July 5, 1932. W. J. DURING 1,866,191

DIE CASTING MACHINE

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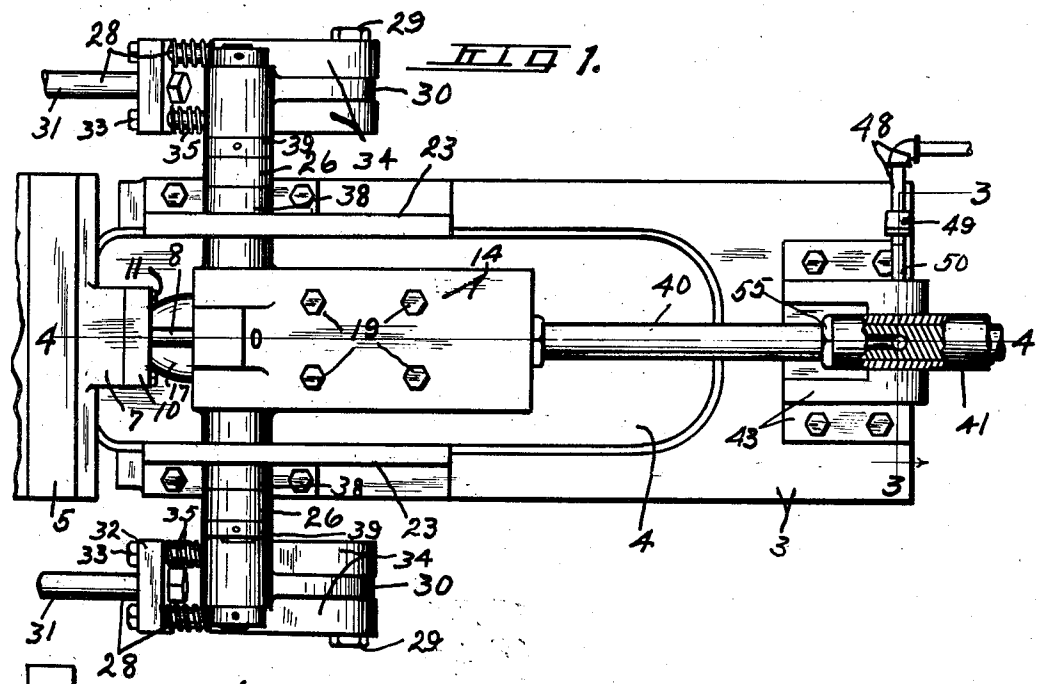


FIG 1.

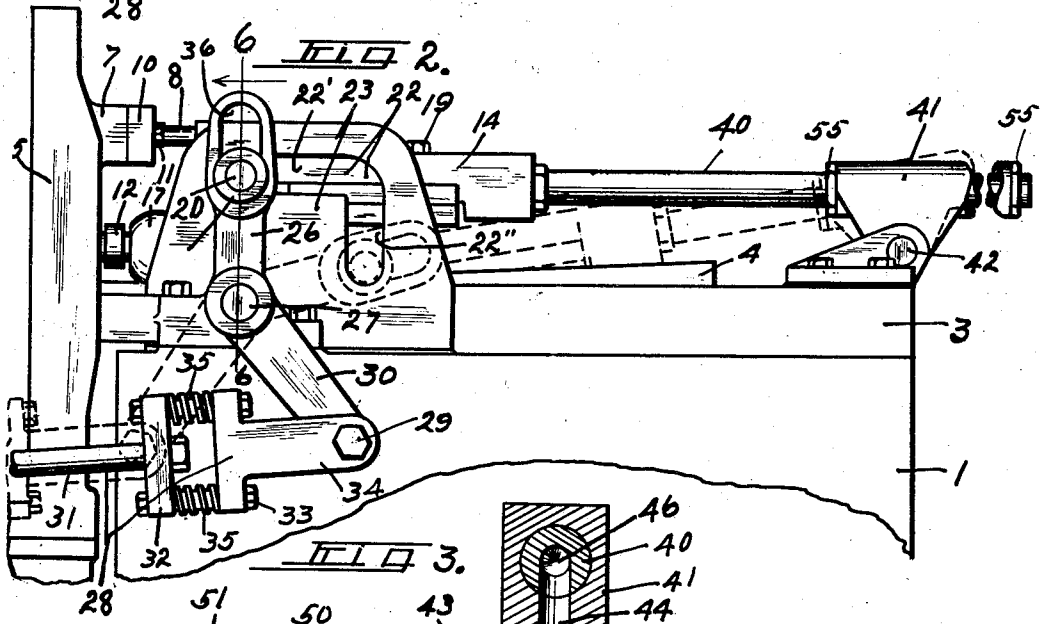


FIG 2.

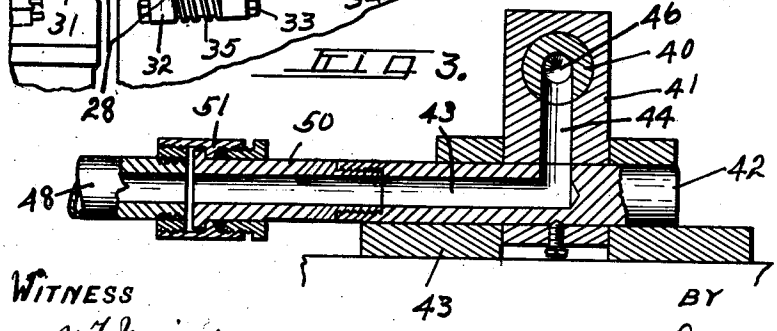


FIG 3.

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FIG. 4.

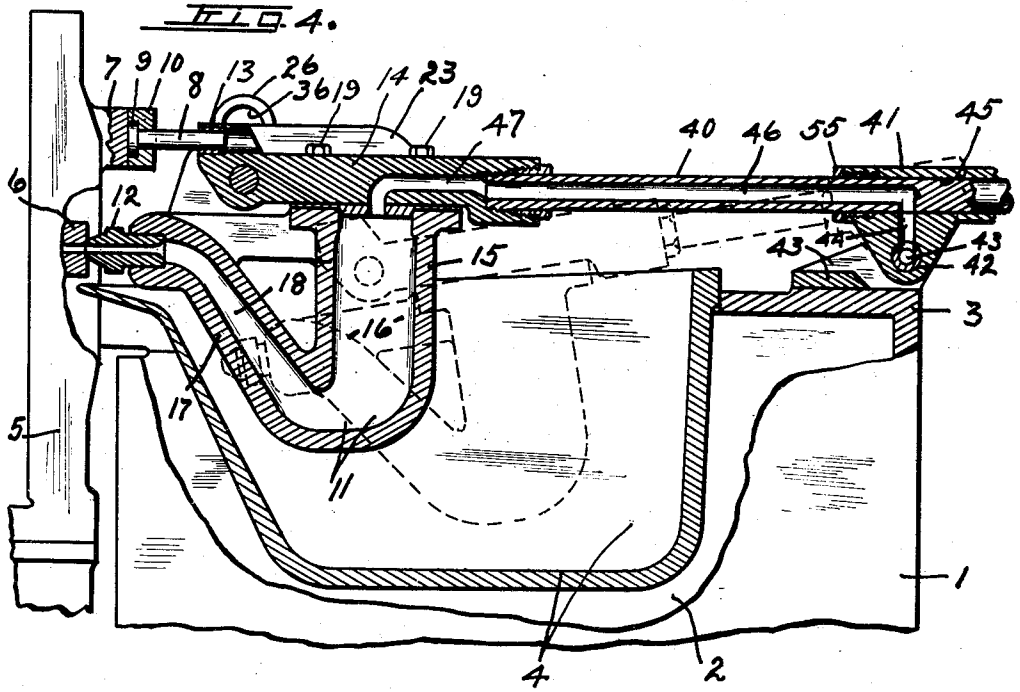


FIG. 5.

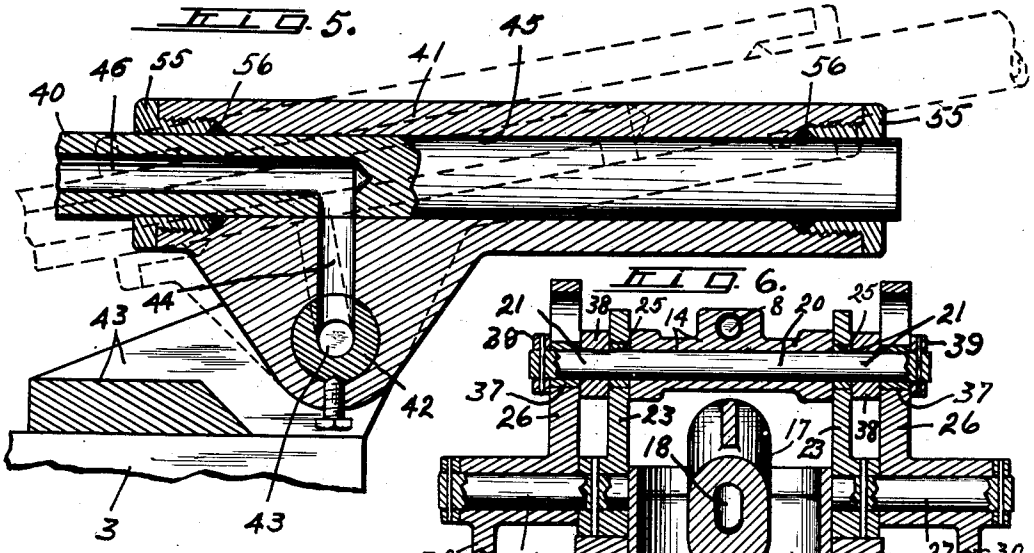


FIG. 6.

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UNITED STATES PATENT OFFICE

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DIE-CASTING MACHINE

Application filed November 14, 1929. Serial No. 407,158.

This invention relates to certain new and useful improvements in die casting machines. The invention pertains more particularly to the construction and operation of the pressure pot or ladle used for conveying molten metal from a suitable melting pot to a die or mold.

The main objects of the invention are the production of a pressure pot or ladle which is durable in construction, easily and quickly operated, is positive in its action and combines economy of fluid used under pressure for discharging the molten metal from the delivery pot into the die or mold with safeness in operation.

In carrying out the foregoing objects, I have constructed a ladle or pressure pot having a pressure chamber therein adapted to receive molten metal and a delivery nozzle in connection with said chamber adapted when submerged to permit the molten metal to gravitate through the nozzle into the pressure chamber for charging, after which the delivery pot may be moved upward vertically to bring the delivery nozzle into the horizontal plane of the receiving nozzle or gate for the sprue die section and then to move the delivery pot horizontally in a rectilinear manner to bring the delivery nozzle into casting relation with said gate.

A further advantage in this invention resides in the particular construction whereby the fluid under pressure for forcing the molten metal from the pressure chamber into the die, is automatically controlled in that it is only possible to admit the fluid into the pressure chamber when the delivery nozzle is in casting relation with the die or mold.

Other objects and advantages relate to the detail of the structure and relation of the parts all as will more fully appear from the following description taken in connection with the accompanying drawings, in which:

Figure 1 is a top plan of a portion of a die casting machine embodying the various features of this invention.

Figure 2 is a side elevation of the device as illustrated in Fig. 1.

Figure 3 is an enlarged detailed vertical section taken in the plane of line 3—3, Fig. 1.

Figure 4 is a longitudinal vertical section taken on line 4—4, Fig. 1.

Figure 5 is an enlarged detailed longitudinal section through the pivotal support for the delivery pot guide arm illustrating the manner in which the pressure chamber is automatically connected and disconnected with the source of fluid supply.

Figure 6 is a detailed transverse vertical section taken in the plane of the line 6—6, Figure 2.

In the construction shown in the drawings the usual frame or fire box —1— is used having a furnace chamber —2— therein; a cover plate, as —3—, is secured to the upper face of the frame —1— and has mounted therein a suitable melting pot —4— which extends downwardly from the plate —3— into the furnace chamber —2— and is adapted to contain molten metal.

In close relation to the forward end of the frame or fire box —1— is positioned a suitable die supporting plate —5— which contains the usual gate —6— adapted to register with the inlet port of a suitable die or mold, not shown, carried by the plate —5—.

The plate —5— may be supported in any suitable manner and may be movable or secured to the frame of the machine in a fixed position. In this instance, a rearwardly extending boss —7— is provided on the upper portion of the rear vertical side of the plate —5— in a plane above the gate —6— and to this boss —7— is securely clamped a rearwardly extending horizontally disposed guide rod —8—.

The guide rod —8— is provided with an enlarged annular head portion —9— which is positioned in a suitable recess provided in the inner face of a clamping bar —10— which is secured to the boss —7— by screws —11—. The clamping bar —10— is also provided with an aperture therethrough in alignment with the recess through which the rod —8— extends rearwardly to form a guide for the delivery pot or laddle —11— as said delivery pot approaches its forward or casting position to maintain the metal delivery nozzle as

—12— secured to the delivery pot in operative alignment with the gate —6—. This is accompanied by the guide rod —8— registering in a bushing —13— secured in the upper front portion of a bracket —14— secured to the upper end of the delivery pot —11—.

The delivery pot —11— in this instance, is of the goose-neck type and is provided with a vertically disposed major portion —15— having a pressure chamber —16— therein. A spout —17— for the delivery pot extends from the lower end of the major portion —15— upwardly and forwardly and is adapted to support the delivery nozzle —12— in the forward end thereof.

The delivery nozzle —12— is connected with the lower end of the chamber —16— by a duct —18— provided in the spout —17—.

The bracket —14— is secured by bolts —19— to the upper portion of the delivery pot —11— and extends forwardly from the major portion —15— of the pot and is provided with a horizontally disposed aperture therethrough adapted to receive a shaft —20—. The shaft —20— extends outwardly at either side from the bracket —14— to form a pair of trunnions —21— for the delivery pot. Each of the ends of the shaft —20— extend outwardly through and are supported in suitable guide slots —22— provided in a pair of opposed vertical upwardly extending plates —23— respectively which are made integral with or secured to the upper surface of the frame —1— near the forward end thereof.

The guide slots —22— in this instance, are each composed of horizontal portion —22′— disposed in a plane above the horizontal plane of the gate —6— and a vertically disposed portion —22″— which extends downwardly from the rear end of the horizontal portion —22′— thereby forming the inverted L-shaped slot —22— for guiding the delivery pot from the casting position to the charging position and vice versa.

In this instance, the width of the slot —22— is greater than the diameter of the shaft —20— so that a roller —25— may be rotatably mounted on the outer ends of the shaft —20— and which is adapted to travel in the respective slot —22— to effect the easy movement of the shaft through said slot.

The shaft —20— may be moved through the slots —22— by means of a pair of rock arms —26— positioned one at the outside of each of the plates —23— and in this instance, in spaced relation thereto and journaled for pivotal movement on respective shafts —27— said shafts being secured to the lower portion of the respective plates —23— near the forward end thereof so that when the shaft —20— is positioned in the forward portion of the guide slots —22— to bring the delivery pot into the casting position, the rock arms —26— will be in a substantially vertical position.

The rock arms —26— may be operated by any suitable means as, for instance, a cross-head not shown, slidably mounted upon a suitable guide secured to a convenient portion of the machine, also not shown, the cross-head being connected by a pair of drive rods —28— which may be secured at their forward ends to the cross-head and have their rear ends pivotally secured at —29— to the lower end of a rock arm —30— which is secured at the upper end thereof to reciprocate the rock arm —26— or may be made integral therewith to form a bell crank lever.

The drive rods —28— may, as shown in the drawings, Figs. 1 and 2, be composed of a rod —31— having a plate —32— secured to the rear end thereof which is secured by bolts —33— to the forward end of a bifurcated arm —34— which is pivotally connected at —29— to the arm —30—.

The plate —32— may be yieldingly held in spaced relation to the arm —34— by coil springs as —35— positioned on the bolts —33— between said plate and the arm —34—. The springs —35— are of a relatively heavy construction so that when the arm —30— is rocked rearwardly to bring the nozzle —12— into casting relation with the gate —6—, a sufficient amount of pressure will be exerted upon the nozzle —12— to maintain it in its proper engagement with the gate —6— against any back pressure which may be produced when the molten metal is forced into the die at the same time providing a yielding connection between the operating means, as a cross-head and the arm —30— to compensate for any difference in movement of the operating means and the rock arms —26—.

The upper ends of the rock arms —26— are each provided with an elongated slot —36— through which the outer ends of the shaft —20— extends, the width of the slots —36— being greater than the diameter of the shaft —20— so as to permit a roller —37— to be rotatably mounted on each end of the shaft and adapted to travel in the respective slot —36— of the rock arms —26—.

The rollers —25— and —37— are each of substantially the same width as the plates —23— and arms —26— respectively and may be maintained in the proper spaced relation by a spacing collar —38— mounted on the outer ends of the shaft —20— between the arms —37— and respective plate —23— while a collar —39— may be secured to each of the outer ends of the shaft —20— to maintain the rollers —25— and —37— in their proper operative position in the respective slots —22— and —36—.

The delivery pot —11— may be secured against undue rocking movement about the axis of the shaft —20— by means of a guide

rod —40— which is secured to the rear portion of the bracket —14— and extends rearwardly therefrom with the rear end of said guide rod slidably mounted in a pivotal arm —41— which is secured to a rock shaft —42—.

The rock shaft —42— is pivotally mounted in a suitable bracket —43— which is secured to the rear portion of the cover plate —3—. The shaft —42— is provided with a passageway or duct —43— which extends from one of the outer ends thereof inwardly to the plane of the guide rod —40— where it registers with a vertically disposed passageway —44— provided in the arm —41— and extends upwardly from the shaft —42— to the bore —45— provided in the arm —41— for receiving the guide rod —40—.

The guide rod —40— is also provided with a longitudinal passageway —46— therein which extends from the forward end thereof rearwardly to such a distance that when the delivery pot —11— is in the casting position, the inner end of said passageway will be in registration with the passageway —44— in the arm —41—, the passageway —46— being in communication with the upper end of the chamber —16— by means of a duct —47— provided in the rear portion of the bracket —14— so that when the delivery pot is in the casting position, fluid, as air under pressure, may be admitted through the shaft —42— and passageways —44— and —46— and duct —47— to the pressure chamber —16— for discharging the molten metal contained in said chamber through the delivery nozzle —12— into the die or mold secured to the plate —5—.

The passageway —43— in the shaft —41— may be connected with any suitable source for delivering fluid, as air under pressure as a pump, not shown, by a suitable conduit —48— which may or may not be provided with a suitable control valve, not shown, for manually controlling the flow of the fluid and is connected to the shaft —42— by a suitable swivel joint as —49— which may have one end member thereof as —50— secured to the shaft —42— and the other end of said member rotatably mounted in a housing —51—. The housing —51— in turn, may be secured to one end of the conduit —48— so that the conduit —48— may remain in a stationary position and at the same time, permit the free rotary movement of the rock shaft —42— to permit the passageways —43— and —44— to remain in registration at all times.

The horizontal length of the arm —41— through which the rod —40— reciprocates, is somewhat greater than the length of the longitudinal movement of said rod so that the inner end of the passage —46— will always remain within said arm and secured to each end of the arm —41— adjacent the rod —40— is a gland nut —55— adapted to compress packing —56— about the shaft —40— to prevent the escapement of the fluid used to discharge the metal from the delivery pot and at the same time permit the free reciprocating movement of the rod —40— in the arm —41—.

Referring now to Figs. 4 and 5, it is evident that when the delivery pot —11— is moved from the casting position, as illustrated by the full lines, to the charging position with the nozzle submerged in the molten metal contained in the melting pot —4— as illustrated by dotted lines, that the delivery pot —11— will be rocked about the axis of the shaft —20— during the vertical movement thereof in the guide slots —22—, due to the pivotal movement of the rod —40— about the axis of the shaft —42— as the guide rod is moved endwise through the arm —41— and this swinging movement of said delivery pot will bring the nozzle —12— into the submerged position in the molten metal contained in the melting pot —4—, for permitting the chamber —16— to be charged with the metal.

It will also be noted, especially in Fig. 5, that as soon as the delivery pot —11— commences its rearward movement along the horizontal portion —22'— of the guide slots —22— that the passageway —46— in the guide rod —40— will be brought out of registration with the passageway —44— in the pivotal arm —41— thereby severing the connection between the chamber —16— and the source of fluid supply and thus prevent any possibility of accidents caused by the careless or unintentional opening of any fluid control valve which may be used.

As the delivery pot —11— is moved from the charging position with the nozzle —12— submerged in the metal contained in the melting pot —4— to the casting position by the action of the arms —26— moving the trunnions —21— along the guide slots —22—, the nozzle —12— will be brought into operative alignment with the gate —6— as the trunnions approach the horizontal portion —22'— of the guide slots —22— by the action of the guide rod —40— and as the delivery pot —11— approaches the casting position as it continues its forward movement along the horizontal portion —22'— of the slots —22—, the delivery pot bracket —14— will be guided by the guide rod —8— entering the bushing —13— to insure the proper positioning of the delivery nozzle —12— horizontally as said nozzle engages the gate —6—.

Although I have shown and particularly described the preferred embodiments of this invention, I do not wish to be limited to the exact construction shown, as various changes both in the construction and relation of the parts may readily be made without departing from the spirit of this invention as set forth in the appended claims.

I claim:

1. In a die casting machine in combination with a melting pot adapted to contain molten metal, of a delivery pot provided with a pressure chamber therein and a delivery nozzle connected with said chamber, supporting means for the delivery pot comprising a pair of opposed trunnions projecting from the forward portion thereof, a pair of opposed guides extending vertically and horizontally of the melting pot and adapted to guide the trunnions and the delivery pot connected therewith laterally of the melting pot, means connected with the rear portion of the delivery pot to move therewith and mounted for longitudinal movement and to swing about a fixed axis for rocking the delivery pot about the axis of the trunnions during the vertical movement thereof to bring the delivery nozzle from the charging position within the molten metal to a discharging position in a predetermined plane above the melting pot, and means operably connected with the trunnions for moving the delivery pot along the supporting means.

2. In a die casting machine in combination with a melting pot adapted to contain molten metal, of a delivery pot provided with a pressure chamber therein and a delivery nozzle connected with said chamber, supporting means for the delivery pot comprising a pair of opposed trunnions projecting from the forward portion thereof, a pair of opposed guideways extending upward vertically from the melting pot and terminating in a horizontal portion adapted to receive the trunnions, actuating means for the delivery pot operably connected with the trunnions for moving said delivery pot along the guideways, a guide rod connected at one end with the rear portion of the delivery pot to move therewith and having the other end slidably mounted for longitudinal movement in and to swing about the axis of a pivotal arm for rocking the delivery pot about the axis of the trunnions during the vertical movement thereof to bring the delivery nozzle from the charging position within the molten metal to a discharging position in a predetermined plane above the melting pot.

3. In a die casting machine in combination with a melting pot adapted to contain molten metal, of a delivery pot provided with a pressure chamber therein, and a delivery nozzle connected with said chamber, supporting means for the delivery pot comprising a pair of opposed trunnions projecting from the forward portion thereof, a pair of opposed guideways extending upward vertically from the melting pot and terminating in a horizontal portion adapted to receive the trunnions, actuating means for the delivery pot operably connected with the trunnions for moving said delivery pot along the guideways, a guide rod connected at one end with the rear portion of the delivery pot to move therewith and having the other end slidably mounted for longitudinal movement in and to swing about the axis of a pivotal arm for rocking the delivery pot about the axis of the trunnions during the vertical movement thereof to bring the delivery nozzle from the charging position within the molten metal to a discharging position in a predetermined plane above the melting pot, metal ejecting means comprising a fluid passage in said pivotal arm connected with a fluid conduit, a fluid passage in the guide rod in communication with the pressure chamber and adapted when the delivery pot is in the discharging position to register with the fluid passage in the pivotal arm for admitting fluid under pressure to the pressure chamber.

4. In a die casting machine in combination with a melting pot adapted to contain molten metal, and a gate adapted to register with the inlet port of a die, of a delivery pot provided with a pressure chamber therein and a delivery nozzle connected with said chamber, supporting means for the delivery pot comprising a pair of opposed trunnions projecting from the forward portion thereof, a pair of opposed guideways extending upward vertically from the melting pot and terminating in a horizontal portion adapted to receive the trunnions, actuating means for the delivery pot operably connected with the trunnions for moving said delivery pot along the guideways, a guide rod connected at one end with the rear portion of the delivery pot to move therewith and having the other end slidably mounted for longitudinal movement in and to swing about the axis of a pivotal arm for rocking the delivery pot about the axis of the trunnions during the vertical movement thereof to bring the delivery nozzle from the charging position within the metal into operative alignment with the gate and a fixed guide adapted to engage the delivery pot as it approaches the discharging position to cause the proper registration of the delivery nozzle with the gate.

5. In a die-casting machine in combination with a melting pot adapted to contain molten metal, of a delivery pot provided with a pressure chamber therein and a delivery nozzle connected with said chamber, supporting means for the delivery pot comprising a pair of opposed trunnions projecting from the forward portion thereof, a pair of opposed guides extending vertically and horizontally of the melting pot in a rectilinear manner and adapted to guide the trunnions and the delivery pot connected therewith to bring the delivery nozzle from the charging position submerged in the metal, to a discharging position above the melting pot, and means operably connected

with the trunnions for moving said delivery pot along said supporting means.

6. In a die-casting machine in combination with a melting pot adapted to contain molten metal, of a delivery pot provided with a pressure chamber therein and a delivery nozzle connected with said chamber, supporting means for the delivery pot comprising a pair of opposed trunnions projecting from the forward portion thereof, a pair of opposed guideways extending upward vertically from the melting pot and terminating in a horizontal portion adapted to receive the trunnions, and actuating means for the delivery pot operably connected with the trunnions for moving said trunnions along the guideways to bring the delivery nozzle from the charging position submerged in the metal, to a discharging position above the melting pot.

7. In a die-casting machine in combination with a melting pot adapted to contain molten metal, of a delivery pot provided with a pressure chamber therein and a delivery nozzle connected with said chamber, supporting means for the delivery pot comprising a pair of opposed trunnions projecting from the forward portion thereof, a pair of opposed guideways extending upward vertically from the melting pot and terminating in a horizontal portion adapted to receive the trunnions, and actuating means for the delivery pot comprising rock arms journaled to rock about a fixed axis and having a sliding connection with the trunnions for moving said trunnions along the guideways to bring the delivery nozzle from the charging position submerged in the metal to a discharging position above the melting pot.

8. In a die-casting machine in combination with a melting pot adapted to contain molten metal, of a delivery pot provided with a pressure chamber therein and a delivery nozzle connected with said chamber, supporting means for the delivery pot comprising a pair of opposed trunnions projecting from the forward portion thereof, a pair of opposed guideways extending upward vertically from the melting pot and terminating in a forwardly extending horizontal portion adapted to receive the trunnions, and actuating means for the delivery pot comprising rock arms journaled to rock about a fixed axis arranged in the vertical plane of the forward end of the horizontal portion of said guideways and having a sliding connection with the trunnions for moving said trunnions along the guideways to bring the delivery nozzle from the charging position submerged in the metal to a discharging position above the melting pot.

9. In a die-casting machine in combination with a melting pot adapted to contain molten metal, of a delivery pot provided with a pressure chamber therein and a delivery nozzle connected with said chamber, supporting means connected with the delivery pot for guiding said pot vertically and horizontally of said melting pot in a rectilinear manner, a guide rod connected with the delivery pot to move therewith and mounted to swing about a fixed axis for rocking said delivery pot to bring the delivery nozzle from the charging position within the molten metal to a discharging position above the melting pot, said axis and guide rod being provided with co-operating fluid-conveying means adapted to supply compressed air to the pressure chamber when the delivery pot is in the casting position to discharge the metal from said chamber through the delivery nozzle.

10. In a die-casting machine in combination with a melting pot adapted to contain molten metal, of a delivery pot provided with a pressure chamber therein and a delivery nozzle connected with said chamber, supporting means connected with the delivery pot for guiding said pot vertically and horizontally of said melting pot in a rectilinear manner, a pivoted arm, a guide rod connected at one end with the delivery pot to move therewith and having the other end slidably mounted for longitudinal reciprocative movement in and to swing about the axis of said pivoted arm for rocking said delivery pot to bring the delivery nozzle from the charging position within the molten metal to a discharging position above the melting pot, and metal-ejecting means comprising a fluid passage in said pivoted arm connected with a fluid conduit and a fluid passage in the guide rod in communication with the pressure chamber and adapted, when the delivery pot is in the discharging position, to register with the fluid passage in the pivoted arm for admitting fluid under pressure to the pressure chamber.

11. In a die-casting machine in combination with a melting pot adapted to contain molten metal, of a delivery pot provided with a pressure chamber therein and a delivery nozzle connected with said chamber, supporting means connected with the delivery pot for guiding said pot vertically and horizontally of said melting pot in a rectilinear manner, a rock shaft having a fluid passage connected with a fluid conduit, a rock arm secured to said rock shaft to rock therewith, said arm having a fluid passage in communication with the fluid passage in said rock shaft and a guide rod connected at one end with the delivery pot to move therewith and having the other end slidably mounted for longitudinal reciprocative movement in and to swing about the axis of said pivoted arm for rocking said delivery pot to bring the delivery nozzle from the charging position within the molten metal to a

discharging position above the melting pot, said guide rod having a fluid passage in communication with the pressure chamber and adapted, when the delivery pot is in the discharging position, to register with the fluid passage in the pivoted arm for admitting fluid under pressure to the pressure chamber.

12. In a die-casting machine in combination with a melting pot adapted to contain molten metal, of a delivery pot provided with a pressure chamber therein and a delivery nozzle connected with said chamber, supporting means connected with the delivery pot for guiding said pot vertically and horizontally of said melting pot in a rectilinear manner, a pivoted arm having a fluid passage connected with a fluid conduit, and a guide rod connected at one end with the delivery pot to move therewith and having the other end slidably mounted for longitudinal reciprocative movement in and to swing about the axis of said pivoted arm for rocking said delivery pot to bring the delivery nozzle from the charging position within the molten metal to a discharging position above the melting pot, said guide rod being provided with a fluid passage having the outlet thereof in communication with the pressure chamber and the inlet normally closed and adapted, when the delivery pot is in the discharging position, to communicate with the fluid passage in the pivoted arm for admitting fluid under pressure to the pressure chamber.

13. In a die-casting machine in combination with a melting pot adapted to contain molten metal, of a delivery pot provided with a pressure chamber therein and a delivery nozzle connected with said chamber, supporting means connected with the delivery pot for guiding said pot vertically and horizontally of said melting pot in a rectilinear manner, a guide rod connected with the delivery pot to move therewith and mounted for longitudinal reciprocative movement and to swing about a fixed axis and a fluid conduit adapted to be connected with a source of fluid under pressure, said guide rod being provided with a fluid passage having the outlet thereof in communication with the pressure chamber and the inlet normally closed and adapted, when the delivery pot is in the discharging position, to register with said fluid conduit for admitting fluid under pressure to the pressure chamber.

In witness whereof I have hereunto set my hand this 29th day of October, 1929.

WILLIAM J. DURING.