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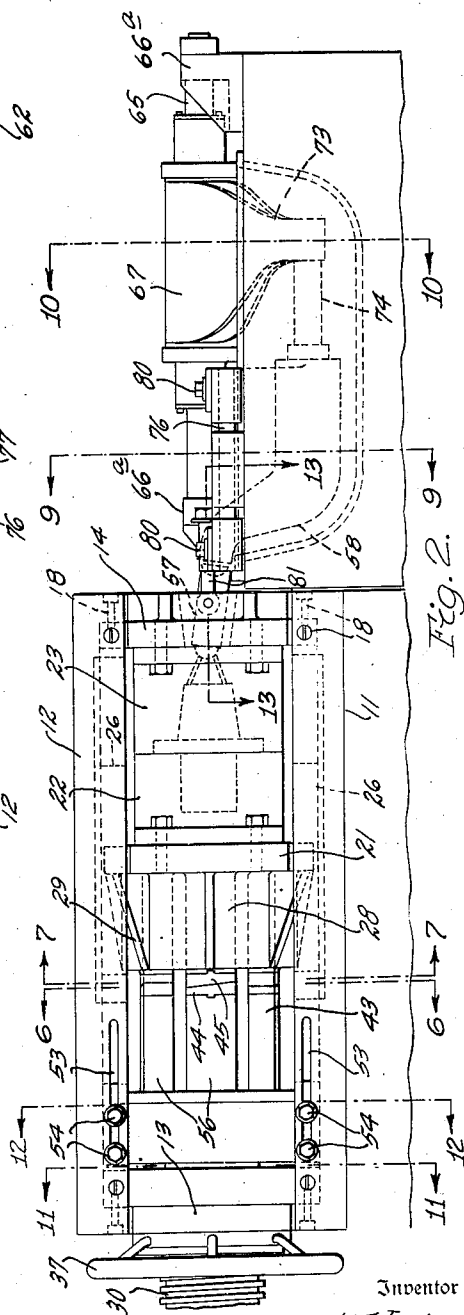
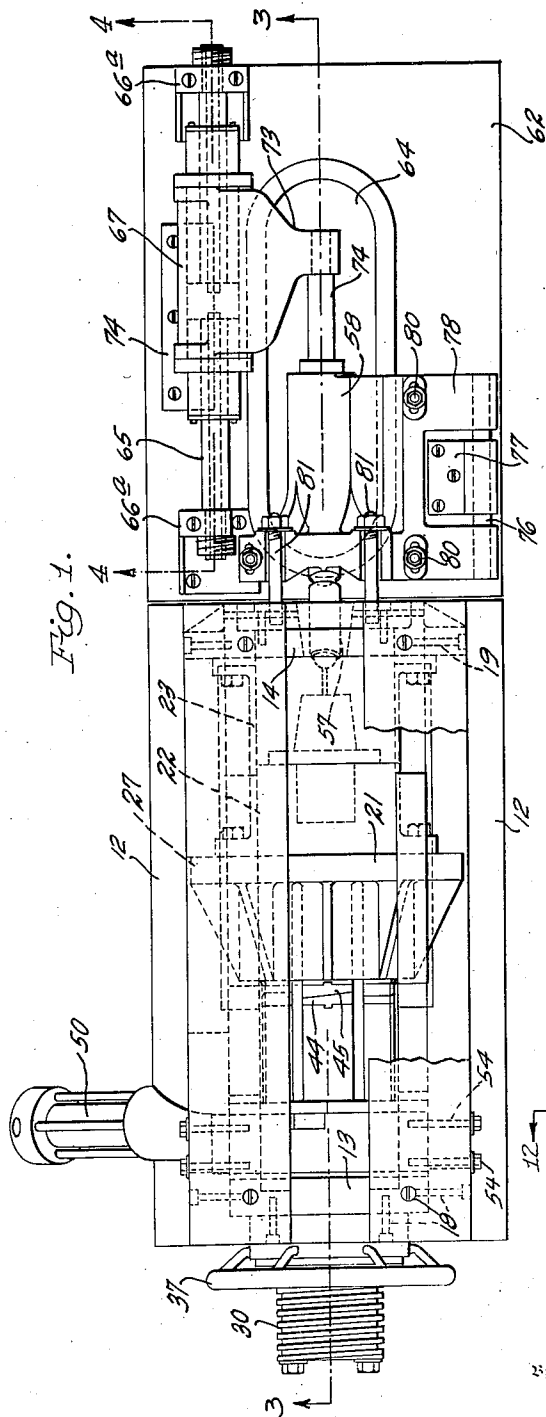
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2,268,949

DIE CASTING MACHINE

Filed Oct. 23, 1939

5 Sheets-Sheet 1



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Jan. 6, 1942.

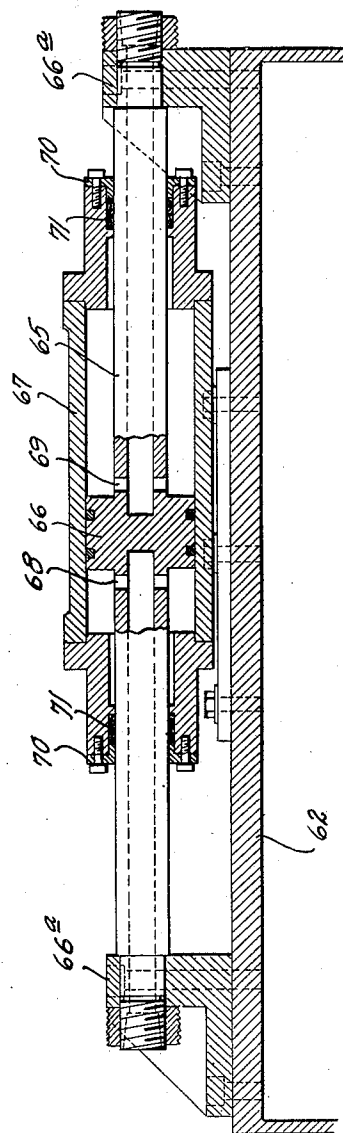
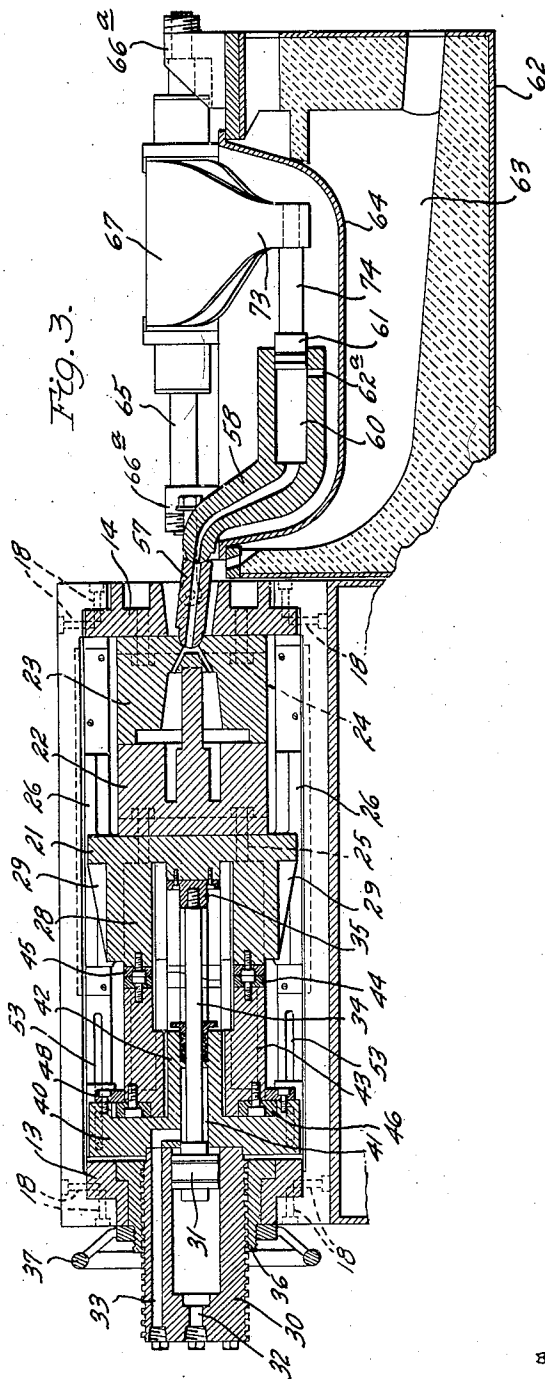
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DIE CASTING MACHINE

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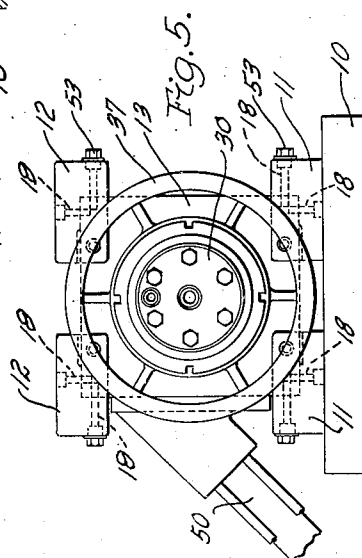
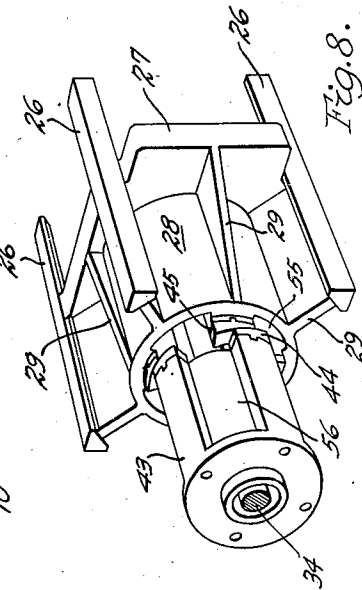
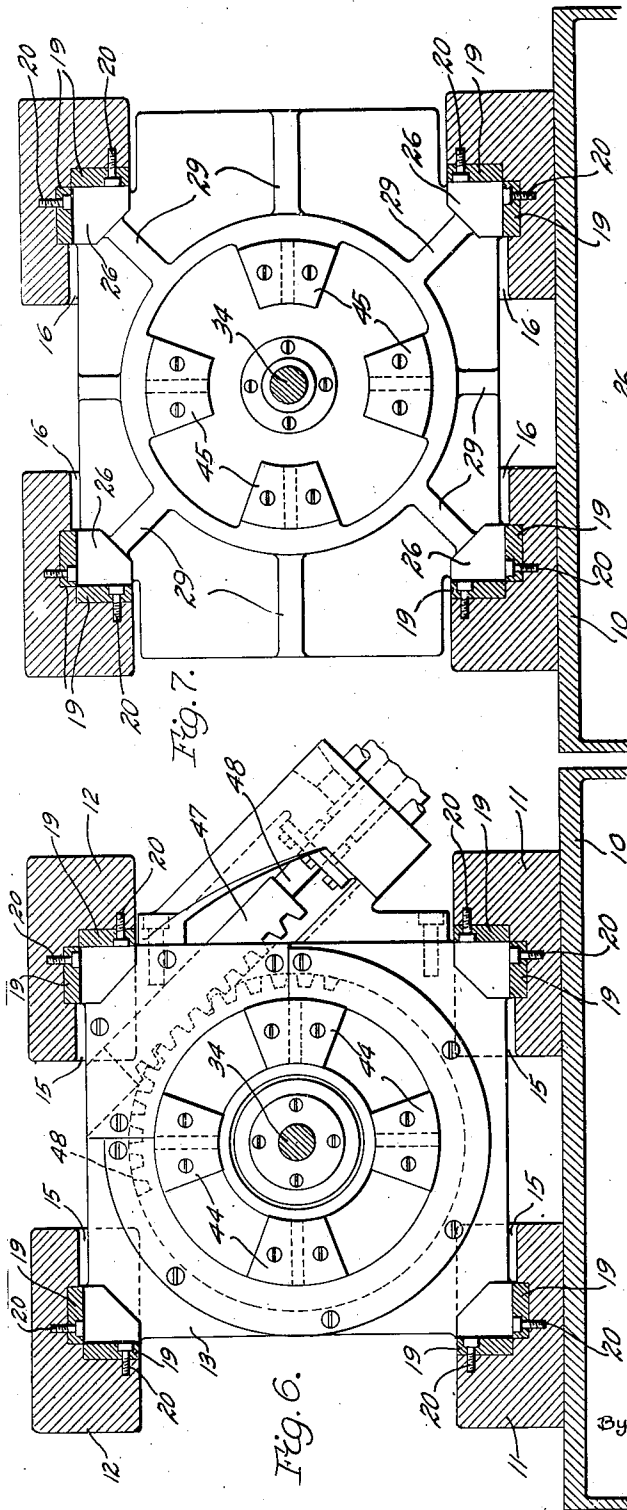
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DIE CASTING MACHINE

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5 Sheets-Sheet 3



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DIE CASTING MACHINE

Filed Oct. 23, 1939

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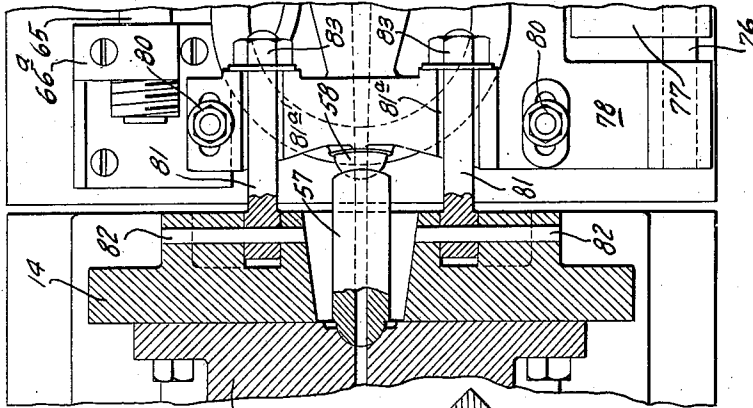


Fig. 13.

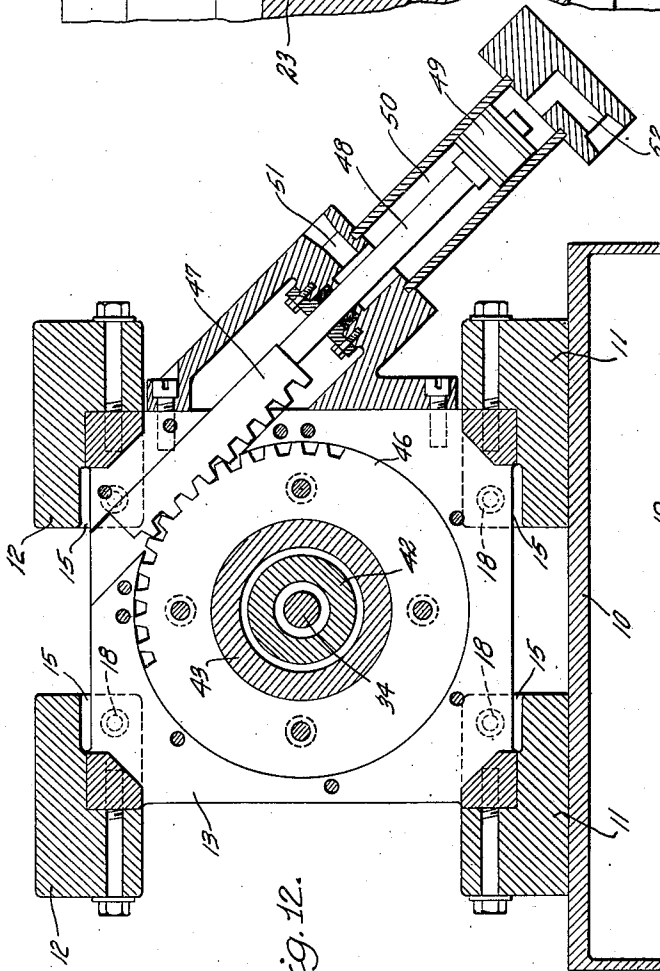
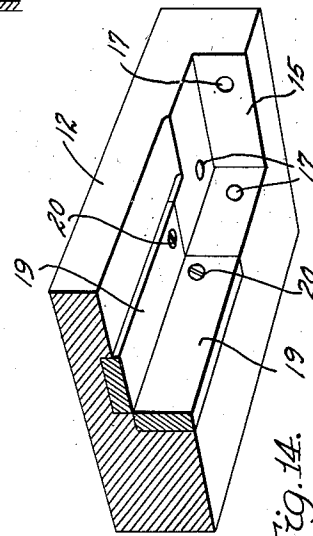


Fig. 12.



UNITED STATES PATENT OFFICE

2,268,949

DIE CASTING MACHINE

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Application October 23, 1939, Serial No. 300,742

7 Claims. (Cl. 22—92)

This invention relates generally to die casting and molding machines.

It is an object of the present invention to provide a new and improved die casting and molding machine of a structural character such that substantially perfect castings may be made.

Another object of the invention is to provide a new and improved die casting and molding machine in which a pair of separable dies are positively held against separation during the casting operation.

A further object of the invention is to provide a die casting and molding machine of new and improved construction to withstand the stresses and strains accompanying operation of such machines.

A still further object of the invention is to provide a die casting and molding machine having a supply of liquid casting material in which automatic die charging apparatus is disposed and arranged to be moved out of the supply between extended periods of operation to avoid damage to the charging apparatus by contraction and expansion of the casting material.

Other objects of the invention will become apparent from the following detailed description taken with the accompanying five (5) sheets of drawings in which—

Figure 1 is a top plan view of a die casting machine embodying features of my invention;

Figure 2 is a side view shown in elevation of the die casting machine;

Figure 3 is a view shown in section taken longitudinally of the machine along the line and in the direction of the arrows 3—3 of Fig. 1;

Figure 4 is a view shown in section taken longitudinally of the machine along the line and in the direction of the arrows 4—4 of Fig. 1;

Fig. 5 is an end view of the machine looking from left to right of Fig. 2;

Fig. 6 is a view shown in cross section of the machine, taken along the line and in the direction of the arrows 6—6 of Fig. 2;

Fig. 7 is a view similar to Fig. 6 but taken along the line and in the direction of the arrows 7—7 of Fig. 2;

Fig. 8 is a perspective view of certain cooperating parts of the machine;

Fig. 9 is a view of the machine shown partly in elevation and partly in cross section, taken along the line and in the direction of the arrows 9—9 of Fig. 2;

Fig. 10 is a fragmentary view of the machine shown in cross section, taken along the line and in the direction of the arrows 10—10 of Fig. 2;

Fig. 11 is a view of the machine shown in cross section, taken along the line and in the direction of the arrows 11—11 of Fig. 2;

Fig. 12 is a view of the machine shown in cross section, taken along the line and in the direction of the arrows 12—12 of Fig. 2;

Fig. 13 is a fragmentary top plan view of the machine shown partly in section, taken along the line and in the direction of the arrows 13—13 of Fig. 2, and

Fig. 14 is a perspective view shown partly in section of a part of the machine.

Referring to the drawings by characters of reference, the die casting machine includes a base 10 on which is mounted a rigid frame comprising a pair of spaced, parallel, lower side members or rails 11, a pair of spaced, upper, parallel side members or rails 12 and opposite end walls 13 and 14. The upper rails 12 overlie and are parallel with the lower rails 11 and both pair of rails are preferably rectangular in shape. The end walls 13, 14 seat on the lower rails and support the upper rails. Along their respective upper and lower inner edges the rails 11 and 12 are recessed, these recesses terminating adjacent the opposite ends of the rails to provide shoulders or seating surfaces 15, 16 for the end walls 13, 14 respectively so that strain caused by casting operations will be taken longitudinally of and by the rails. The rails 11, 12, adjacent their opposite ends may be provided with apertures 17, Fig. 14 to align with apertures in the end walls 13, 14 to receive bolts 18 to secure the parts together but, it will be seen that the rails 11 and 12 because of the shoulders 15, 16 take the longitudinal strains and that the bolts 18 are not under shearing stresses.

The recessed rails together provide a guide or slideway and the walls of these recesses are further recessed to receive hardened metallic strips 19 which may be secured to the rails by screws 20. On these hardened slideways, a die carrier member 21 is slidably supported and carries a die member 22 cooperable with a fixed die member 23, the die 23 being rigidly secured to the frame end wall 14 by screws or bolts 24. The movable die 22 may be rigidly secured to its carrier 21 by screws 25 or by other suitable means. This carrier member 21, Fig. 8, comprises four slide rails 26 joined by a vertical wall 27 to which the die member 22 is secured and integral with the wall 27, a tubular portion 28 extending centrally between and longitudinally of the rails 26 is reinforced and joined to the wall 27 by radially spaced webs 29.

Any suitable power means may be employed to move the die member 22 to open and close the die and in the present instance, hydraulic power means is employed. This hydraulic power means comprises a cylinder member 30 mounted in the frame end wall 13 and a piston 31, the cylinder member 30 being provided with passages 32 and 33 to effect hydraulic action on opposite sides of the piston. A push rod 34 having one end secured to the piston 31 has its other end secured to the die carrier member 21, the rod 34 extending centrally through the carrier tubular portion 28 and being screwthreaded into a detachable member 35 which may be secured by screws or by other suitable means to the end wall 23 of the die carrier. The cylinder member 30 is screwthreaded into an internally threaded member 36 which is rotatably mounted in the end wall 13 and is rotatable by a hand wheel 37. This provides an adjustment to compensate for dies of different depth or thickness.

Slidably mounted in and adjustable along the frame slideways, is a cam carrier or supporting member 40 which is of general cylindrical shape having a central bore 41 through which the piston push rod 34 extends and is freely reciprocal. In its rear surface, the carrier member 40 is recessed to receive the inner end of the adjustable cylinder 30, rotation of which adjusts the position of carrier 40 along the slideways. The member 40 is provided with a reduced tubular portion 42 on which is rotatably mounted a tubular member 43 on one end of which is secured radially spaced cam members 44 providing together an interrupted but inclined cam surface cooperable with an interrupted cam surface on similar cam members 45 which are secured to the rear end of the die carrier 21, this cam action being provided to close the die tightly and to hold it tightly closed during the casting operation. Rigidly secured to the rear end of the rotatable cam carrier member 43, a gear 46 in mesh with a movable rack 47 provides for rotation of member 43 to close the die tightly and the gear 46 and member 43 are held to the guide and carrier member 40 by a retaining ring 48.

As shown more clearly in Fig. 12, the rack 47 is preferably operated hydraulically and to this end is provided with a push rod 48 on the end of which a piston 49 reciprocates in a cylinder 50 having fluid passages 51, 52 leading into the cylinder on opposite sides of the piston. In the frame rails 11 and 12, slots 53 extending longitudinally thereof are provided to receive bolts 54 for retaining the carrier member 40 in the desired position of adjustment. Carriers 28 and 43 are adapted to telescope, member 28 being provided with longitudinal internal slots 55 and member 43 being provided with external slots 56 so that member 28 may slide over member 43 when the parts are properly aligned, see Fig. 8. These slotted members 28, 43 result in the cooperating cam surfaces on their opposed ends being interrupted, as previously mentioned, the cooperating cam members 44, 45 being radially spaced between the slots and being hardened and rigidly secured to respective ends of the members 43, 28 by screws or by other suitable means.

Through the end wall of the fixed die 23 and through the adjacent frame end wall 14 are aligning apertures to receive a nozzle 57 for introducing or charging the die with metal for casting. Metal is introduced preferably hydraulically into the nozzle 57 by a second and

removable nozzle 58 having a body provided with a cylinder 60 containing a piston 61. The die charging mechanism is mounted on a base 62 having a drainage sump 63 for excess metal and positioned in the drainage sump 63 is a second and removable sump 64 wherein a quantity of liquid metal is kept in which the nozzle 58 is submerged. The metal in the sump or reservoir 64 automatically fills the cylinder 60 of the nozzle 58 when the piston 61 is retracted such that it opens a submerged inlet passage 62a leading into the cylinder. A burner (not shown) may be provided in the sump 63 below the sump 64 to keep the metal therein in a liquid state and at the proper temperature for casting.

The die charging mechanism is preferably hydraulically operated and to this end includes an open ended fluid tube 65 which is mounted on brackets 66a which are rigidly but removably secured to the top of the base 62. Intermediate its ends, the tube 65 is provided with an enlarged portion or what may be termed a fixed piston 66 which is enclosed in a cylinder 67 adapted to move longitudinally of the tube. The tube 65 is provided on opposite sides of the piston portion 66 with outlets 68 and 69. The opposite ends of the cylinder are closed by cap members 70 which slidably receive the tube 65 and compress sealing material 71 to provide fluid tight sliding joints. The cylinder 67 is provided with a laterally and downwardly extending rigid arm 73 which extends down into the sump 64 and to which is rigidly secured a push rod 74 to which the piston 61 is rigidly secured. Secured on the top of the base 62, Fig. 10, an adjustable plate 74 cooperates with a downwardly directed extended portion 75 of the cylinder 67 to limit downward swinging movement of the cylinder 67 about the tube 65.

On the opposite side of the sump from the hydraulic actuator, the nozzle 58 is pivoted on a shaft 76 which is hinged mounted on top of the base 62 by a bracket 77. Normally, the hinge, as at 78, of the nozzle 58 is rigidly secured to the base 62 by bolts 80 to retain the nozzle rigidly in place in the sump during casting operations. Also, the nozzle 58 is held with its outlet end tightly against the inlet end of the fixed nozzle 57 by a pair of spaced parallel bolts 81 which have their inner ends pivoted on shafts 82 mounted in aligned bores which extend through the frame end wall 14 transverse of the machine. The bolts 81 position in upwardly facing semi-cylindrical bores 81a in the nozzle body and the free ends of the bolts are threaded to receive nuts 83 which may be tightened down against washers to urge and hold the nozzle 58 against the fixed nozzle member 57. This arrangement provides for easy and ready removal of the nozzle and associated parts out of the metal in the sump so that they will not be subjected to stresses and strains to which they would otherwise be subjected by and when the metal is permitted to cool and harden. To remove the nozzle member 58 it is only necessary to loosen bolts 81 and remove bolts 80 after which the nozzle may be swung upward out of the sump about the shaft 76. Also, after withdrawing the piston 61 from its cylinder 60, arm 73 of the hydraulic actuator may be swung upwardly about the tube 65 out of the sump.

In operation, assuming the die to be closed, suitable well known control means (not shown) establishes communication between the cylinder 67 through passage 68 and a source of fluid un-

der pressure which causes the cylinder 67 to move along tube 65 toward the die. This moves the piston 61 inwardly, displacing the liquid metal in its cylinder, causing the metal to flow through nozzle 57 into the die. After the cast has been made the die is opened hydraulically by first bringing fluid pressure to bear on the inner end of the piston 49, retracting the rack 47 and rotating gear 46 and cam carrier member 43 until the splines thereon coincide with the recesses 55 of the die carrier member tubular portion 28. When this occurs, the cooperating cam members will, of course, be disengaged and the die carrier member is free to slide or telescope over the cam carrier 43. Opening movement of the die is obtained by introducing fluid under pressure through passage 33 into the cylinder 31 wherein the pressure will act to retract piston 31, and through the connecting rod 34 move the die member 22 and its carrier 20 to open position away from the fixed die member 23 after which the finished casting may be removed. On closing the die, fluid pressure acts on piston 31 to move the die to closed position after which fluid pressure acting through the rack 47 and gear 46 rotates member 43 and the cooperating cam members 44 and 45 tightly close the die and hold it against any slight opening movement during the casting operation so that substantially perfect castings may be made.

While I have shown and described my invention in detail it is to be understood that the same is to be limited only by the appended claims for many changes may be made without departing from the spirit and scope of the invention.

What I claim is:

1. In a die casting machine, a frame having a slideway, a die member secured to said frame, a carrier member slidably mounted in said slideway, a die member carried by said carrier member and movable therewith toward and away from said first-named die member, said second-named die member having a closed position cooperable with said first-named die member, said carrier member having a tubular portion provided on one end thereof with cam means, a rotatable tubular member supported by said frame and having cam means on one end thereof, said cam means upon rotation of said tubular member in one direction cooperating with said first-named cam means for releasably locking said second-named die member in closed position, said rotatable member upon rotation in the opposite direction disengaging said first-named cam means and said second-named cam means and fitting into said carrier member upon movement thereof to move said second-named die member to open position, means to rotate said rotatable member, and means to move said carrier member.

2. In a die casting machine, a frame having a slideway, a die member secured to said frame, a carrier member slidably mounted in said slideway, a die member carried by said carrier member and movable therewith toward and away from said first-named die member, said second-named die member having a closed position cooperable with said first-named die member, said carrier member having a tubular portion provided on one end thereof with cam means, a rotatable tubular member carried by said frame and having cam means on one end thereof, said second-named cam means upon rotation of said tubular member in one direction cooperating with said first-named cam means for releasably

locking said second-named die member in closed position, said rotatable member upon rotation in the opposite direction disengaging said first-named cam means and said second-named cam means and fitting into said carrier member upon movement thereof to move said second-named die member to open position, means to rotate said rotatable member, means to move said carrier member, and means extending through said rotatable member and operatively connecting said carrier member and the carrier moving means.

3. In a die casting machine, a plurality of spaced parallel rails recessed to provide a slideway and having inwardly facing end abutment shoulders, opposite end walls abutting said shoulders, a die member secured to one of said end walls, a carrier member slidably guided by said slideway, a die member carried by said carrier member and cooperable with said first-named die member, said second-named die member being movable between open and closed positions with respect to said first-named die member, a second carrier member slidably adjustable along said slideway, a rotatable member carried by and rotatable relative to said second-named carrier member, cam means carried by said first-named carrier member, cam means carried by said rotatable member and cooperable with said first-named cam means upon rotation of said rotatable member in one direction to hold said second-named die member in closed position.

4. In a die casting machine, a plurality of spaced parallel rails recessed to provide a slideway and having inwardly facing end abutment shoulders, opposite end walls abutting said shoulders, a die member secured to one of said end walls, a carrier member slidably guided by said slideway, a die member carried by said carrier member and cooperable with said first-named die member, said second-named die member being movable between open and closed positions with respect to said first-named die member, a second carrier member slidably adjustable along said slideway, a rotatable member carried by and rotatable relative to said second-named carrier member, cam means carried by said first-named carrier member, cam means carried by said rotatable member and cooperable with said first-named cam means upon rotation of said rotatable member in one direction to hold said second-named die member in closed position, and adjustment means mounted in the other end wall and operable to adjust the position of said second-named carrier member.

5. In a machine of the character described, a frame including a plurality of spaced longitudinally-extending rails positioned to provide a slideway and opposite end members mounted on said frame, a die member secured to one of said end members, a carrier member slidably guided by said slideway, a die member carried by said carrier member and cooperable with said first-named die member, a second carrier member slidably adjustable along said slideway, a rotatable member carried by said second-named carrier member, and means on said first-named carrier member and on said second-named carrier member cooperable by rotation of said rotatable member to hold said movable die member in closed position with respect to said first-named die member.

6. In a machine of the character described, a frame including means providing a slideway, a die member secured to said frame at one end

of said slideway, a carrier member slidably guided by said slideway, a die member carried by said carrier member and cooperable with said first-named die member, a second carrier member slidably adjustable along said slideway, a rotatable member carried by said second-named carrier member, and means on said first-named carrier member and on said second-named carrier member cooperable by rotation of said rotatable member to hold said movable die member in closed position with respect to said first-named die member.

7. In a machine of the character described, a frame including means providing a slideway, a carrier member slidably guided by said slideway, 15 a die member mounted on said frame, a second

die member cooperable with said first-named die member and carried by said carrier member, said second-named die member being movable between open and closed positions with respect to said first-named die member, a second carrier member slidably adjustable along said slideway, a rotatable member carried by and rotatable relative to said second-named carrier member, and circumferentially spaced interrupted cam means on said second-named carrier member and on said rotatable member cooperable and interengageable with one another on rotation of said rotatable member to urge said die members together.

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