Jan. 29, 1946. G. L. CHERRY ET AL 2,393,588

DIE CASTING APPARATUS

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FIG. 1

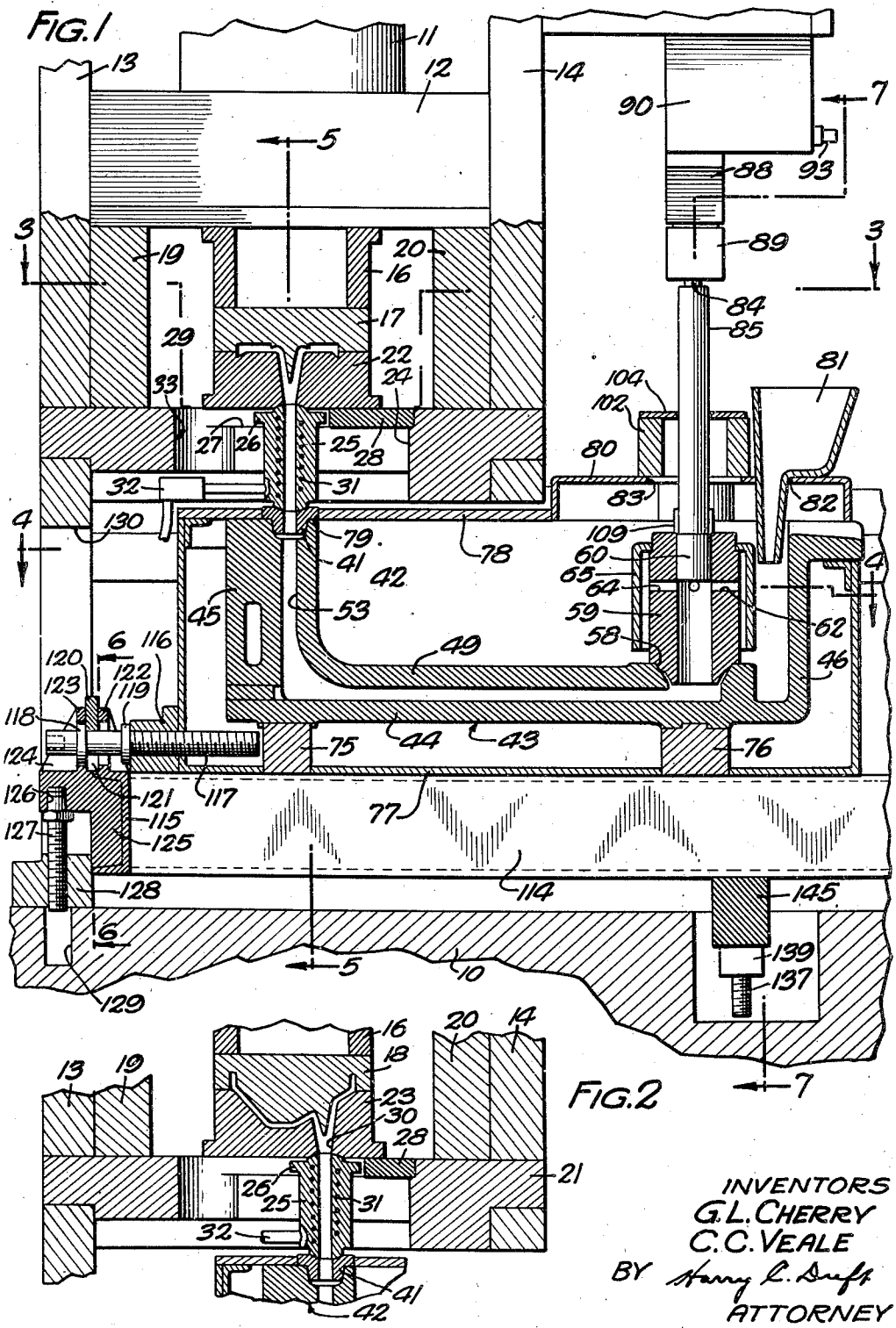


FIG. 2

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FIG. 3

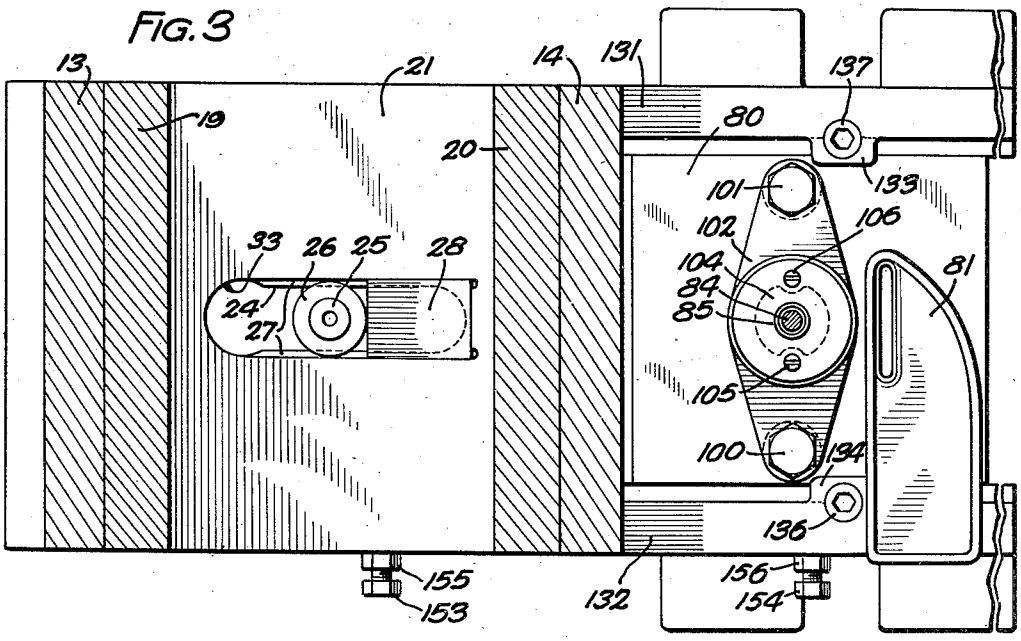
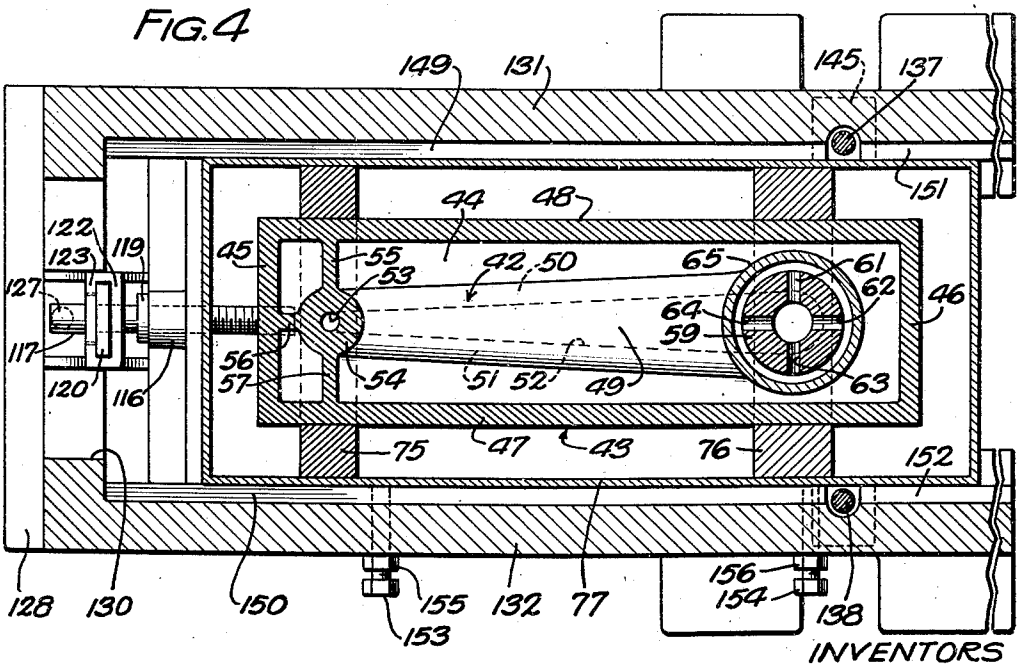


FIG. 4



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FIG. 5

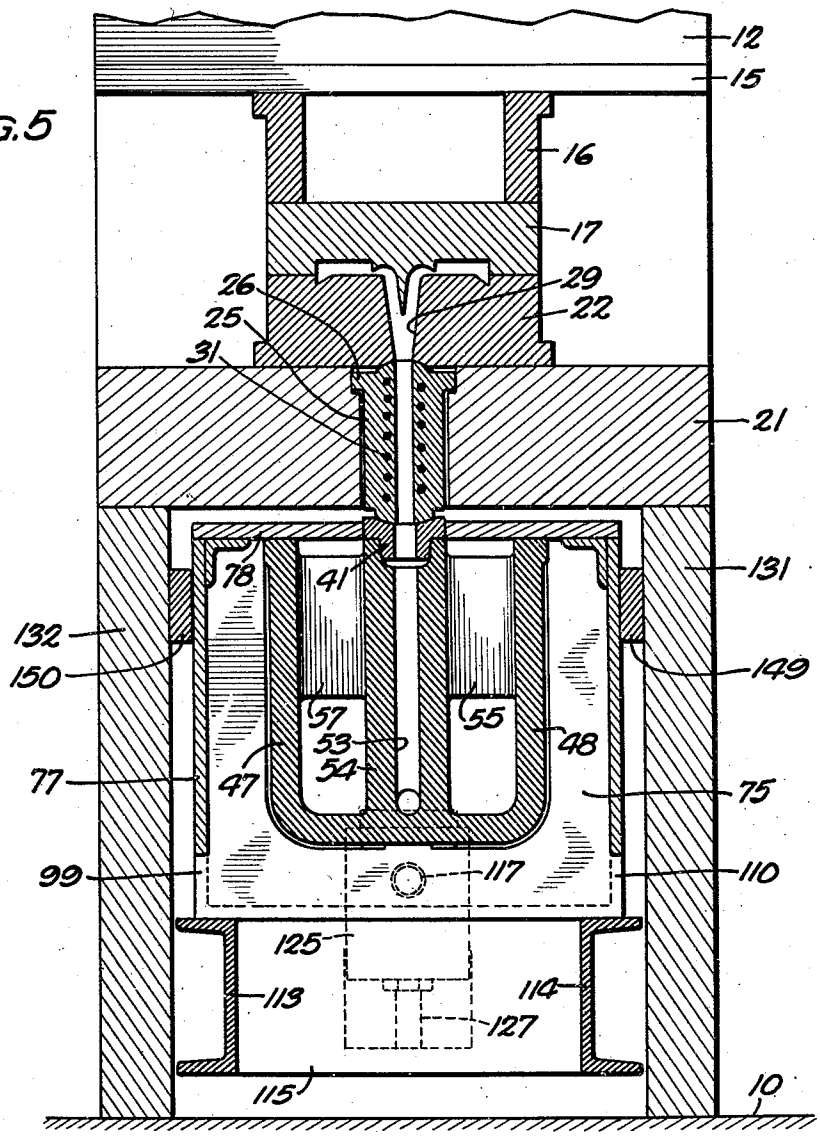
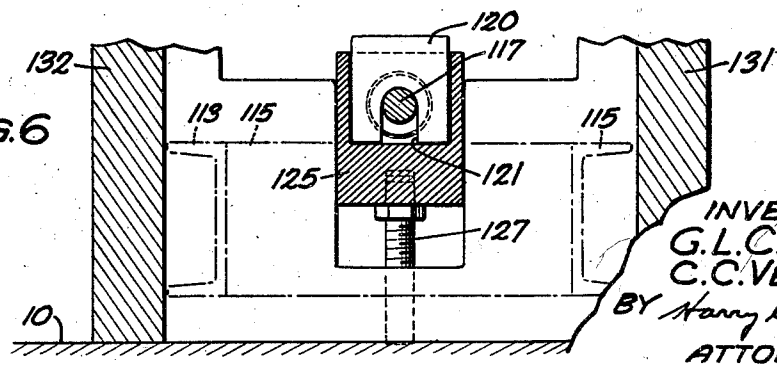


FIG. 6



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DIE CASTING APPARATUS

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FIG. 7

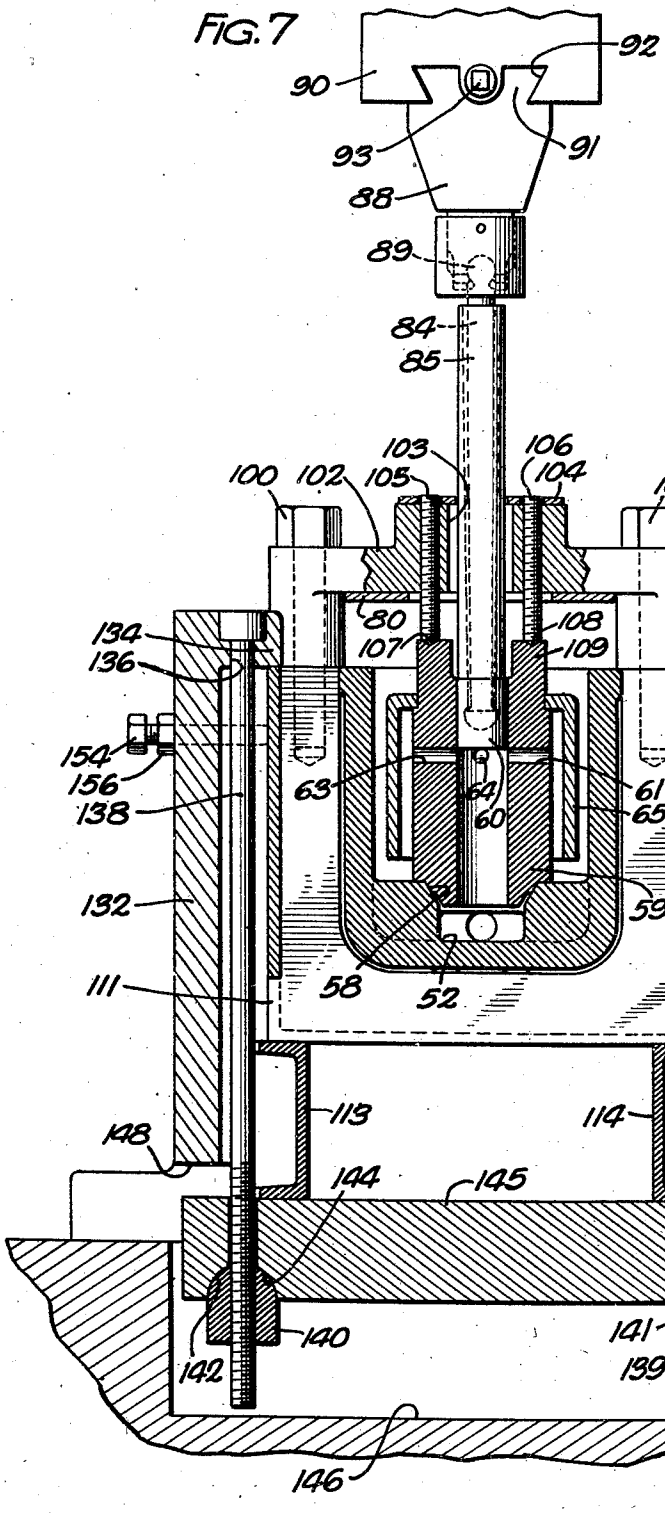
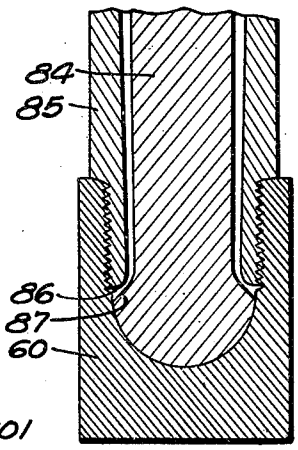


FIG. 8



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Patented Jan. 29, 1946

2,393,588

UNITED STATES PATENT OFFICE

2,393,588

DIE CASTING APPARATUS

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Application August 10, 1943, Serial No. 498,079

6 Claims. (Cl. 22—68)

This invention relates to die casting apparatus and more particularly to a die casting apparatus having an adjustable injecting plunger and melting pot to permit the injection of the die casting material at selected points of the die cavities.

It is an object of the present invention to provide a simple readily adjustable die casting apparatus.

In accordance with one embodiment of the invention, a die casting machine including separable dies is provided with a melting pot, having a built-in gooseneck, wherein the pot may be adjusted transversely of the direction of movement of the dies to permit off-center gating of the die cavities. In this apparatus, the injection plunger is mounted on a cross head so that it may be slid into position to cooperate with an injection cylinder seated in the gooseneck, and a ball and socket connection between the actuating piston for the plunger and the plunger itself permits a limited amount of self-adjustment of the plunger.

A complete understanding of the invention may be had by reference to the following detailed description considered in conjunction with the accompanying drawings, wherein:

Fig. 1 is a front elevational view, partly in section, of a die casting machine embodying the novel features of the invention and showing cooperating dies in place to receive the die casting material at the center of the dies;

Fig. 2 is a fragmentary vertical sectional view showing a pair of dies adapted to be gated off-center;

Fig. 3 is an irregular plan section taken substantially along the line 3—3 of Fig. 1 in the direction of the arrows;

Fig. 4 is another plan section taken substantially along the line 4—4 of Fig. 1 in the direction of the arrows showing some details of the melting pot;

Fig. 5 is a transverse vertical sectional view taken substantially along the line 5—5 of Fig. 1 in the direction of the arrows showing the arrangement of the supports for the melting pot and some details of its built-in gooseneck;

Fig. 6 is a fragmentary vertical sectional view taken substantially along the line 6—6 of Fig. 1 in the direction of the arrows showing some details of the mechanism whereby the melting pot may be adjusted to properly position it beneath whichever type of die is being used;

Fig. 7 is a vertical sectional view taken substantially along the line 7—7 of Fig. 1 in the direction of the arrows showing the injecting or shot plunger and its associated cylinder; and

Fig. 8 is a fragmentary detail sectional view through the juncture of the plunger actuating rod and the piston.

Referring to the drawings, it will be seen that the apparatus is designed to be mounted upon a base 10. The die supporting and actuating mechanisms are not shown in detail herein since they form no part of the invention, it being sufficient to state that the various portions of the dies and their actuating mechanism are supported in position to permit reciprocation of a piston rod 11 having suitably fixed thereto a cross head 12. The cross head 12 is slidable between a pair of upright members 13 and 14 and carries a plate 15 on its lower surface, to which a die holder 16 may be suitably attached. There may be fixed to the underside of the die holder, in any suitable manner, either an upper die 17 (Fig. 1) or an upper die 18, as shown in Fig. 2. Cross members 19 and 20 mounted upon a bolster 21 serve to limit the downward movement of the plate 15 so that it will properly register either the die 17 or the die 18 with cooperating lower dies 22 or 23, respectively.

As shown most clearly in Fig. 3, the bolster 21 has an irregularly shaped aperture 24 formed in it, through which a nozzle 25 may extend. The nozzle 25 has an annular shoulder 26 formed on it, which is of a diameter such that its outer periphery engages the upper edges of the aperture 24, which has a shoulder 27 formed on it. A spacer plate 28 may be set into the aperture 24, resting on the shoulder 27, and will serve to properly position the nozzle 25 in alignment with an entrance aperture 29 of the lower die 22 or with an entrance aperture 30 of lower die 23, it being understood that plates 28 of different sizes may be used to locate the nozzle 25 at different positions, depending upon the position of the entrance aperture or gate in the lower die member. The nozzle 25 is provided with a heating element 31, connected by suitable conduit 32 to a source of current, whereby the nozzle may be maintained at such a temperature as to prevent freezing of the die casting metal in the nozzle. At the left end of the irregularly shaped aperture 24, the shoulder 27 is cut away to provide a partially circular entrance hole 33 (Fig. 3), through which the nozzle 25 may be readily inserted or removed.

The bolster 21 is set into the upright members 13 and 14 and will position the nozzle 25 in alignment with a suitable spacer element 41, which serves to interconnect the lower end of the nozzle with a gooseneck designated generally by the numeral 42. As may be seen most clearly by reference to Figs. 1, 4 and 5, the gooseneck 42 is formed integrally with a melting pot 43, which comprises a base portion 44, a left end portion 45, a right end portion 46, and side portion 47 and 48. The base portion 44 of the melting pot forms the bottom wall of the gooseneck 42, an upper wall 49 thereof tapering from right to left, as seen most clearly in Fig. 4, to cooperate with

side walls 50 and 51 of the gooseneck to define a passage 52 which becomes smaller from right to left and terminates in an upwardly extending passage 53. The upwardly extending passage 53 is in communication with the spacer element 41 and is defined by a tubular portion 54, from which flanges 55, 56 and 57 extend to the side portion 48, left end portion 45 and side portion 47, respectively, of the melting pot 43. The passage 52, at its right end, terminates in a seat 58 adapted to receive the lower nesting end of a cylinder 59, in which a shot plunger 60 may be reciprocated. The cylinder 59 is provided with four entrance apertures 61, 62, 63 and 64, through which molten die casting metal may flow to the interior of the cylinder. In order to prevent undue agitation of the molten metal in the melting pot and to keep dross from entering the cylinder 58, the cylinder has a skirt 65 mounted on it which extends down to a point close to the upper surface of the gooseneck and well beyond the lower edges of the entrance apertures 61, 62, 63 and 64.

The melting pot 43 is mounted in a pair of yokes 75 and 76 (Figs. 4, 5 and 7), which serve to support it within a casing 77, which has a cover plate 78 suitably supported thereon and extending substantially half-way from the left end of the casing to the right end thereof, a suitable aperture 79 being formed in the cover plate 78 to receive the spacer element 41. The right end of the melting pot has a cover plate 80 mounted thereon, into which a pouring funnel 81 may be inserted through an aperture 82 formed in the plate 80. In addition to the aperture 82 for receiving the funnel 81, the cover plate 80 has an aperture 83 formed therein through which an actuator rod 84 and the shot plunger 60 may extend. The actuator rod 84, as seen most clearly in Figs. 7 and 8, is surrounded by a sleeve 85, which is threaded into the shot plunger 60 and carries its lower edge 86 in the path of an annular shoulder or ball 87 formed on the actuator rod 84, so that when the rod 84 is moved upwardly, the shoulder 87 will engage the lower edge 86 of the sleeve 85 and due to the threaded engagement of the sleeve 85 with the shot plunger 60, the shot plunger will be moved upwardly with the actuator rod 84. However, a limited amount of play is thus provided whereby, if the actuator rod is not in exact alignment with the shot plunger 60, there will be no tendency for the plunger to bind in the cylinder 59.

At its upper end, the actuator rod 84 is interconnected with a piston rod 88 by means of a ball and socket joint 89 and the piston rod 88 is, in turn, interconnected with an actuator head 90 adapted to be driven by any suitable mechanical or hydraulic driving means, which will impart reciprocation to it. The means for interconnecting the piston rod 88 with the actuator head 90 comprises a dove-tail 91 slidable in ways 92. In this manner, the piston rod 88 may be shifted from left to right (Fig. 1) to the desired position, depending upon the position of the nozzle 25, so that the shot plunger 60 will be in alignment with the cylinder 59 as closely as possible, the ball and socket joint 89 and the construction of the lower end of the actuator rod 84 compensating for any slight misalignment of these parts. The mechanism for adjusting the position of the piston rod 88 may comprise any suitable adjusting mechanism, for example, an adjusting screw 93.

Fixed to the upper surfaces of the yoke 76 by means of machine screws 100 and 101 (Fig. 7), is a cross yoke 102 having a central aperture 103 through which the sleeve 85 extends. A cover plate 104, which also encircles the sleeve 85, closes substantially all of the aperture 103 and prevents any possible splashing of metal out through the top of the yoke. The cross yoke 102 has a pair of set screws 105 and 106 threaded in it adapted to engage depressions 107 and 108, respectively, formed in an upstanding collar 109 of the cylinder 59, whereby the cylinder will be forced into the seat 58 to seal the cylinder into the seat. The yoke 75 has a pair of projecting shoulders 109 and 110 and the yoke 76 has a pair of similar projecting shoulders 111 and 112, which extend through the casing 77 to lock the yoke and casing together. Any suitable heating means (not shown) may be provided within the casing 77 for heating the melting pot 43. A preferred form of heating means may comprise electrical heating units (not shown) imbedded in the walls of the melting pot 43 and connected to a suitable source of power.

The entire melting pot 43 and the casing 77 are supported by a pair of channel members 113 and 114, which are joined together at their left end (Fig. 1) by a cross channel member 115. The casing 77 is not fixed to channel members 113 and 114, but is slidable with respect thereto, being provided at its left end (Fig. 1) with a threaded member 116, which is attached to the casing and which is adapted to receive the threaded portion of an adjusting screw 117. The screw 117 is provided with a pair of shoulders 118 and 119, either one of which may cooperate with a removable abutment member 120. As shown most clearly in Figs. 1 and 5, the abutment member 120 has a slot 121 formed in it to receive a reduced portion of the adjusting screw 117 between the shoulders 118 and 119. This abutment member is adapted to be positioned between walls 122 and 123 of a double-walled bracket 124, which is, in turn, attached to a support block 125. The support block 125 extends into the channel of the channel member 115 and is suitably attached thereto whereby when the adjustment screw 117 is rotated, the shoulder 118 or shoulder 119 thereon will engage with the abutment member 120 if it is in the position shown in Figs. 1 and 6, and, accordingly, the entire assembly including the melting pot 43 and casing 77 may be moved to the right or left along the channels 113 and 114, thus to properly position the nozzle 25 with respect to the lower die being used in the apparatus. The amount of travel of the melting pot assembly to accommodate the gates or entrance apertures of the dies is not very great, but the adjustment member 117 is adapted, when rotated, to impart sufficient movement to the melting pot assembly to facilitate its removal or insertion in the apparatus, the removable abutment member 120 being provided so that the adjustment screw 117 may be removed after an appreciable amount of movement has been imparted to the melting pot assembly so that the ends of the threads of the adjustment screw 117 will not be stripped when the melting pot is being removed.

The support block 125, in addition to supporting the double-walled bracket 144, has a socket 126 formed in it to receive the upwardly extending end of a vertical adjustment screw 127, which is threaded into a base block 128 mounted on the base 10, which is, in turn, provided with a clearance hole 129 to receive the vertical adjustment screw 127. In placing the melting pot in

position with respect to a die, the pot may be adjusted in a horizontal plane by means of the adjustment screw 117 to bring the spacer element 41 into alignment with the nozzle 25 and, thereafter, the left end of the melting pot assembly may be elevated by manipulating the adjustment screw 127.

The lefthand upright member 13 extends down to the base 10, being cut out as shown at 130 to permit access to the adjustment screws 117 and 127. However, the righthand upright member 14 is supported on a pair of side walls 131 and 132, which constitute a housing for the melting pot assembly 43 and casing 77, which are provided with inwardly extending lugs 133 and 134, respectively (Fig. 7). Shouldered apertures 135 and 136 are formed in the lugs 133 and 134 to receive the heads and shanks of support bolts 137 and 138, respectively. The bolts 137 and 138 extend downwardly beneath the channel members 113 and 114 and are threaded into threaded members 139 and 140, respectively, which are provided with rounded upper ends 141 and 142 adapted to nest in pockets 143 and 144, respectively, in a cross bar 145. The cross bar 145 extends beneath the two angle members 113 and 114 and it is believed to be apparent that by manipulation of the bolts 137 and 138, the position of the right end of the melting pot assembly may be suitably adjusted. The base 10 is cut out as shown at 146 (Figs. 1 and 7) to receive the cross bar 145 and the walls 131 and 132 are cut out as shown at 147 and 148 to permit adjustment of the right end of the melting pot assembly by moving the cross bar 145. In order to prevent the casing 77 from contacting the walls 131 and 132, spacer members 149, 150, 151 and 152 are attached to the side walls 131 and 132 to guide the casing 77 in its movement with respect to the walls 131 and 132. After the melting pot assembly, including the casing 77, has been properly adjusted, set screws 153 and 154 may be engaged with the casing 77 and locked in place by lock nuts 155 and 156 to hold the melting pot 43 and casing 77 rigid with respect to the rest of the apparatus.

What is claimed is:

1. In a die casting machine, a melting pot having a gooseneck formed therein, an adjustable casting for supporting said melting pot in a selected position, an injection cylinder for cooperating with said gooseneck, an ejector plunger to cooperate with said cylinder, a movable actuator head for actuating said plunger, a piston rod mounted on said head and adjustable transversely of the path of movement of the head, and a self-aligning means interconnecting the plunger and piston rod.

2. In a die casting apparatus, an injecting nozzle adjustable to cooperate with different die apertures, a melting pot and associated gooseneck adjustable as a unit to feed molten metal to the nozzle, a shot plunger shiftable to position to cooperate with the gooseneck, a channel iron framework for slidably supporting the melting pot, means for raising and lowering the framework to move the gooseneck into and out of association with the nozzle, and means for adjusting the relative position of the melting pot with respect to the framework.

3. In a die casting apparatus, separable dies, one of which has a vertically disposed entrance aperture, a nozzle positionable to direct molten metal vertically into said aperture, a melting pot having an integrally formed gooseneck, a shot cylinder nesting in an end of the gooseneck, a shot plunger cooperating with said cylinder, means for adjusting the plunger to align it with the cylinder, and means for aligning the gooseneck with the nozzle, including a framework positioned beneath the melting pot for supporting it, means for sliding the melting pot longitudinally of the framework, and means for raising and lowering the framework.

4. In a die casting apparatus, separable dies, one of which has a vertically disposed entrance aperture, a nozzle positionable to direct molten metal vertically into said aperture, a melting pot having an integrally formed gooseneck, a shot cylinder nesting in an end of the gooseneck, a shot plunger cooperating with said cylinder, means for adjusting the plunger to align it with the cylinder, and means for aligning the gooseneck with the nozzle, including a framework positioned beneath the melting pot for supporting it, means for sliding the melting pot longitudinally of the framework, and means for raising and lowering the framework, said means for moving the melting pot longitudinally of the framework comprising an adjusting screw having abutment engaging shoulders formed thereon and a removable abutment engageable with a portion of the framework.

5. In a die casting apparatus, separable dies, one of which has a vertically disposed entrance aperture, a nozzle positionable to direct molten metal vertically into said aperture, a melting pot having an integrally formed gooseneck, a shot cylinder nesting in an end of the gooseneck, a shot plunger cooperating with said cylinder, means for adjusting the plunger to align it with the cylinder, and means for aligning the gooseneck with the nozzle, including a framework positioned beneath the melting pot for supporting it, means for sliding the melting pot longitudinally of the framework, and means for raising and lowering the framework, said means for raising and lowering the melting pot comprising a pair of side walls disposed alongside the melting pot, a crossbar positioned beneath and supporting said framework, and a pair of support plates mounted in said side walls for raising and lowering the crossbar.

6. In a die casting apparatus, separable dies, one of which has a vertically disposed entrance aperture, a nozzle positionable to direct molten metal vertically into said aperture, a melting pot having an integrally formed gooseneck, a shot cylinder nesting in an end of the gooseneck, a shot plunger cooperating with said cylinder, means for adjusting the plunger to align it with the cylinder, and means for aligning the gooseneck with the nozzle, including a framework positioned beneath the melting pot for supporting it, means for sliding the melting pot longitudinally of the framework, and means for raising and lowering the framework, said means for raising and lowering the melting pot comprising a pair of side walls disposed alongside the melting pot, a crossbar positioned beneath and supporting said framework, and a pair of support plates mounted in said side walls for raising and lowering the crossbar to raise one end of the melting pot, and a bracket mounted on the other end of the framework and supported from a threaded base block by means of an adjusting screw.

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