

Sept. 5, 1933.

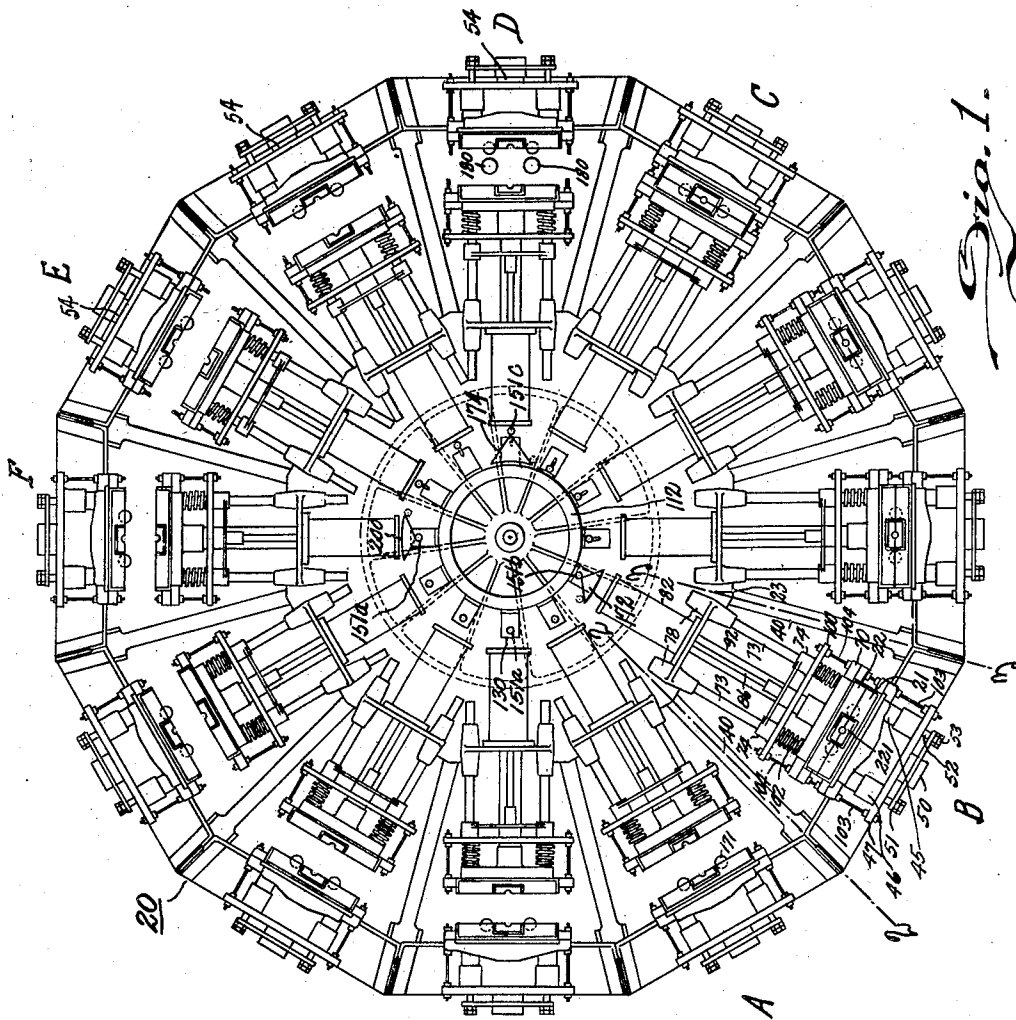
L. C. SHIPPY

1,925,497

CASTING APPARATUS

Filed March 17, 1930

8 Sheets-Sheet 1.



Inventor

Leo C. Shippy

By *Jencks Hardman & Fitch*
his Attorneys

Sept. 5, 1933.

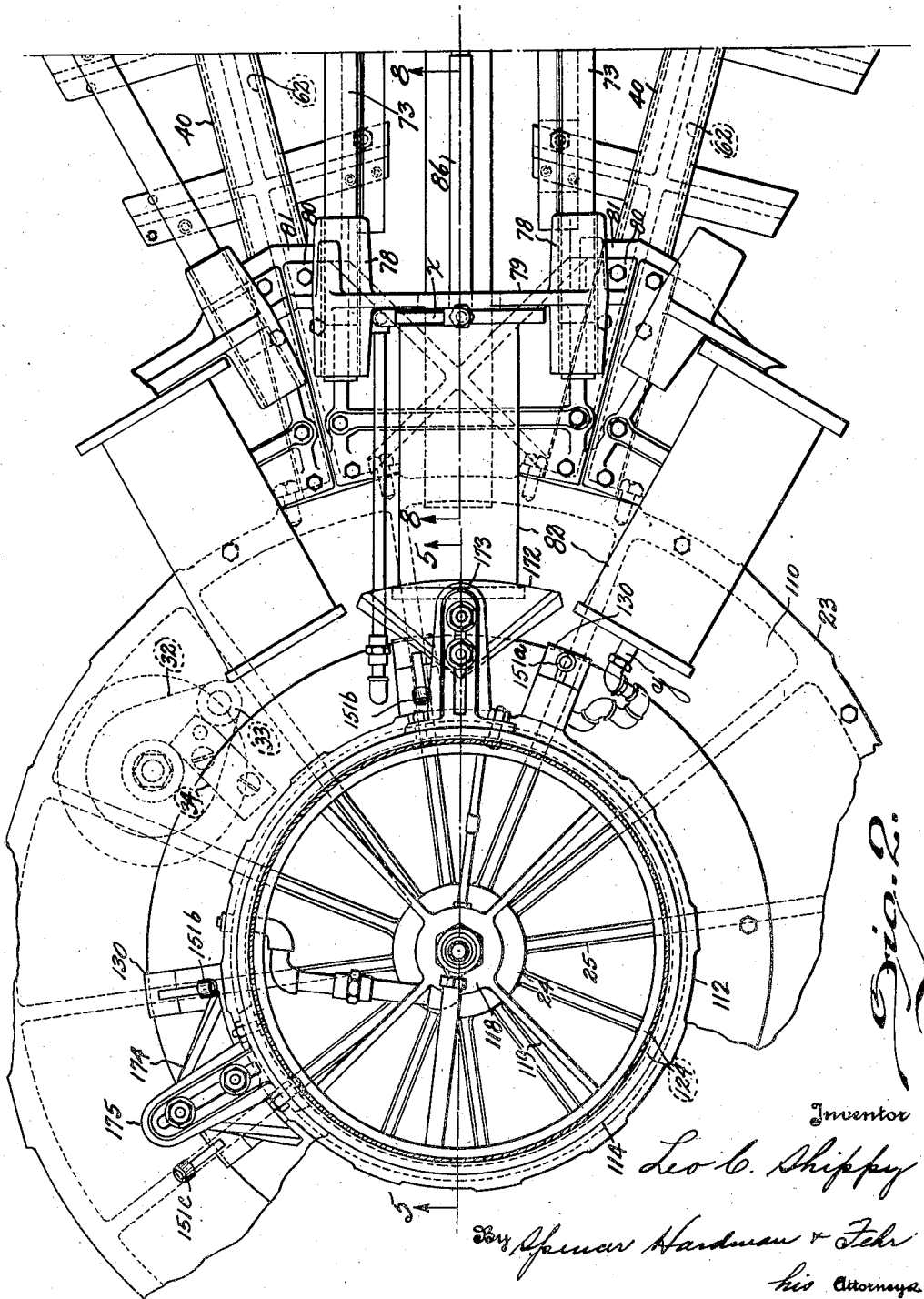
L. C. SHIPPY

1,925,497

CASTING APPARATUS

Filed March 17, 1930

8 Sheets-Sheet 2



Sept. 5, 1933.

L. C. SHIPPY

1,925,497

CASTING APPARATUS

Filed March 17, 1930

8 Sheets-Sheet 3

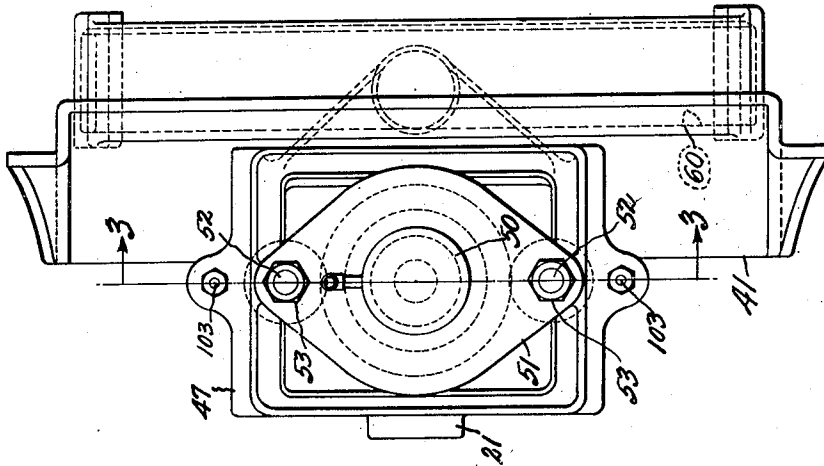


Fig. 4.

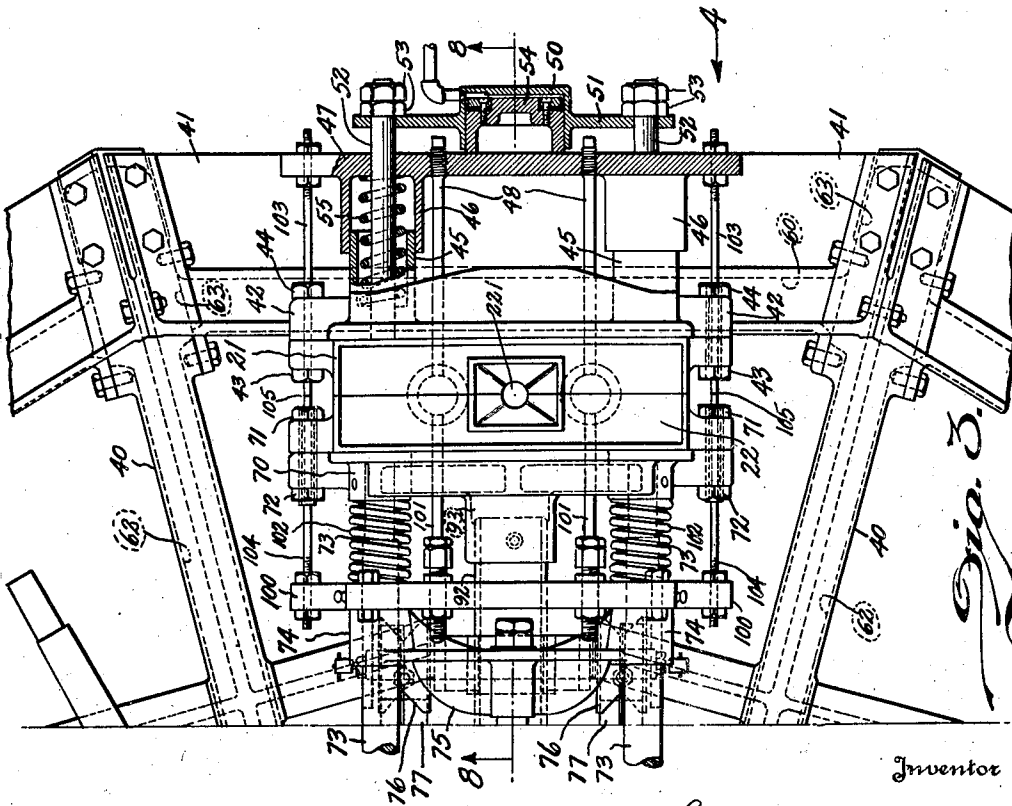


Fig. 5.

Inventor

Leo C. Shippy

Spencer Hardman & Felt
his Attorneys

Sept. 5, 1933.

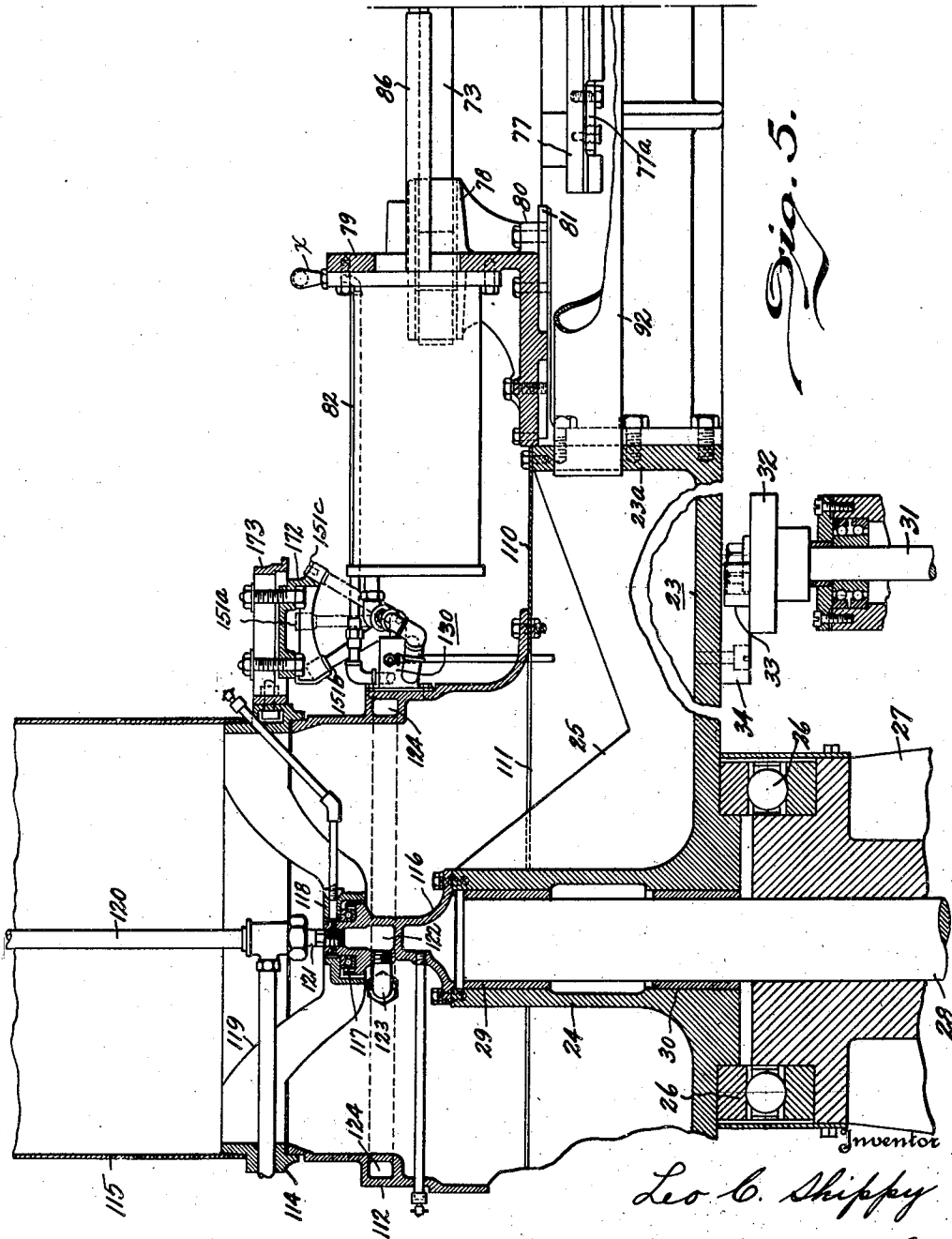
L. C. SHIPPY

1,925,497

CASTING APPARATUS

Filed March 17, 1930

8 Sheets-Sheet 4



Sept. 5, 1933.

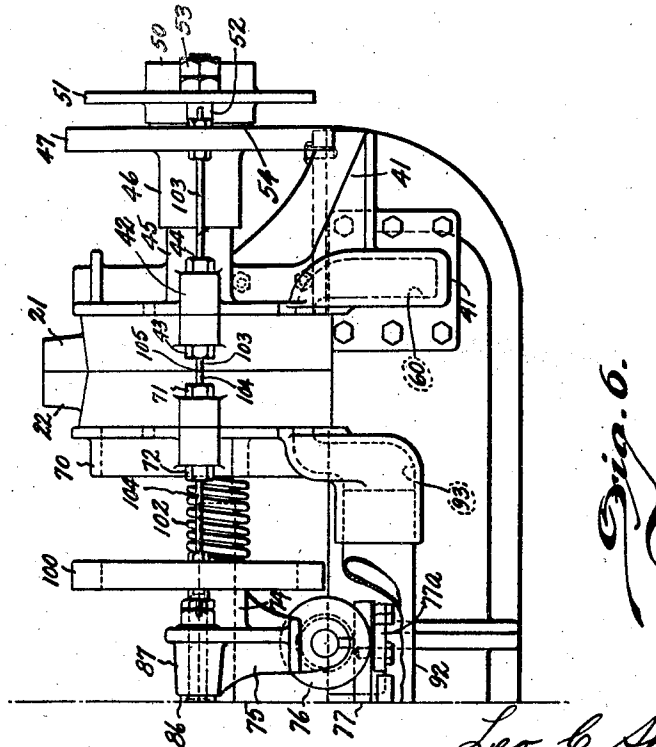
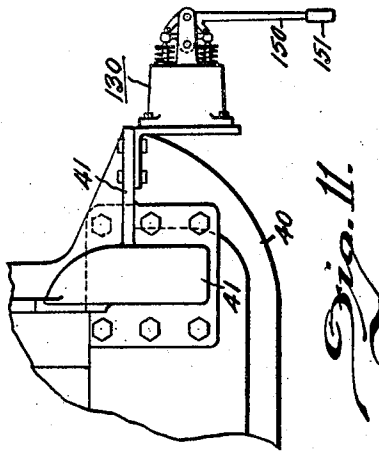
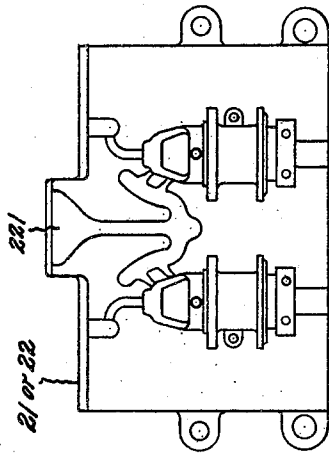
L. C. SHIPPY

1,925,497

CASTING APPARATUS

Filed March 17, 1930

8 Sheets-Sheet 5



Inventor

Leo C. Shippy

By *Spencer Hardman & Fehr*
his Attorneys

Sept. 5, 1933.

L. C. SHIPPY

1,925,497

CASTING APPARATUS

Filed March 17, 1930

8 Sheets-Sheet 6

By Spencer Hardman Fisher
his Attorney

Sept. 5, 1933.

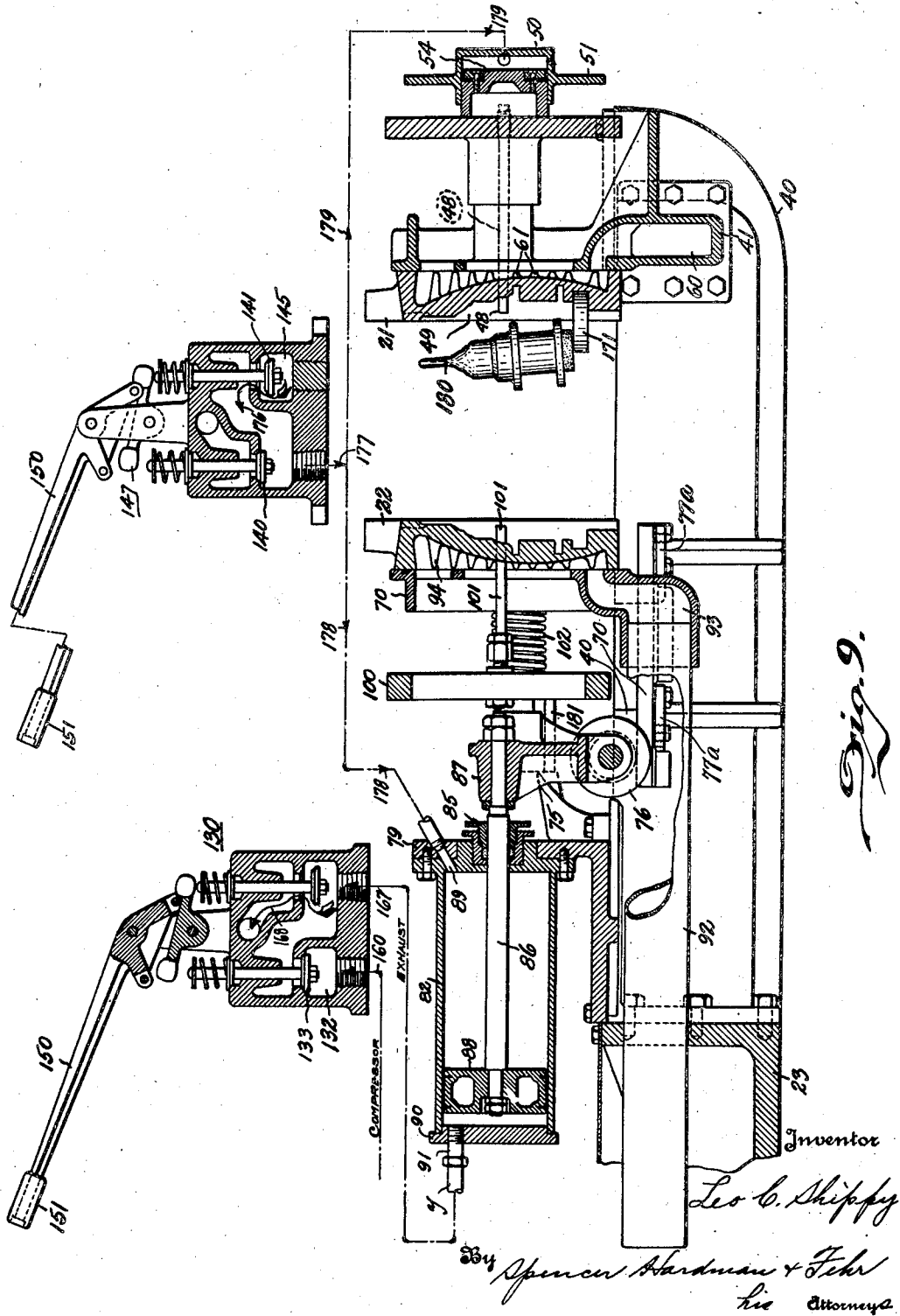
L. C. SHIPPY

1,925,497

CASTING APPARATUS

Filed March 17, 1930

8 Sheets-Sheet 7



Sept. 5, 1933.

L. C. SHIPPY
CASTING APPARATUS

1,925,497

Filed March 17, 1930

8 Sheets-Sheet 8

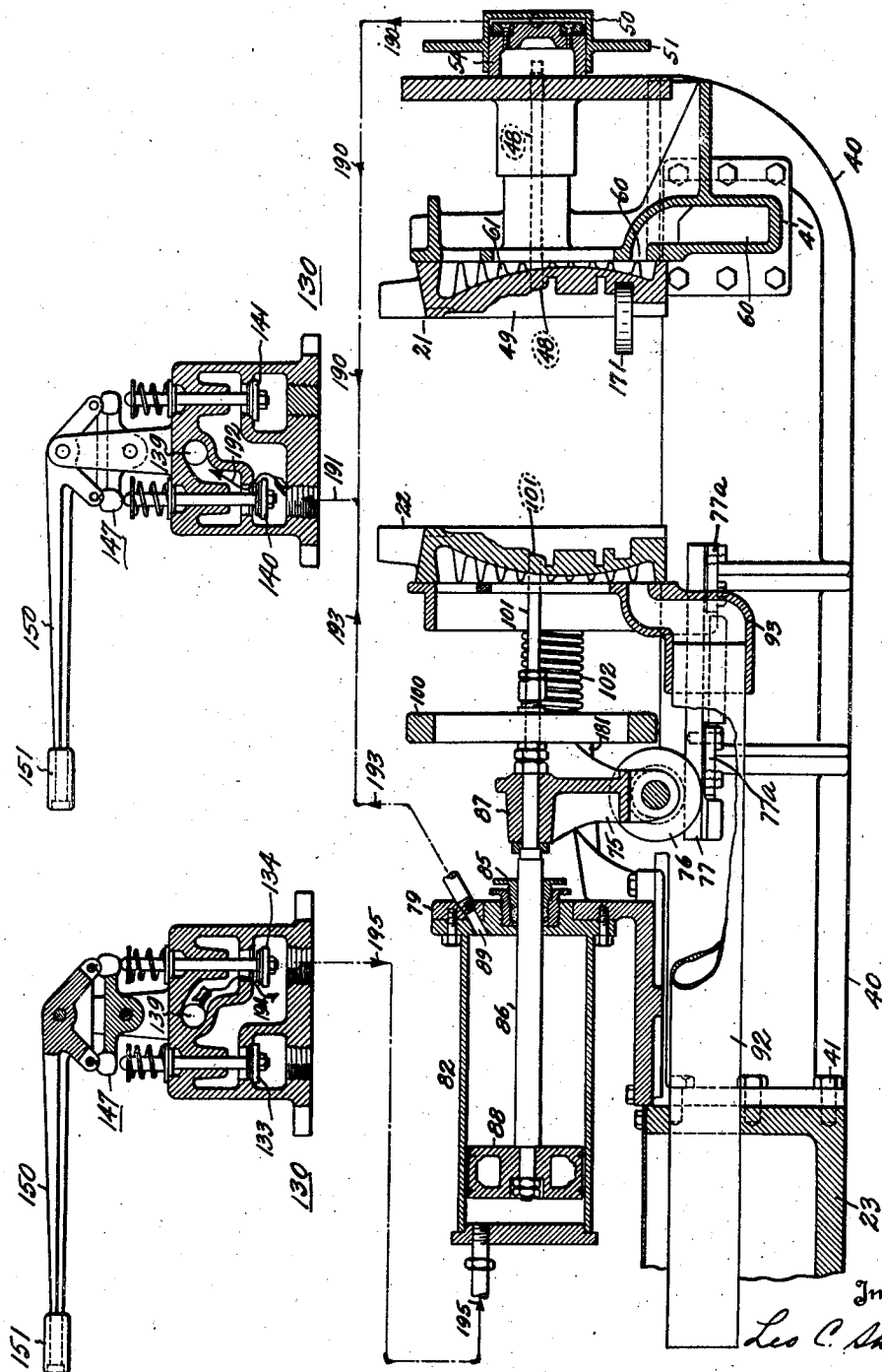


Fig. 10.

Inventor
Leo C. Shippy

334 Spencer Hardman & Sohn
his Attorneys

UNITED STATES PATENT OFFICE

1,925,497

CASTING APPARATUS

Leo C. Shippy, Anderson, Ind., assignor to Delco-Remy Corporation, Anderson, Ind., a corporation of Delaware

Application March 17, 1930. Serial No. 436,437

7 Claims. (Cl. 22—94)

This invention relates to permanent mold casting machines and more particularly to the type of machine comprising a conveyor which carries a plurality of pairs of cooperating mold castings, which, when brought together, provide a mold cavity.

One of the objects of the present invention is to provide improved means for ejecting castings when the mold parts are separated. This object of the invention is accomplished by providing each pair of mold parts with its own ejecting device and providing a controller by which the ejector is caused to operate concurrently with the separation of the molds. Preferably, the molds are closed and opened by fluid pressure and likewise the ejector is operated by fluid pressure. The present invention contemplates a valve having three positions of control. In one extreme position the molds are caused to move together preparatory to casting. In the other extreme position of the controller the molds are caused to separate and the ejector to operate. In an intermediate position of the controller, the ejector is retracted from the mold cavity while the mold parts remain separated. The present invention contemplates operating the controller manually or automatically as the conveyor turntable revolves.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred embodiment of one form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a plan view of the machine embodying the present invention.

Figs. 2 and 3 taken together, constitute a large scale plan view of that portion of the machine included between the radial lines 2—2 and 3—3 of Fig. 1. Fig. 3 is partly in cross section taken on the line 3—3 of Fig. 4.

Fig. 4 is an end view looking in the direction of the arrow 4 of Fig. 3.

Figs. 5 and 6 taken together, constitute a side elevation of that fragment of the machine which is shown in Figs. 2 and 3. Fig. 5 is partly in cross section taken on the line 5—5 of Fig. 2.

Fig. 7 is a side elevation of one of the mold parts.

Fig. 8 shows a sectional view on line 8—8 of Figs. 2 and 3, when the mold parts are brought together. Fig. 8 also shows sectional views of the controller shown diagrammatically connect-

ed with the cylinder for operating the movable mold member.

Fig. 9 is a view similar to Fig. 8 showing the molds separated and the ejector operating. Fig. 9 shows sectional views of the controller in position for causing the movable mold to be retracted from the stationary mold part and the ejector to operate.

Fig. 10 is a view similar to Figs. 8 and 9, showing the ejectors retracted and sectional views of the controller in neutral position for permitting certain springs to operate to effect retraction of the ejectors while the mold parts remain separated.

Fig. 11, which is shown on sheet 5, with Figs. 6 and 7, shows how the controller may be conveniently mounted for manual operation in case manual operation is preferred to the automatic control shown in Figs. 1, 2 and 5.

Referring first to Fig. 1, the permanent mold casting machine comprises a conveyor 20, carrying a plurality of equi-angularly spaced pairs of mold parts, one of the molds 21 of each pair being stationary and the other molds 22 being radially movable. Referring now to Figs. 2 and 5, the turntable 20 comprises a cup-shaped hub 23 having a tubular central bearing portion 24, braced with the hub 23 by ribs 25. The hub 23 is supported by a thrust bearing 26 upon a pedestal 27, to which a shaft 28 is fixed. The tubular portion 24 of the hub carries bearings 29 and 30, journaled upon the shaft 28.

The turntable 23 supports twelve pairs of mold parts, hence it is required to be rotated by a step-by-step motion intermittently, through an angle of 30 degrees. The power for turning the turntable is transmitted by suitable gears from a motor, not shown, to a shaft 31, which drives an arm 32, carrying a roller 33 engageable with any one of a series of equidistant radially disposed plates 34, secured to the bottom of the hub 23.

The turntable includes a plurality of radially extending equiangularly spaced spokes 40, attached at their inner ends to the hub 23 and at their outer ends by brackets 41, each having a mounting pad 42 to which a stationary mold part 21 is attached by tubular bolts 43 cooperating with nut 44. Each mounting pad 42 provides tubular bosses 45, which fit telescopically into tubular bosses 46 provided by an ejector-pin-carrying-plate 47 carrying ejector pins 48 which are movable from a retracted position outside the mold cavity 49 shown in Fig. 8, to an advanced position within the mold cavity 49, as shown in Fig. 9. The pins 48 are movable into

the mold cavity by fluid pressure means comprising a cylinder 50 integral with a plate 51 mounted on studs 52 attached to the bracket 41 and carrying nuts 53 which prevent movement of the plate 51 away from the mold 21. The cylinder 50 receives a piston 54 directly engageable with the ejector pin carrying plate 47. Springs 55, located within the tubular bosses 45 and 46 and surrounding the studs 52, tend to urge the ejector plates 47 away from the mold part 21.

Referring to Fig. 8, the bracket 41 provides an air passage 60 for directing air upon radiating points or fins 61 located on the back of the permanent mold part 49. Air is conducted from the interior of the hub 23 to the passages 60 through ducts 62 located in the spokes 40. The passage 62 is in communication with passage 60 at 63 indicated in Fig. 3.

The movable mold 22 is attached to a bracket 70 by tubular bolts 71 cooperating with nuts 72. The bracket 70 is supported upon rods 73 which extend through and are attached to tubular bosses 74 of a carriage 75 supported by V-grooved rollers 76 which roll along tracks 77 each having a cross section adapted to fit into the V-groove of a roller. Tracks 77 rest upon brackets 77a provided by the spokes 40. The inner ends of the rods 73 are guided by tubular bosses 78 of a frame 79 having feet 80 attached to pads 81 integral with the spokes 40. The frame 79 supports a cylinder 82 having an integral end wall 83 attached by screws 84 to the frame 79 and providing a stuffing box 85 through which a piston rod 86 extends. The rod 86 is connected with a tubular boss 87 of the carriage 75 and with a piston 88 located within the cylinder 82. The frame 79 provides a connection with a pipe X communicating with a passage 89 in the end wall 83 of the cylinder. The other end of the cylinder 82 is closed by a cap 90 having a connection 91 with a pipe Y. A pipe 92 conducts air from the interior of the hub 23 to a passage 93 provided by the frame 70, and air flows from the passage 93 around the radiating projections 94 of the mold part 21 for the purpose of cooling the same.

An ejector pin carrying plate 100 is slidable along the rods 73 and adjustably supports the ends of ejector pins 101 which are adapted to project into the cavity provided by the mold 22. Springs 102 surrounding the rods 73 urge the plate 100 against the bosses 74 of the carriage 75 and thus locate the pins 101 so that they do not project into the mold cavities of the mold 22. By means to be described, a relative movement between the plate 100 and the mold 22 is caused to take place in order to cause the pins 101 to move into the cavities of the mold 22. In order to insure withdrawal of the ejector pins 48 and 101 from the cavities of molds 21 and 22 when these molds are brought together as shown in Fig. 3, the pin carrying plates 47 and 100 respectively, are attached to rods 103 and 104 respectively, which pass respectively through the tubular bolts 43 and 71, and are of such length that they will abut as indicated at 105 in Fig. 3, when the molds 21 and 22 are together. If, for any reason the springs 55 and 102 are not permitted to return the ejector pin carrying plates 47 and 100 respectively, to normal position, this is accomplished by the abutting of the ends of rods 103 and 104 when the mold parts are brought together.

The outer wall 23a of the hub 23 supports a plate 110 having a circular central opening 111 communicating with a collar 112 supported by

the plate 110 and rotatable with the conveyor or turntable. The collar 112 has a flange 113 fitting with a ring 114 connected with an air duct 115 which is fixed against rotation and to which the ring 114 is fixed. The duct 115 and ring 114 are supported by central bracket 116 attached to the hub bearing support 24 and providing a step bearing 117 upon which there rests a central hub 118 connected by spokes 119 with the ring 114. A non-rotatable air pipe 120 is connected with a rotatable pipe 121 threadedly connected with the bracket 116 and communicating with a passage 122 therein. The passage 122 is connected by a pipe 123 with an annular passage 124 provided by the collar 112. With each cylinder 82 there is associated a controller 130 comprising a valve body 131 attached to the collar 112 and providing communication between the duct 124 and the inlet passage 132 of the valve body 131.

The valve body 131 houses valves 133 and 134 for controlling ports 135 and 136 respectively. Port 135 provides communication between intake passage 132 and a passage 137, and port 136 provides communication between passage 137 and a passage 138 leading to an exhaust outlet or vent 139. The valve body 131 also houses valves 140 and 141, for controlling the admission of pressure fluid through ports 142 and 143 respectively. The port 143 provides communication between a passage 145 connected with the intake passage 132. The port 142 provides communication between a passage 144 and a passage 146, which is connected with the vent 139. The stems of these valves are engaged respectively, by the arms of a lever 147, pivoted at 148, upon a bracket 149 integral with the body 131. The lever 147 is actuated by control lever 150 having a roller 151 or handle adapted to be manually operated or to be automatically operated by a suitable cam in a manner to be described later. The lever 150 is pivoted at 152 upon the bracket 149 and is provided with notched arms 153 adapted to straddle the intermediate portions 147b of the lever 147, and these notched arms each carry a cross pin 155 adapted to engage the head portion 147a of the lever 147 and then move into a notch 147c where the head portion 147a joins the intermediate portion 147b as shown in Fig. 8. When the pin 155 is in such a position, the lever 147 will be yieldingly maintained in inclined position against the action of one of the springs 156 which tends to maintain one of the valves in seated position. It will be seen upon reference to Figs. 8, 9 and 10, that the controller lever 150 has three positions, namely, two operating positions shown in Figs. 8 and 9, and a neutral position shown in Fig. 10. When the lever 150 has once been actuated into either of these positions, it will remain there until moved into another position.

When the lever 150 is moved into the position shown in Fig. 8, pressure fluid will be permitted to flow from the annular passage 124 connected with a source of fluid pressure, such as an air compressor, to the left hand end of the cylinder 82 as viewed in Fig. 8. The path and direction of flow are indicated by arrows 160, 161 and 162 in Fig. 8. This will cause the piston 88 to move toward the right in order to move the mold part 22 against the mold part 21. At the same time, the right hand end of the cylinder 82 will be connected with the vent 139 through a circuit represented by the arrows 163, 164 and 165 in Fig. 8. When the mold parts are located as shown in Fig. 8 they are ready to receive the

molten metal which is poured through a gate 221 shown in Fig. 3. Fig. 8 shows a core 170 resting upon a core support 171 attached to one of the mold parts. The valve controller lever 150 may be manually moved into the position shown in Fig. 8 and in such case the controller 130 is mounted adjacent the periphery of the conveyor as shown in Fig. 11. If the controller 130 is to be automatically operated it is mounted upon the collar 112 as shown in Fig. 5, the automatic actuation of the lever 150 is effected by a triangular shaped cam 172 mounted upon a bracket 173 and so shaped as to cause the roller 151 to move from the position 151a shown in Figs. 1 and 2 to the position 151b. Position 151a corresponds to the position shown in Fig. 10 and position 151b corresponds to the position shown in Fig. 8. It will be noted that the cam 172 is so located that as the conveyor rotates counterclockwise and causes a pair of molds to move from a core loading station A to a pouring station B, the controller handle roller 151 will move from position 151a into position 151b to effect the closing of the mold in the manner described.

As a pair of molds moves from a position C to a position D indicated in Fig. 1, the controller handle 151 will be moved from position 151b to position 151c due to engagement with a triangular shaped cam 174 supported by a bracket 175 attached to the collar 114. Fig. 9 shows the position of the controller 150 corresponding to the handle position 151b indicated in Fig. 1. In this position of the controller lever, the valves are arranged so that the right hand ends of the cylinders 82 and 50 will both be connected with the air compressor as indicated by arrow 160 pointing into passage 132 which is connected with passage 145 and arrows 176, 177, and 178 pointing to the right hand end of cylinder 82 and arrow 179 pointing to the right hand end of cylinder 50. The left end of cylinder 82 is vented as indicated by arrows 167 and 168. Consequently, the piston 88 will move from right toward left in order to separate the mold part 22 from the mold part 21 so that the casting 180 may be ejected. If the casting 180 should tend to stick to the mold part 22, it will be loosened therefrom by the ejector pins 101, which are caused to project into the mold cavity of part 22 as the part 22 moves into the position shown in Fig. 9. The pin frame 100 is not permitted to move toward the left the same distance that the mold frame 70 moves, but its movement is arrested by its engagement with stop rods 181, which arrest movement of the pins 101 while the mold part 22 continues to move toward the left by an amount sufficient to cause the ends of the pins 101 to be located within the mold cavities of the part 22. If the casting should stick to the mold part 21 it will be ejected therefrom by the pins 48 which are caused to move toward the left in Fig. 9 when pressure fluid is admitted to the right hand end of the cylinder 50 in the manner described.

As a pair of molds moves between positions E and F in Fig. 1 the controller lever roller 151 is moved by cam 200 from position 151c to position 151a corresponding to the position shown in Fig. 10. In this position of the lever 150, the exhaust valves 134 and 140 are held off their seats while the intake valves 133 and 141 are permitted to be seated. Consequently, both ends of the cylinder 82 and the right hand end of the cylinder 50 will be vented. This condition will permit springs 55, shown in Fig. 3, to expand and move

piston 54 towards the right from the position shown in Fig. 9 to that shown in Fig. 10, and during this movement of piston 54 the air in cylinder 50 may flow to the vent 139 in the manner indicated by arrows 190, 191 and 192. At the same time spring 102 will be permitted to expand to cause the mold part 22 to move toward the right from the position shown in Fig. 9 to that shown in Fig. 10, while the pin frame 100 remains relatively stationary, thus the mold cavities of the part 22 will be located so that the ends of the pins 101 do not project therein. During movement of the mold part 22 toward the right, the air in the right hand end of the cylinder 82 is permitted to escape through a circuit shown by arrows 193, 191 and 192. At the same time air is permitted to enter the left hand end of the cylinder 82 through the vent 139 in the manner indicated by arrows 194 and 195.

After the molds have been located as shown at station F in Fig. 1, they may be cleaned and sooted preparatory to receiving the cores which may be inserted by the time the molds have reached the station A.

While the form of embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A permanent mold casting machine comprising, in combination, a pair of cooperating mold members, means for moving one mold member relative to the other; an ejector plate spaced in parallel relation from one of the mold members and movably supported thereby; ejector pins attached to said plate members and adapted to extend through the supporting mold member to eject a casting; studs extending from the last named mold member; and means independent of the means for moving the molds and carried by said studs for effecting relative movement between the ejector plate and the supporting mold member.

2. A permanent mold casting machine comprising, in combination, a pair of cooperating mold members, means for moving one mold member relative to the other; an ejector plate spaced in parallel relation from one of the mold members and movably supported thereby; ejector pins attached to said plate adapted to extend through the supporting mold member; springs normally tending to separate the plate and its supporting mold member; studs extending from said supporting mold member and extending through said springs; and means independent of the means for moving the molds and carried by said studs for effecting relative movement between the plate and the supporting mold member.

3. A permanent mold casting machine comprising, in combination, a pair of cooperating mold members; means for moving one mold member relative to the other; an ejector plate spaced in parallel relation from one of the mold members; ejector pins attached to the plate and adapted to project through the last-mentioned mold member to eject a casting from the mold; telescopically engaging guides on said plate and said last-mentioned mold member whereby the plate is supported by said last-mentioned mold member; springs located in said guides normally tending to separate the plate from the supporting mold member; studs extending from the supporting mold member and extending through said springs; and means independent of the

means for moving the first-mentioned mold member and carried by said studs for effecting relative movement between the plate and the supporting mold member.

5 4. A permanent mold casting machine comprising, in combination, fixed and movable mold members; means for moving said movable mold member relative to the fixed member; an ejector plate spaced in parallel relation from the stationary mold member; ejector pins attached to
10 said ejector plate and projecting through the stationary mold member to eject a casting therefrom; telescopically engaging guides on the stationary mold member and the ejector plate for movably supporting said plate; springs located
15 in said guides normally tending to move the ejector plate away from the stationary mold; studs extending from the stationary mold and passing through said springs; and independent
20 means mounted on said studs for effecting yielding movement of the ejector plate relative to the stationary mold.

5. A mold casting machine comprising, in combination, a stationary mold; a cooperating movable mold; a cylinder, a fluid pressure operated piston therein for actuating the movable mold; ejector pins projecting into the stationary mold; a plate having the ejector pins attached thereto, said plate being movably supported by the stationary mold; springs normally maintaining said
30 plate spaced from the stationary mold in such position that the free ends of the ejector pins form part of the cavity in the stationary mold; a cylinder on the stationary mold; a fluid operated piston therein for moving said plate relative
35 to the stationary mold thereby causing the ejector pins to enter the cavity of the stationary mold; and control means for both fluid pressure operated pistons effecting closing of the molds or
40 concurrently opening of the molds and entering of the ejector pins into the cavity of the stationary mold.

6. A permanent mold casting machine, comprising, in combination, a conveyor, a plurality of
45 pairs of molds carried thereby, each pair of molds including a relatively stationary and a relatively movable mold; a cylinder for each pair of molds; a fluid pressure operated piston therein for actuating the relatively movable mold; ejector pins
50 projecting into the relatively stationary mold; a plate movably supported by the relatively stationary mold, said plate having the ejector pins attached thereto; springs normally maintaining the plate spaced from the relatively stationary
55 mold in such position that the free ends of the

ejector pins form part of the cavity therein; a cylinder attached to the relatively stationary mold, fluid pressure operated pistons therein for moving the plate relative to the relatively stationary mold thereby causing the ejector pins to enter the cavity of the latter; a pair of fluid pressure controlling valves for each pair of molds, said valves being carried by the conveyor; stationary means actuating the valves in response to movement of the conveyor past said means so as to admit simultaneously fluid pressure to that side of the mold moving piston which is adjacent the relatively movable mold and to the ejector plate actuating piston of the relatively stationary mold; and stationary means actuating the valves in response to movement of the conveyor past said means so as to relieve both mentioned piston sides from fluid pressure.

7. A permanent mold casting machine, comprising, in combination, a conveyor; a plurality of pairs of molds carried thereby, each pair of molds including a relatively stationary and a relatively movable mold; a cylinder for each pair of molds; a fluid pressure operated piston therein for actuating the relatively movable mold; ejector pins projecting into the relatively stationary mold; a plate movably supported by the relatively stationary mold, said plate having the ejector pins attached thereto; springs normally maintaining the plate spaced from the relatively stationary mold in such position that the free ends of the ejector pins form part of the cavity therein; a cylinder attached to the relatively stationary mold, fluid pressure operated pistons therein for moving the plate relative to the relatively stationary mold thereby causing the ejector pins to enter the cavity of the latter; a pair of fluid pressure controlling valves for each pair of molds, said valves being carried by the conveyor; stationary means actuating the valves in response to movement of the conveyor past said means so as to admit simultaneously fluid pressure to that side of the mold moving piston which is adjacent the relatively movable mold and to the ejector plate actuating piston of the relatively stationary mold; stationary means actuating the valves in response to movement of the conveyor past said means so as to relieve both mentioned piston sides from fluid pressure, and stationary means actuating the valves in response to movement of the conveyor past said means so as to admit fluid pressure to that side of the mold moving piston which is remote from the relatively movable mold.

LEO C. SHIPPY. 130

60

135

65

140

70

145

75

150