O. SCHNITZLER.

DIE CASTING MACHINE.

APPLICATION FILED OCT. 9, 1913.

1,194,549.

Patented Aug. 15, 1916.

4 SHEETS—SHEET 1.

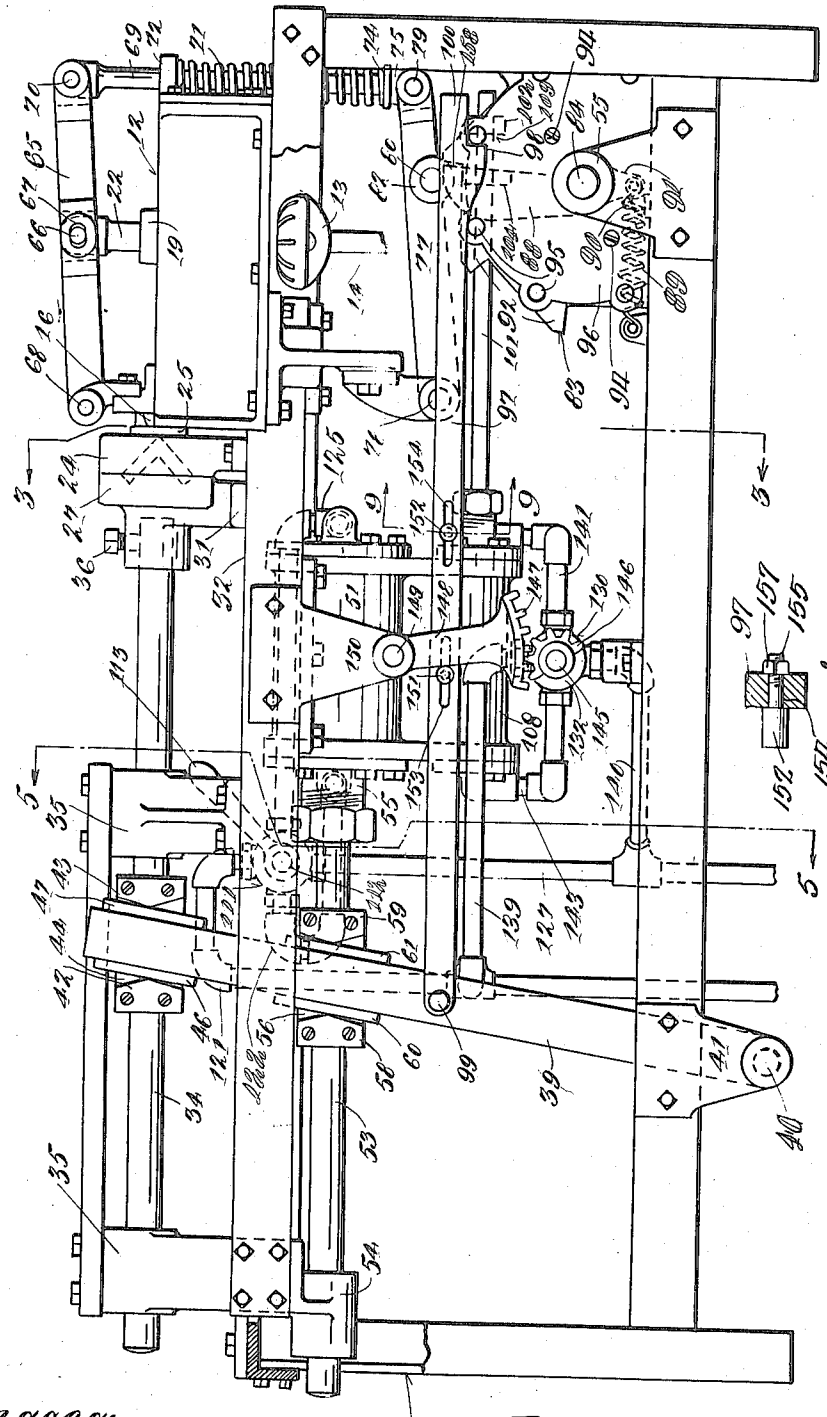

Fig. 1.



Fig. 9.

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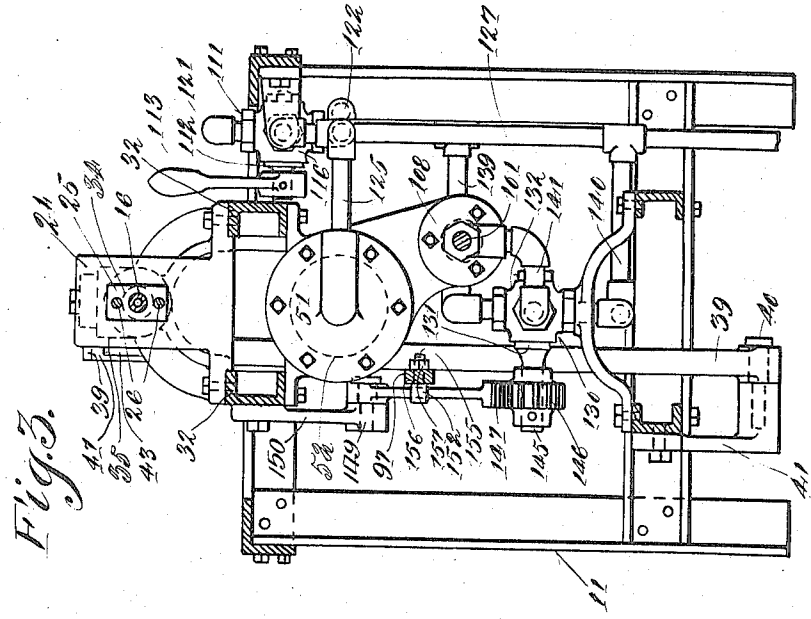

Fig. 3.

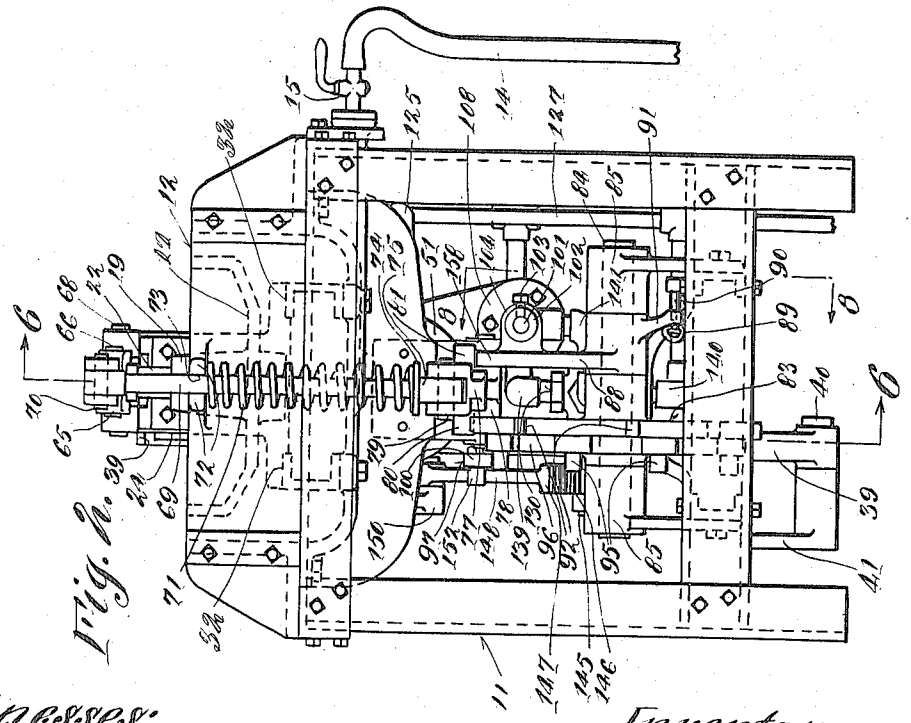

Fig. 2.

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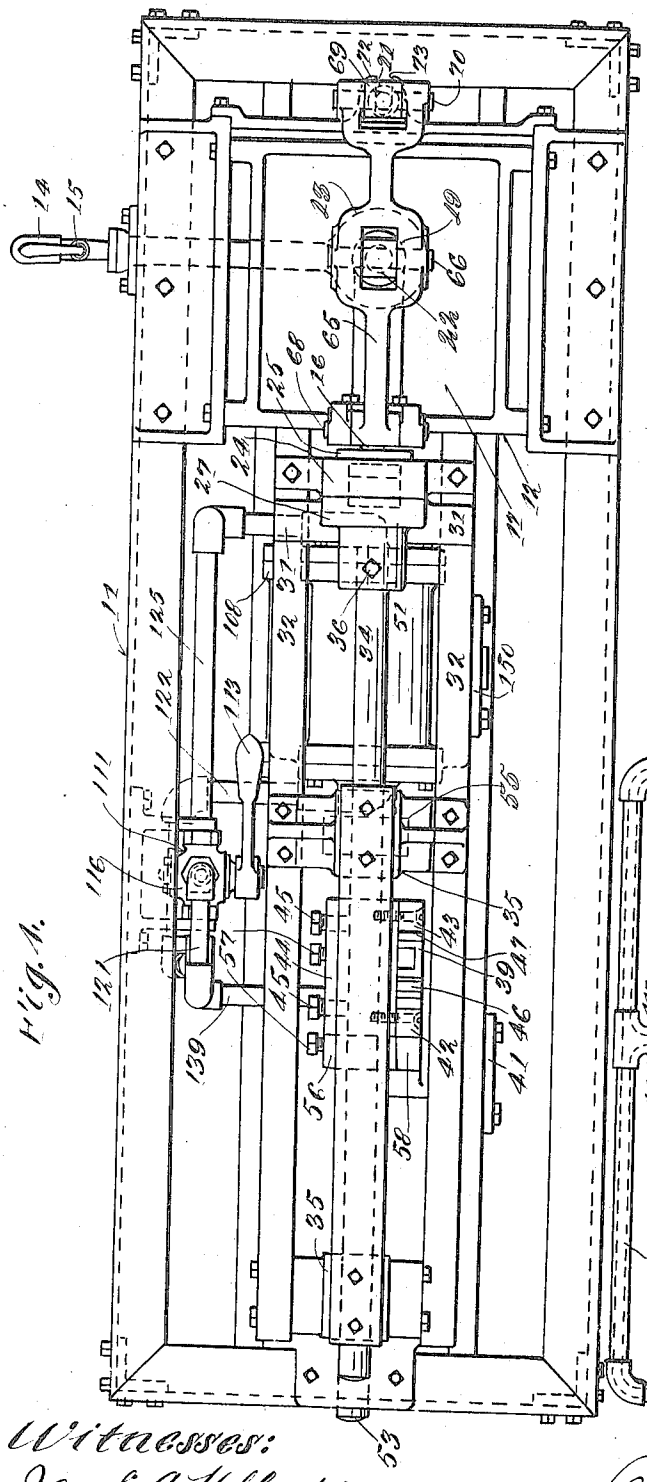
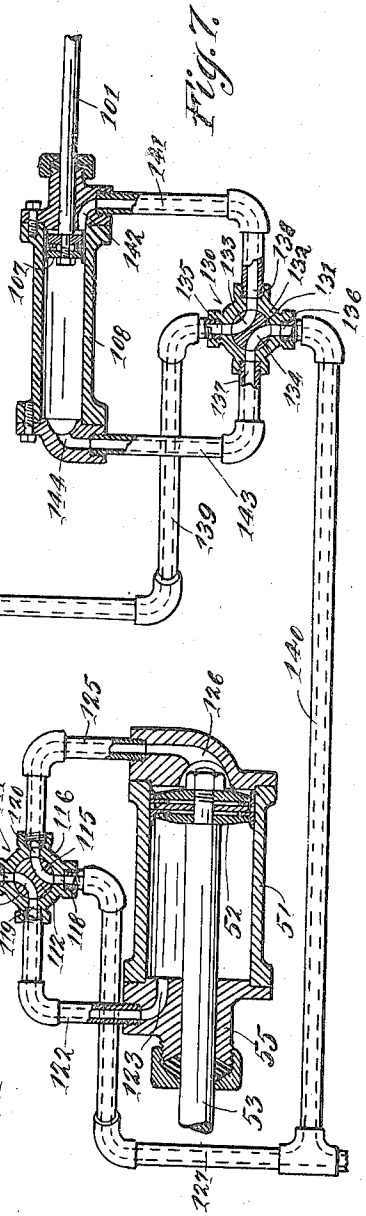


Fig. 7.



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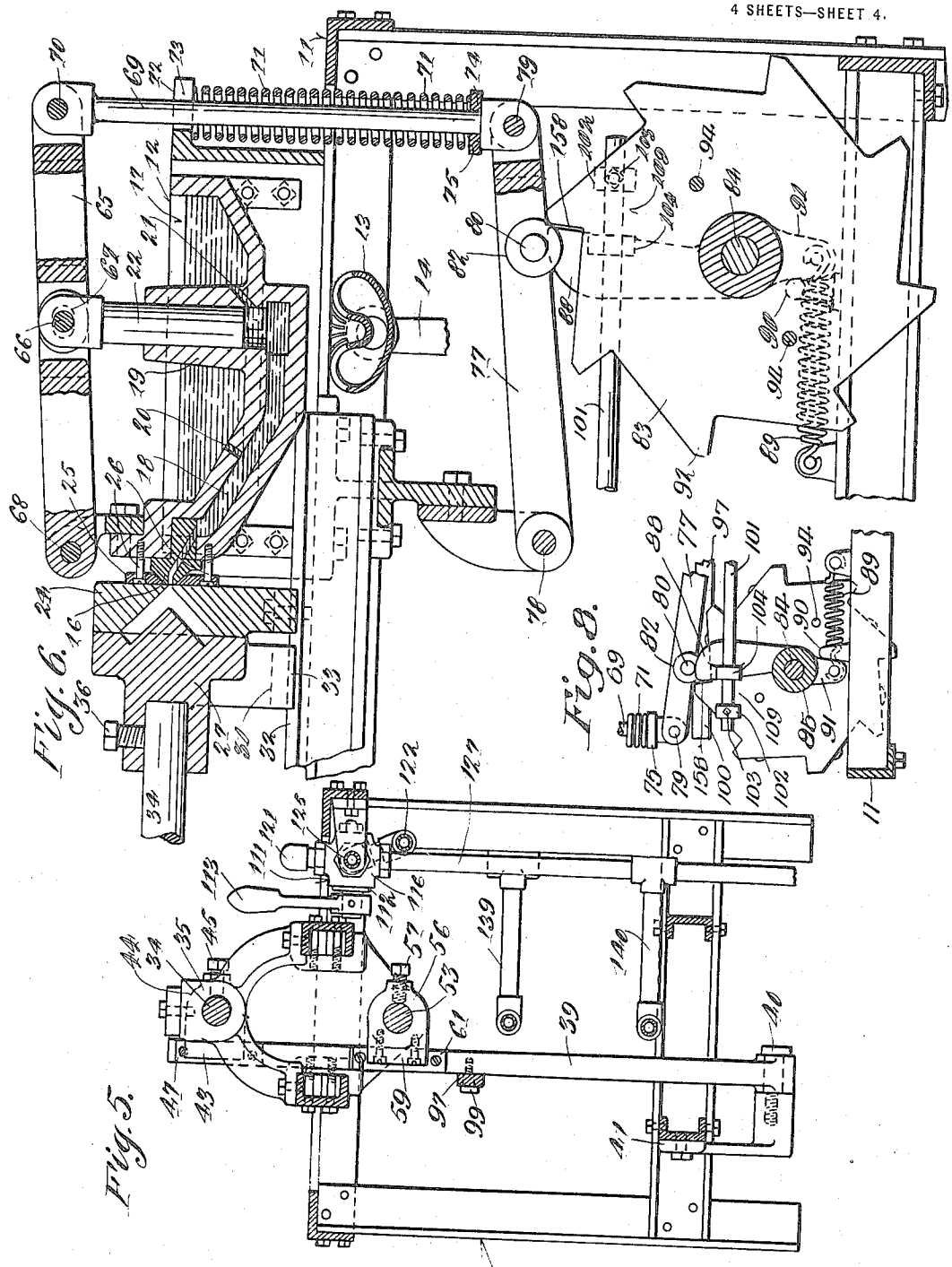

Fig. 5.



Fig. 6.



Fig. 9.

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# UNITED STATES PATENT OFFICE.

OSCAR SCHNITZLER, OF REMINGTON, OHIO.

## DIE-CASTING MACHINE.

1,194,549. Specification of Letters Patent. Patented Aug. 15, 1916.

Application filed October 9, 1913. Serial No. 794,265.

*To all whom it may concern:*

Be it known that I, OSCAR SCHNITZLER, a citizen of the United States, residing at Remington, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Die-Casting Machines, of which the following is a specification.

My invention relates to die-casting machines arranged for injecting the metal to be cast into a die, the die being used for successive castings.

Objects of my invention are to provide novel means whereby the movement of the movable die is effected; to provide novel means for controlling the movement of the movable die; to provide novel means for causing injection of the molten metal into the die; to provide novel means whereby the relation of movements between the die closing means and the molten metal injecting means are effected; to provide novel means whereby the die moving and metal injecting means are operatively connected; and the invention will be further readily understood from the following description and claims, and from the drawings, in which latter:

Figure 1 is a side elevation of my improved device. Fig. 2 is a rear end elevation of the same. Fig. 3 is a cross-section of the same taken on the line 3—3 of Fig. 1. Fig. 4 is a plan view of the same. Fig. 5 is a cross-section of the same on the irregular line 5—5 of Fig. 1. Fig 6 is a longitudinal section of the casting end of the machine, taken on the irregular line 6—6 of Fig. 2. Fig. 7 is a diagrammatic representation showing the compressed fluid passages and valves, the valves being shown in cross-section and the cylinders in axial section. Fig. 8 is a detail in section on the line 8—8 of Fig. 2, showing the means for actuating the keeper; and, Fig. 9 is a detail view in section on the line 9—9 of Fig. 1.

11 represents the main frame, which supports a melting pot 12 for the molten metal, heated for instance by a gas-burner 13, fed from a pipe 14, the flame being controlled by a gas-valve 15.

The melting pot is provided with a nozzle 16. (See Fig. 6.) The cavity 17 of the pot, which contains the molten metal, communicates with the nozzle through a passage 18 which communicates with a molten metal cylinder 19. Molten metal ports 20, 21, communicate respectively with the passage and the cylinder. A plunger 22 is arranged to reciprocate in the cylinder 19 for the purpose of injecting the molten metal into a suitable die, of which 24 is the stationary die, suitably secured to the frame against a nozzle-plate 25 forced against the nozzle by clamp-screws 26. 27 is the movable die.

A slide 31 is associated with the movable die and reciprocates on guideways 32 on the frame, (see Figs. 1, 2, 4 and 6) the slide sliding on the guideways and having depending lugs 33 for guiding the slide laterally. A rod 34 reciprocates lengthwise in bearings 35 on the frame and has connection with the movable die, as by a set-screw 36.

The reciprocation of the movable die is effected by a lever 39, (see Figs. 1, 2, 3, 4 and 5), which is pivoted to the main frame on a stud 40 of a hanger 41 and is received between cheeks 42, 43, on a collar 44, secured adjustably lengthwise on the rod 34 by means of set-screws 45, the cheeks being preferably hardened steel blocks rigidly screwed to the collar. Contact with the cheeks on the collar is made by the lever by means of hardened steel plates 46, 47.

51 is a cylinder having a piston 52 therein, from which a piston-rod 53 extends, (see Figs. 1, 3, 4 and 7) the piston-rod being movable endwise in a bearing 54 on the main frame and a packing-box 55 on the cylinder. The piston-rod has a collar 56 thereon adjustably secured lengthwise thereof in suitable positions, by means of set-screws 57, (see also Fig. 5), the collar being provided with cheeks 58, 59, which are preferably hardened steel blocks rigidly screwed to the collar. Contact with the cheeks is made by hardened steel plates 60, 61, rigidly secured to the lever 39.

The molten metal plunger 22 has articulation with a lever 65, (see Figs. 1, 2, 4 and 6) this articulation being shown by a pin 66 in the piston received in slots 67 in the lever 65. The lever 65 is pivoted at 68 to the melting pot. A link 69 is articulated at 70 to the lever 65. A spring 71, received about the link, normally urges inward movement of the plunger 22 in the cylinder 19.

One end of the spring is shown received against a lug 72, extending from the melting pot and having a slot 73 therein in which the link has movement, the other end of the spring being received against a washer 74 resting on a shoulder 75 on the link.

I provide actuating means for retracting the molten metal plunger, shown accomplished in the present exemplification by the following instrumentalities: 77 is a lever pivoted to the frame at 78 and having articulation with the link 69 at 79 (see Figs. 1, 2, 5, 6, 7, and 8). The lever is provided with a contact-part 80 and with a contact-part 81. These contact-parts are shown formed by a pin received through a bearing 82 in the lever 77, and protruding at the respective sides of said lever.

83 is a cam-wheel rotatable on a shaft 84 latched in bearings 85 of the main frame, and coöperating with the contact-part 80.

88 is a keeper pivoted on the shaft 84 and coöperating with the contact-part 81, the keeper being normally urged under said contact-part 81 by means of a spring 89, against a stop 90 (see Figs. 2, 6 and 8). One end of the spring is attached to the main frame and the other end thereof is attached to a lug 91 on said keeper.

The radial lengths of the cams 92 on the cam-wheel are greater than the radial effective length of the keeper, or the parts are otherwise so related that the cam-tooth will raise the lever 77 sufficiently for permitting the keeper to be received under the contact-part 81 by the actuation thereof effected by the spring 89.

95 is a series of pins, (see Figs. 1 and 2), the pins being so arranged that there is a pin adjacent to each cam 92. These pins are on a pin-plate 96 rigid with the cam-wheel, as by being secured thereto by screws 94. An actuating rod 97 is provided with a pawl 98, which coöperates with the pins 95 for moving the cam-wheel with a step-by-step movement. The actuating rod is articulated with the lever 39 at 99, (see also Fig. 5), and is provided with a tail 100 which, during retracted position of the rod, rests on the pin 95 to be next acted on, the effect being that the actuating rod actuates the cam-wheel for the distance of one pin or one cam-tooth during each back-and-forth movement thereof. I have, in the present exemplification, provided means for automatically withdrawing the keeper 88 from its coacting part 81, (see Figs. 1, 2, 6 and 8), shown effected by means of a rod 101 provided with a collar 102 adjustably placed lengthwise of the rod by a set-screw 103 and coacting with a lug 104 on the keeper 89. The rod 101 is shown as a piston-rod, having connection with a piston 107 which reciprocates in a cylinder 108, (see also Figs. 3 and 5), the rearward movement of the piston causing rearward movement of the rod and its collar for permitting reception of the keeper under its pin or contact-part 81 when the pin or contact-part shall have been raised by the cam-wheel and further effecting a spaced connection 109 between its collar and the keeper.

I have provided novel means whereby the actuation of a single manually operated part will effect a complete movement of the die-casting apparatus for closing the die and operating the molten metal plunger for injecting the metal into the die, and another manual movement of the manually operated part will effect a retraction of the movable die and of the actuating parts for the plunger. By manually operated device I mean a device controlled by the operator, whether by his hand or foot or otherwise. I have shown the functions effected by means of fluid mechanism which may be hydraulic or compressed air or other fluid.

111 is a valve, the plug 112 of which is operated by a handle 113. (See Figs. 1, 3, 4, 5 and 7). The plug has fluid passages 114, 115. The casing 116 of the valve is provided with ports 117, 118, 119, 120. An inlet-pipe 121 connects with the port 117. A pipe 122 connects the port 119 with the port 123 at one end of the main cylinder 51. A pipe 125 connects the port 120 with the port 126 at the other end of said cylinder.

127 is an outlet pipe which connects with the port 118.

The fluid admission and emission for the auxiliary cylinder 108 is controlled by a valve 130 which comprises a plug 131 in a casing 132. (See Figs. 1, 3 and 7). The plug is provided with fluid passages 133, 134, and the casing with the ports 135, 136, 137 and 138. A branch 139 of the inlet-pipe communicates with the port 135. A branch 140 of the outlet-pipe communicates with the port 136. A pipe 141 connects the port 138 with a port 142 at one end of the auxiliary cylinder and a pipe 143 connects the port 137 with a port 144 at the other end of said auxiliary cylinder.

The valve-stem 145 extending from the plug 131 is provided with a pinion 146 with which a segment-gear 147 meshes. (See also Fig. 2). The segment-gear is on an arm 148 pivoted on a pin 149 rigidly placed on a depending lug 150 depending from the main frame. The actuating rod 97 is provided with contact pins 151, 152, adjustably placed in slots 153, 154, in said rod, for adjustably determining the moments of actuation of the valve 130, the pins striking the arm 148. (See Figs. 1 and 3). The pins are suitably clamped lengthwise of said slots as by being provided with threaded extensions 155 passing through

said slots and clamped in place between the shoulders 156 of said pins and clamp-nuts 157 for clamping the pins to the actuating rod. (See Fig. 9).

In the drawings the apparatus is shown in a relation in which the movable die has just been closed against the stationary die, the piston 52 having been actuated for effecting this movement, and the valve 130 having just been automatically opened for the admission of the operating fluid against the piston 107 for moving the collar 102 toward the keeper 88 for withdrawing the keeper from the contact-part 81.

In operation, in making a casting, the movable die is moved toward the stationary die by means of the lever 39. This is accomplished by turning the plug 112 of the valve 111 by means of the handle 113 for causing registry of its passage 114 with the inlet-port 117 and the port 119, for causing inflow of the fluid into one end of the cylinder 51 for moving the lever 39 toward the stationary die. This movement of the lever will move the actuating rod 97 and its pawl 98 thereon for contacting one of the pins 95 and turning the cam-wheel for the distance of one tooth. It will be understood that in the meantime the contact-parts 80, 81, will be in lowered position, the molten metal plunger being depressed. The actuation of the cam-wheel will cause the ascending cam 92 to contact the contact-part 80 for raising the plunger against the tension of the spring 71. In the meantime the rear face 158 of the keeper normally rests against the contact-part 81, the contact part 80 in turn normally resting in the depression between the cam-teeth of the cam-wheel.

As soon as the lever 77 has been raised sufficiently to raise the contact-part 81 above the keeper, the keeper will snap under said contact-part and thereby maintain said lever and molten metal plunger in raised relation when said ascending tooth of the cam-wheel has passed just beyond its coacting contact-part 80, where it comes to a position of rest.

When the movable die has been almost seated, the pin 151 on the actuating rod will move the arm 148, and consequently the segment gear, actuating the pinion 146 for turning the valve-plug 131 and causing registry of its passage 133 with the ports 135, 138, causing inflow of fluid and movement of the piston 107 in a direction away from the keeper, (see Figs. 6 and 7), whereby the collar 102 on the piston-rod 101 is moved through the space 109 toward said keeper, this movement following raising of the plunger 22 and the movement of the keeper 88 under the pin 81 hereinbefore explained. The collar 102 will then strike the lug 104, causing retraction of the keeper from under the contact-part 81, whereby descent of the molten metal plunger under the tension of the spring 71 is caused with a quick movement for forcibly injecting the molten metal into the closed die. The molten metal ports 20 and 21 prevent a too forcible injection of molten metal into the die.

A properly timed relation of operation of the devices is effected by my improved device, wherein the die is first closed, the die being held closed by the cushion of fluid acting on the main piston, making nicety of setting of the die unnecessary. The molten metal plunger is then raised, proper time being allowed for the molten metal to enter the molten metal cylinder and passage, and the plunger is then actuated for injecting the molten metal.

When it is desired to open the die and return the parts to normal positions, ready for a succeeding movement, the handle 113 is turned in the opposite direction for causing registry of the passage 115 in the valve-plug 112 with the ports 117, 120, for causing entrance of the actuating fluid to the opposite side of the piston 52 and discharge of the fluid in the main cylinder, whereby an opening movement of the movable die is caused and the actuating rod is returned so as to place its tooth in front of the next pin 95, the tail 100 of said actuating rod resting on said pin. Near the end of the return movement of the actuating rod, the pin 152 thereon will strike the arm 148 for actuating the pinion 146 on the valve-stem of valve 130, thereby causing registry of its passage 133 with the ports 135, 137, and movement of the piston 107 in the opposite direction and discharge of the fluid in the cylinder, causing return of the collar 102 to its spaced relation.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a die-casting machine, the combination with a die, of a die moving part, an injecting part for the molten metal, molten metal confining means coacting therewith, and means for actuating said injecting part comprising a fluid-actuated device, a valve therefor, and means operatively connected with said die moving part for operating said valve.

2. In a die-casting machine, the combination with a die, of a reciprocating die moving part, an injecting part for the molten metal, molten metal confining means coacting therewith, operating means for said injecting part, a lever, and means for swinging said lever on its pivot, said lever having connection with said die moving part for moving the same in both directions and with said operating means for moving the same.

3. In a die-casting machine, the combina-

tion with a die, of a die moving part, an injecting device for molten metal comprising a movable member, operating means comprising a moving element for said movable member, a lever, means for swinging said lever on its pivot, said lever having connection with said die moving part and said moving element for actuating said die moving part and moving said moving element, said operating means further comprising a keeper, fluid-actuated means for operating said keeper, a valve for said fluid-actuated means, and controlling means for said valve actuated by said lever.

4. In a die-casting machine, the combination with a die, of a die moving part, actuating means for the same comprising a fluid-actuated device, an injecting part for the molten metal, molten metal confining means coacting therewith, actuating means for said injecting part comprising a fluid-actuated part, a valve for the latter, and controlling means for said valve actuated by said first-named actuating means.

5. In a die-casting machine, the combination with a die, of a die moving part, a fluid-actuated device for moving the same, a valve for the latter, a part under the control of the operator for actuating said valve, an injecting part for the molten metal, molten metal confining means coacting therewith, means for actuating said injecting part comprising a fluid-actuated device, a valve for said fluid-actuated device, and means for controlling said last-named valve having operative connection with said die moving part.

6. In a die-casting machine, the combination with a die, of a die moving part, an injecting part for the molten metal, molten metal confining means coacting therewith, a lever for actuating said die moving part, actuating means for said injecting part, a fluid-actuated device for controlling the latter, and a valve for said fluid-actuated device, said lever having adjustable connection with said valve for operating the same.

7. In a die-casting machine, the combination with a die, of an injecting part for the molten metal, molten metal confining means coacting therewith, means for normally urging said injecting part into injected relation, a cam-wheel for moving said injecting part into retracted relation, and a keeper movable independently of said cam-wheel acting in conjunction therewith for holding said injecting part in retracted relation.

8. In a die-casting machine, the combination of a movable die, means for moving the same, an injecting part for the molten metal, molten metal confining means coacting therewith, means for normally urging said part into injected relation, a cam for moving said injecting part into retracted relation, a keeper movable independently of said cam-wheel acting in conjunction with said cam for holding said injecting part in retracted relation, and means having controlling connection with said first-named means for retracting said keeper.

9. In a die-casting machine, the combination with a die, of an injecting part for the molten metal, molten metal confining means coacting therewith, means for normally urging said injecting part into injected relation, a cam, a part actuated thereby having connection with said injecting part for moving said injecting part into retracted relation, means for moving said cam past said last-named part, and a keeper arranged to be placed in obstructing relation to said last-named part during the movement of said cam for holding said injecting part in retracted position.

10. In a die-casting machine, the combination with a die, die moving means, of an injecting part therefor for the molten metal, molten metal confining means coacting therewith, means normally urging said injecting part into injected relation, a part having connection with said injecting part for moving the said injecting part into retracted relation, a cam and a keeper coacting with said last-named part for moving said injecting part into retracted relation, said keeper movable independently of said cam, and means having operative connection with said die moving means for actuating said cam and keeper.

11. In a die-casting machine, the combination with a die, of an injecting part for the molten metal, molten metal confining means coacting therewith, means for normally urging said injecting part into injected relation, a cam-wheel for moving said injecting part into retracted relation, a keeper acting in conjunction therewith for maintaining said injecting part in retracted relation, means for normally urging said keeper into obstructing position with relation to said injecting part, and means for moving the said keeper into unobstructing position with relation to said injecting part.

12. In a die-casting machine, the combination of a die, a die moving part, an injecting part for the molten metal, molten metal confining means coacting therewith, means for normally urging said injecting part into injected relation, a cam-wheel for moving said injecting part into retracted relation, a keeper acting in conjunction therewith for maintaining said injecting part in retracted relation, means for normally urging said keeper into obstructing position with relation to said injecting part, and actuating means for moving said keeper into unobstructing position with relation to said injecting part, said die moving part having

operative connection with said keeper and actuating means for controlling the movements of said keeper and actuating means.

13. In a die casting machine, the combination of a melting pot, a plunger therefor, molten metal confining means coacting with said plunger, a spring for normally urging plunged relation of said plunger, a cam, a part actuated thereby for moving said plunger into retracted position and thereby compressing said spring, a keeper coacting with said last-named part for maintaining said plunger in retracted position, and means for alternately moving said cam and keeper.

14. In a die-casting machine, the combination of a melting pot, a plunger therefor, molten metal confining means coacting with said plunger, a spring for normally urging plunged relation of said plunger, a cam, a part actuated thereby for moving said plunger into retracted position and thereby compressing said spring, a keeper coacting with said last-named part for maintaining said plunger in retracted position, and means for alternately moving said cam and keeper, the cam face on said cam arranged for moving said part actuated by said cam a greater distance from its normal position than the position thereof when maintained by said keeper.

15. In a die-casting machine, the combination of a movable die, an injecting part for the molten metal, molten metal confining means coacting therewith, actuating means for said injecting part comprising a spring for forcing the same into injected position, and means for retracting said spring and injecting part comprising a cam-wheel having cams thereon coacting with said actuating means, a lever having operative connection with said movable die for moving the same and with said cam-wheel for actuating the latter, a keeper for holding said actuating means in retracted relation, and operative means therefor having controlling connection with said lever.

In testimony whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

OSCAR SCHNITZLER.

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