1,607,677 and 1,631,686, supra, and 1,590,246, June 29, 1926. Reference may be had to these for further details.

In operation, when power is applied to drive shaft 54 to rotate it clockwise, as shown in Fig. 1, connecting rods 60, 60' move to the left and impart a corresponding movement to cross member 62, die carriage pusher rods 63, 63', and elevator pusher rods 69, 69', until these parts reach the die-charging position of Fig. 1. As a result of this movement of the parts mentioned, die carriage 9 is moved to the left on guide rods 3, 3, 3', 3' until movable die part 10 engages fixed die part 5, as shown in the same figure. Simultaneously, goose neck nozzle 17' is raised by the connections described into contact with nipple plate 16'. Following this, the goose neck and melting pot unit, as will appear shortly, has a final upward movement which carries it into registry with the closed die through the opening in the nipple plate, the position shown in Figs. 1 and 2.

Die carriage 9 is preliminarily adjusted on the guide rods and secured by nuts 66, 66', 67, 67', so that the die parts 5 and 10 are brought together shortly before cross member 62 completes its movement to the left. Hence, when the die parts are brought together, cross member 62 continues its movement to the left and causes springs 68, 68' to be compressed against die carriage 9, pusher rods 63, 63' sliding freely through the die carriage to permit this action. During this short relative movement between cross member 62 and die carriage 9, the goose neck and melting pot unit is elevated to the die-charging position indicated in dotted lines in Fig. 3. Simultaneously, the flow of molten metal from melting pot 13 into the goose neck is cut off by valve 32.

In order to insure accurate seating of valve 32 and provide proper tension between the parts, the valve is suspended from bracket 33 by a resilient mounting. This is shown in detail in Fig. 7, wherein the stem 81 of the valve is threaded into the lower side of a spring metal connecting member 82. A screw 83 extends through an opening in bracket 33 and has threaded connection with the upper part of spring member 82. This spring member is formed with enlarged curved portions 84, 84' at its ends, while centrally there are provided opposed flat surfaces 85, 85'. The latter provide a ready means for insertion of a gage to determine the tension between the valve 32 and goose neck 17, when the latter is in die-charging position. The resilient mounting of valve 32 also permits any necessary lateral movement of the valve which may be caused by the swinging movements of the melting pot and goose neck unit.

After the parts have arrived at the die-charging position of Fig. 1, compressed air, or other suitable pressure fluid, is admitted to the rear end of the goose neck to force the molten metal into the die. The means for accomplishing this will be described shortly. After the charge of metal from goose neck 17 has been forced into the closed die and permitted to freeze, the die and goose neck unit actuating mechanism operates in the opposite direction, i. e., to the right, carrying connecting rods 60, 60' to the right, together with cross member 62. As a result, the goose neck and melting pot unit starts to descend towards the full line, or charge-receiving position of Fig. 3. During this movement, it will be noted that valve 32 is unseated, so that molten metal may flow again into goose neck 17 through port 31.

As cross member 62 and pusher rods 63, 63' continue their movement to the right, nuts 67, 67' engage die carriage 9 and move it to the right, so as to separate the die parts 5 and 10. The parts continue their movement to the right, until the full open position is reached, when the machine is ready for the next casting operation.

The means for supplying the pressure fluid to goose neck 17 will be described now. As indicated in dotted lines in Figs. 1 and 3, nozzle 42 serves to connect goose neck 17 to a pressure fluid connection 86, when the goose neck is in die-charging position. Connection 86 is mounted on standard 20 and has a passage 87 therethrough. Suitable counterweighted means serve to urge fluid connection 86 to the right into sealing engagement with nozzle 42. This mechanism forms no part of the present invention, but is fully disclosed and claimed in my copending application, Ser. No. 476,909, filed August 21, 1930 (Patent No. 1,877,896, September 20, 1932).

A pipe 88 leads from the outer end of passage 87 in connection 86 to a suitable source of pressure fluid supply. Certain valve mechanism interposed in pipe line 88, as described below, is adapted to be actuated automatically when the die is closed to supply pressure fluid to the goose neck through connection 86, and thereby force the molten metal from the goose neck into the die. The supply of pressure fluid is then automatically cut off and the pressure fluid vented from the goose neck and connected parts before the die opens.

Inlet valve casing 89 is located in pipe line 88, while the stem of a normally closed inlet valve 90 projects therefrom for actuation, as hereinafter described, to permit passage of pressure fluid to the goose neck. As shown in Fig. 2, a pipe 91 connects with inlet valve casing 89 between the goose neck and inlet valve 90, the outer end of pipe 91 being connected to an exhaust valve casing 92. The stem of normally closed exhaust valve 93 extends outside of casing 92 for actuation to permit the escape of pressure fluid from the piped connections through exhaust port 94 in casing 92, after a die-charging operation has taken place.

With the described arrangement of the parts, it is clear that, when inlet valve 90 is actuated, compressed air will flow through pipe 88 to goose neck 17. At the same time, compressed air will fill pipe 91 and exhaust valve casing 92. However, since exhaust valve 93 is closed, the compressed air cannot escape at this point and operates with full force on the molten metal in the goose neck. When exhaust valve 93 is operated, this being arranged to take place, of course, when inlet valve 90 is closed, the valve casings 89 and 92 and the several connections are all vented immediately to the atmosphere through exhaust port 94.

The inlet and exhaust valves for controlling the pressure fluid are adapted to be actuated at the proper times through certain mechanism controlled by the main drive shaft 54. As shown in Figs. 1 and 2, a cam 95 is provided on the front end of shaft 54, the periphery thereof being provided with a main surface 96 and a raised operating surface 97. Pivotally mounted at 98 on housing 2 is a bell crank 99 having a roller 100 at the end of one arm thereof engaging the periphery of cam 95. The other arm of bell crank 99 is engaged by the right hand end of thrust rod 101 which extends through the hollow guide rod 3. The opposite end of thrust rod 101 projects beyond hot plate 4 for engagement with the stem of inlet valve 90 to open the valve at the proper time. Coil spring 102, interposed between a fixed collar 103 on thrust rod 101 and wall 2' of the gear housing, serves to urge the thrust rod to the right and thus force roller 100 against cam 95.

When roller 100 is in engagement with cam surface 96, the left end of thrust rod 101 is spaced from the stem of inlet valve 90, so that the latter remains closed. As shaft 54 revolves, roller 100 is engaged by cam projection 97, thereby forcing thrust rod 101 to the left by means of the described connections and operating the inlet valve so that compressed air passes to the goose neck. As soon as cam surface 97 has passed under roller 100, spring 102 serves to move pusher rod 101 back to its original position, permitting inlet valve 90 to close.

The mechanism for operating exhaust valve 93 is identical with that for the inlet valve, except for the form of the operating surface of the cam member. This cam member 104 is secured to the rear end of shaft 54. The cam has a main peripheral surface 105 and a depressed surface 106. As long as roller 100' is in engagement with cam surface 105, which comprises the greater part of the periphery of the cam, thrust rod 101' is held to the left to maintain exhaust valve 93 in open position to vent the parts. As shaft 54 revolves, roller 100' engages the depressed cam surface 106, thereby permitting spring 102' to force thrust rod 101' to the right to enable exhaust valve 93 to close.

With the arrangement of parts and the formation of cams 95 and 104 as they appear in Figs. 1 and 2, the sequence of operations is as follows: Starting with the charge-receiving position of goose neck 17, shown in solid lines in Fig. 3, it will be seen that at this time the die is open and the seal between air nozzle 42 and air connection 86 is broken to permit venting of the parts at this point. At this time the position of cam 104 is such that exhaust valve 93 is held open to vent the remaining parts of the pressure fluid system to the atmosphere.

As drive shaft 54 continues to revolve, nozzle 42 seats against connection 86, the die is closed, and metal discharge nozzle 17' of the goose neck forces nipple plate 16' against the die. By this time, cam 104 has revolved to permit closing of exhaust valve 93. Shortly after this, raised portion 97 of cam 95 acts to open inlet valve 90 for a brief interval. During the entry of compressed air as described exhaust valve 93 remains closed, but shortly after the inlet valve has closed, cam 104 operates to again open the exhaust valve to vent the parts. The exhaust valve remains open until the die closes the next time.

Shortly after exhaust valve 93 opens, pusher rods 69, 69' operate, as hereinbefore described, to permit goose neck nozzle 17' and nipple plate 16' to drop away from the under side of the die and resume their original positions. The die then opens and connection at the rear of the goose neck with the compressed air system is broken. Continued movement of the parts brings them back to the original charge-receiving position of Fig. 3.

It is clear that with the specially designed construction of the melting pot and goose neck unit described, molten magnesium or similar metals may be used readily for the manufacture of diecastings, without danger of the surrounding atmosphere coming in contact with the metal and causing burning thereof. In practice, metal ingots are fed to melting pot 13 through opening 25, so as to keep the metal level as high as possible. Generally this is just below the bottom of cover 26, as indicated by the dot-and-dash line in Fig. 3. In this manner, skirt 29 serves to seal off the bulk of the molten metal from opening 25 and thereby reduce to a minimum the surface of the metal exposed to the atmosphere when the cover is removed for the insertion of ingots. It will be noted that the preferred level indicated brings the molten metal in the goose neck nozzle 17' almost to the discharge opening, and in this manner reduces the area of metal exposed to the atmosphere at this point. Bushing 35 serves effectively to prevent the entrance of air to the molten metal around valve 32, irrespective of the position of the goose neck and melting pot unit.

Special provision is made to permit direct application of fluid pressure to molten magnesium, or similar metals, to force the metal from the goose neck 17 into the die, and at the same time, preclude possible burning of the metal at this point. It has been found that the introduction of a quantity of suitable reagent, such as powdered sulphur, into the pressure fluid acting against the molten metal in goose neck 17 entirely prevents burning of the magnesium metal. This is accomplished automatically by the distributor unit shown in detail in Figs. 9, 10 and 11.

The distributor unit comprises a hopper 107 having a pivoted cover 108 provided with a swinging fastener 108'. The lower part of the hopper is formed to provide a passage 109 the ends of which are threaded, whereby the unit is interposed in the compressed air pipe line 88. A transversely arranged cylindrical enlargement 110 formed on the bottom of hopper 107 is provided with a cylindrical chamber 111 which is open at one end. Chamber 111, as shown in Fig. 10, intersects the upper part of passage 109 so as to provide an opening 112 through which a predetermined quantity of powdered sulphur is fed to passage 109 during each cycle of operation of the machine. An elongated opening 111' connects hopper 107 with chamber 111, while the

feeding of powdered sulphur from the hopper to passage 109 is controlled by a distributor shaft 113 arranged for step-by-step rotation in chamber 111. The surface of shaft 113 is provided with a series of longitudinally disposed, parallel pockets 114 into which the powdered sulphur settles and by means of which it is measured and emptied into passage 109.

Endwise movement of shaft 113 is prevented by a pin 110' mounted in the base of the hopper and projecting into an annular groove 113' in the shaft (Fig. 11). A spring-pressed ball 109' engages successively depressions 112' provided on flange 114' of shaft 113 to insure registration of opening 111' in the bottom of the hopper with each succeeding pocket 114.

The desired step-by-step rotation of distributor shaft 113 is accomplished by arranging for its actuation by lever 71, during the periodic movements of the latter as it raises the goose neck and melting pot unit from charge-receiving to die-charging position in the successive cycles of operation of the machine. The outer end of distributor shaft 113 is reduced at 115 to receive a ratchet wheel 116 which is fixed thereto. Mounted intermediate its ends for oscillatory movement on the reduced outer end 117 of shaft 113 is a lever 118. A nut 119 threaded on the end of shaft 113 serves to hold lever 118 in place. The lower end of lever 118 is pivotally connected by a link 120 to lever 71 near its upper end, as shown in Fig. 1.

Pivoted on the upper end of lever 118 is a pawl 121 the lower end of which engages the teeth of ratchet wheel 116. As shown in Fig. 10, the upper end of pawl 121 is provided with a laterally projecting pin 122 extending over the upper end of lever 118. Mounted in a recess 123 in the upper end of lever 118 is a plunger 124. A coil spring 125 in the lower end of recess 123 urges plunger 124 outwardly into engagement with pin 122, thereby retaining the pawl in engagement with ratchet wheel 116.

Thus, as the goose neck and melting pot unit swings up into die-charging position, as hereinbefore described, the quantity of powdered sulphur deposited by distributor shaft 113 in passage 109 is carried by the compressed air, which is released by inlet valve 90 at this time, into the rear end of goose neck 17. In this manner, the powdered sulphur is intimately mixed and reacts with the compressed air at the rear of the molten magnesium metal in the goose neck and destroys the combustion-supporting properties thereof, so that the molten metal cannot burn. A sufficient amount of sulphur should be injected into the air line to insure definite separation of the molten metal and the incoming supply of oxygen-containing, compressed air.

As a result of the injection of powdered sulphur, this material burns in the air adjacent the molten magnesium, and seemingly the following reaction takes place:—

$$2N+2O+S+3Mg=SO_2+Mg_3N_2.$$

In other words, the oxygen of the air combines with the sulphur to form sulphur dioxide, while the nitrogen of the air combines with a portion of the magnesium to form magnesium nitride. Thus, there is a complete absence of any medium in the vicinity of the molten metal which will support combustion and thereby permit the metal to burn.

It will, therefore, be seen that with my improved method, contact of the surrounding atmosphere and the pressure fluid with the molten magnesium metal is prevented, thereby precluding possible burning of the metal and permitting the rapid production of high class die-castings.

What is claimed is:—

1. The method of die-casting which comprises the steps of providing a pressure chamber containing molten metal and having a metal outlet and an inlet; connecting the metal outlet of the pressure chamber to a die; feeding compressed air to said inlet; and supplying a measured quantity of sulphur to the compressed air prior to its contact with the molten metal.

2. The method of die casting which comprises the steps of providing a pressure chamber containing molten metal and having a metal outlet and an inlet; supplying a measured quantity of a reagent to said pressure chamber inlet; and feeding pressure gas to the pressure chamber inlet to force molten metal from the pressure chamber into a die connected therewith.

3. The method of die casting which comprises the steps of providing a pressure chamber containing molten magnesium or like metal and having a metal outlet and an inlet; connecting the metal outlet of the pressure chamber to a die; feeding compressed air to said inlet; and supplying a measured quantity of sulphur to the compressed air prior to its contact with the molten metal.

4. The method of die casting which comprises providing a quantity of molten metal in a container; conducting a pressure gas to said container to force molten metal therefrom into a die connected to the container; and supplying a measured quantity of sulphur to the pressure gas prior to its contact with the molten metal.

5. The method of die casting which comprises providing a quantity of molten metal in a container; conducting a pressure gas to said container to force molten metal therefrom into a die connected to the container; and supplying to the pressure gas a measured quantity of a substance adapted to react with the pressure gas in the presence of heat to form a gas inert toward the metal being cast.

6. The method of die casting which comprises providing a quantity of molten metal in a container; conducting a pressure gas to said container to force molten metal therefrom into a die connected to the container; and supplying to the pressure gas prior to its contact with the molten metal a measured quantity of a substance adapted to destroy the combustion-supporting property of the pressure gas in the presence of heat.

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