Sept. 10, 1940. A. S. KUX 2,214,638

CASTING MACHINE

Filed Jan. 24, 1938 5 Sheets-Sheet 1

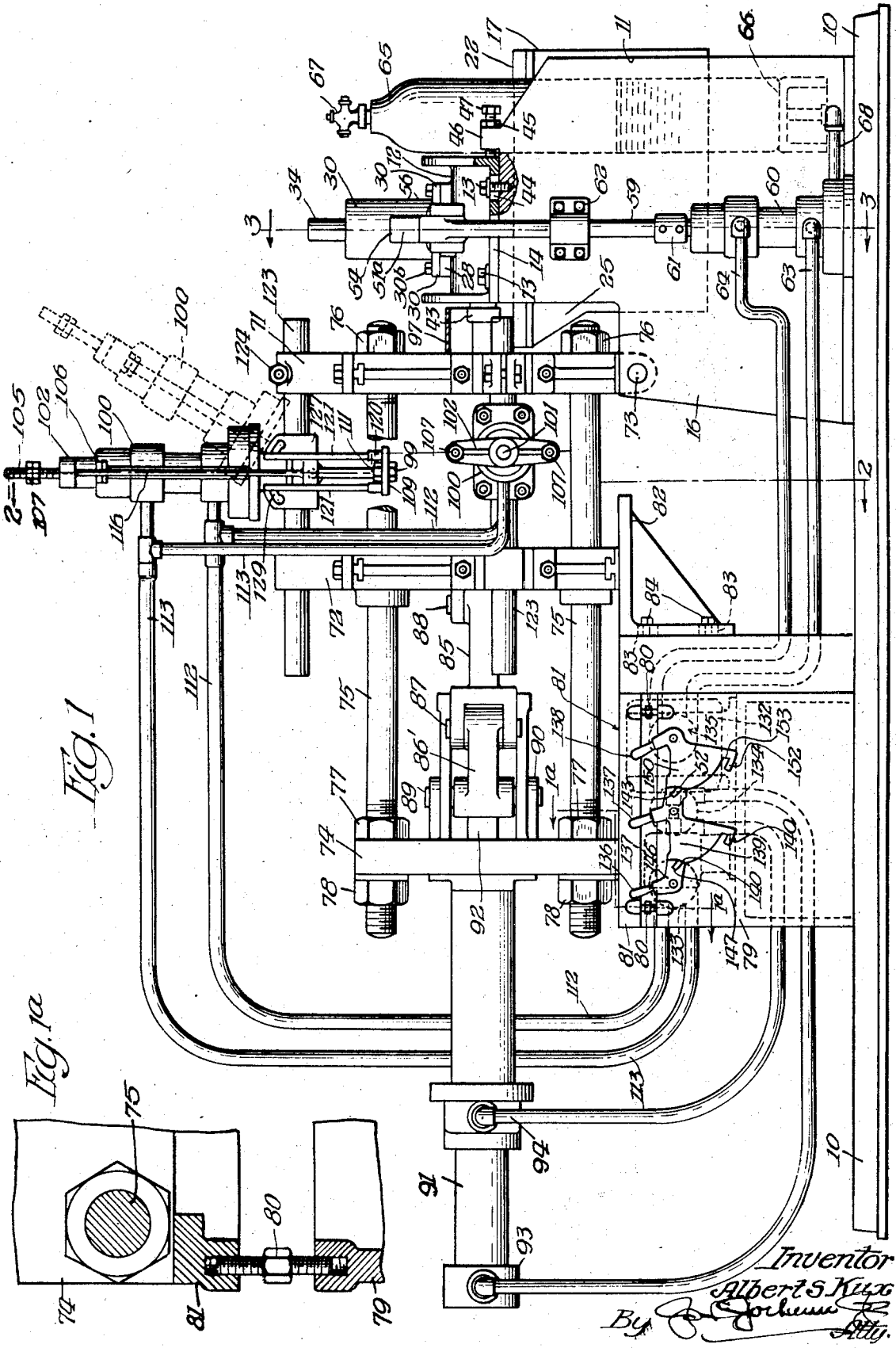


Fig. 1

Fig. 1a

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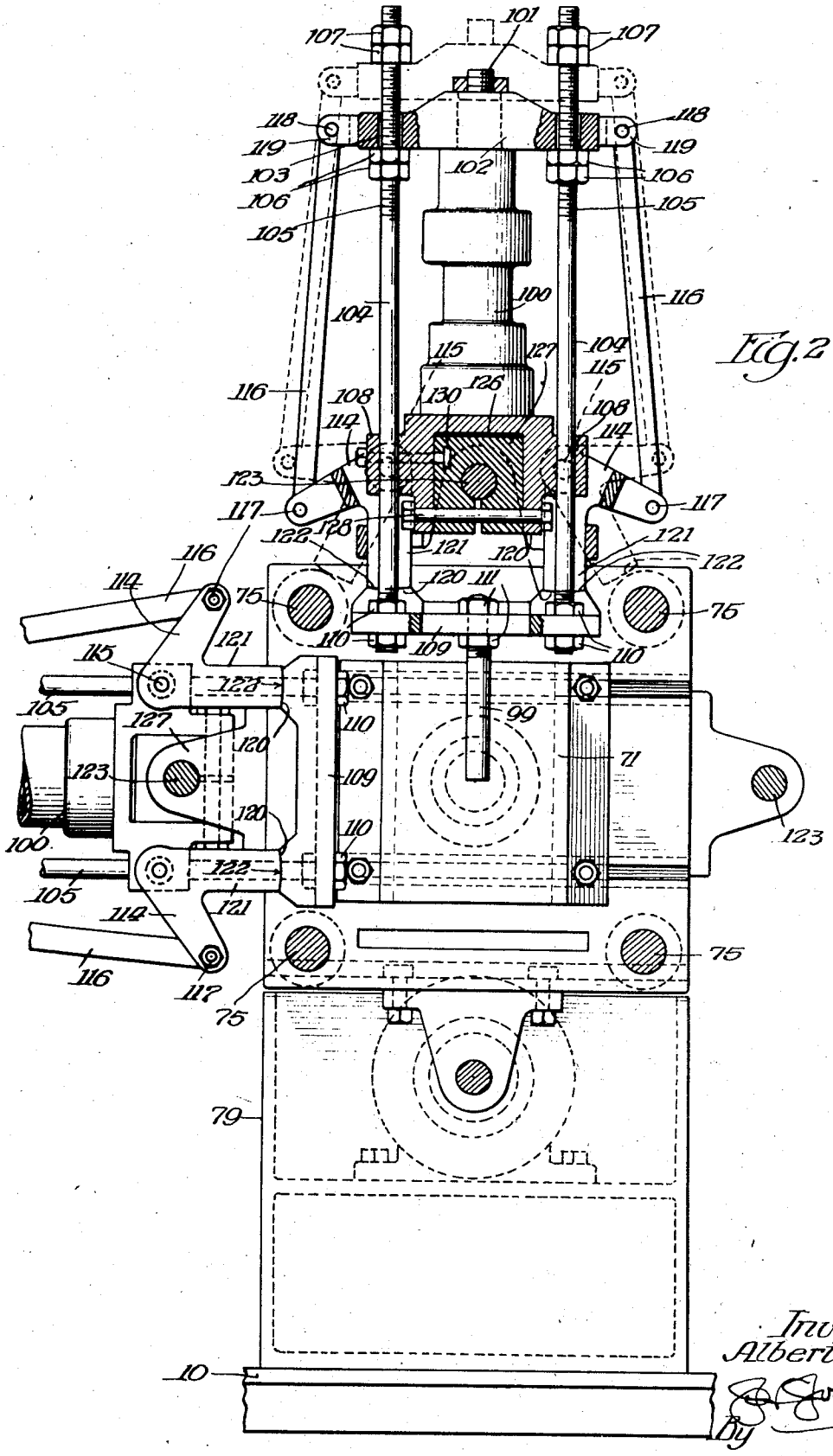


Fig. 2

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CASTING MACHINE

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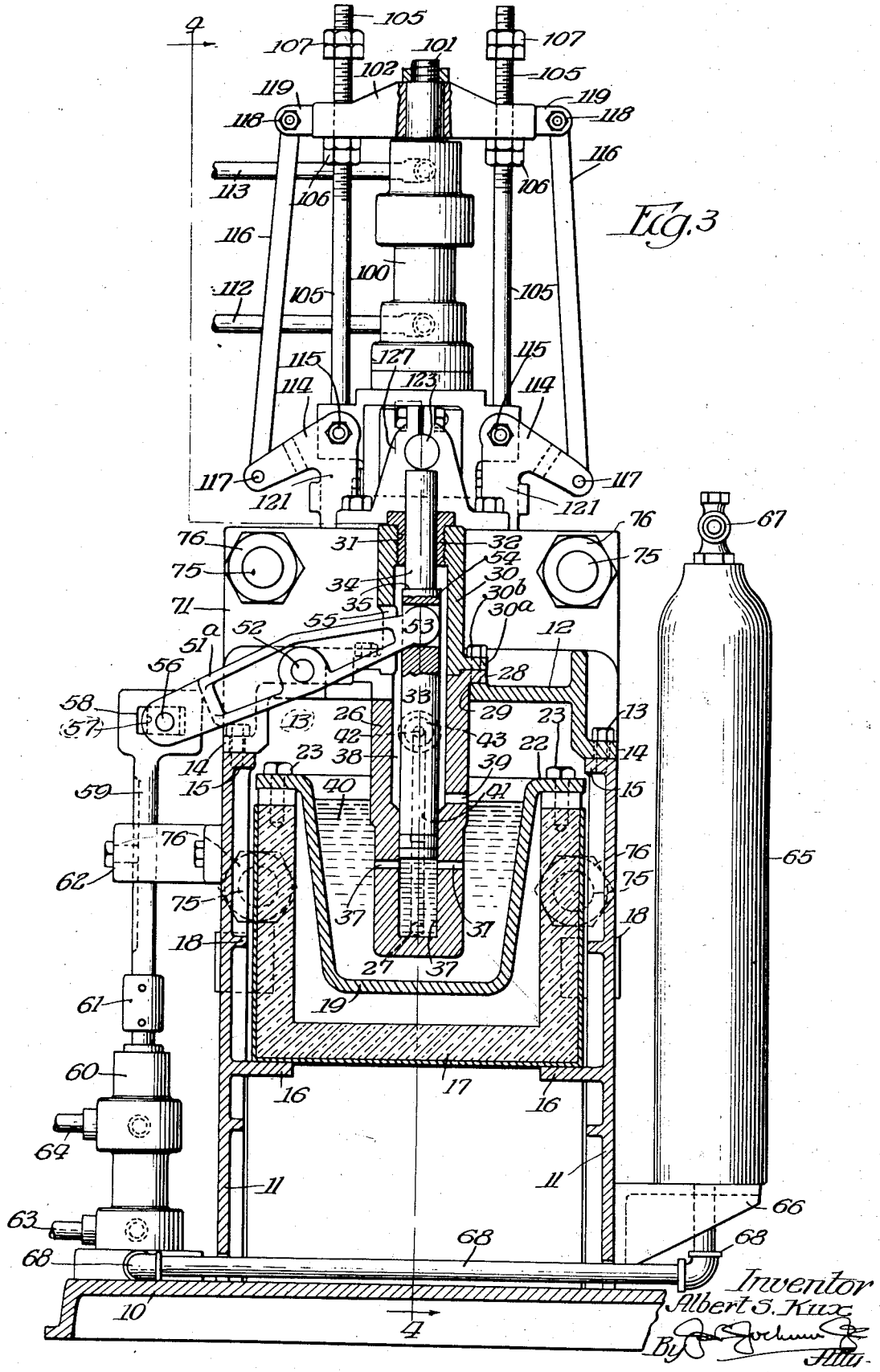
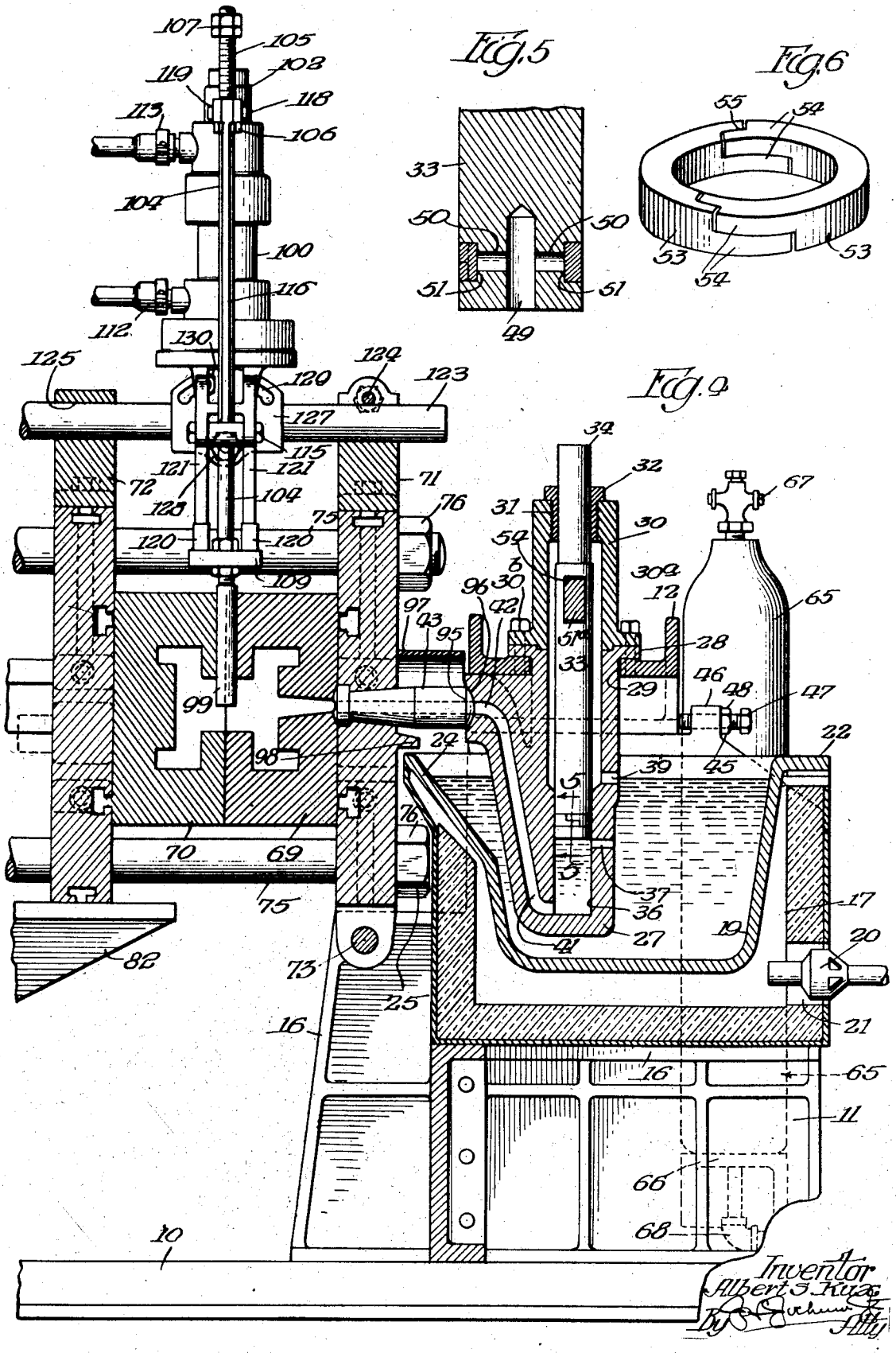


Fig. 3

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CASTING MACHINE

Filed Jan. 24, 1938 5 Sheets-Sheet 5

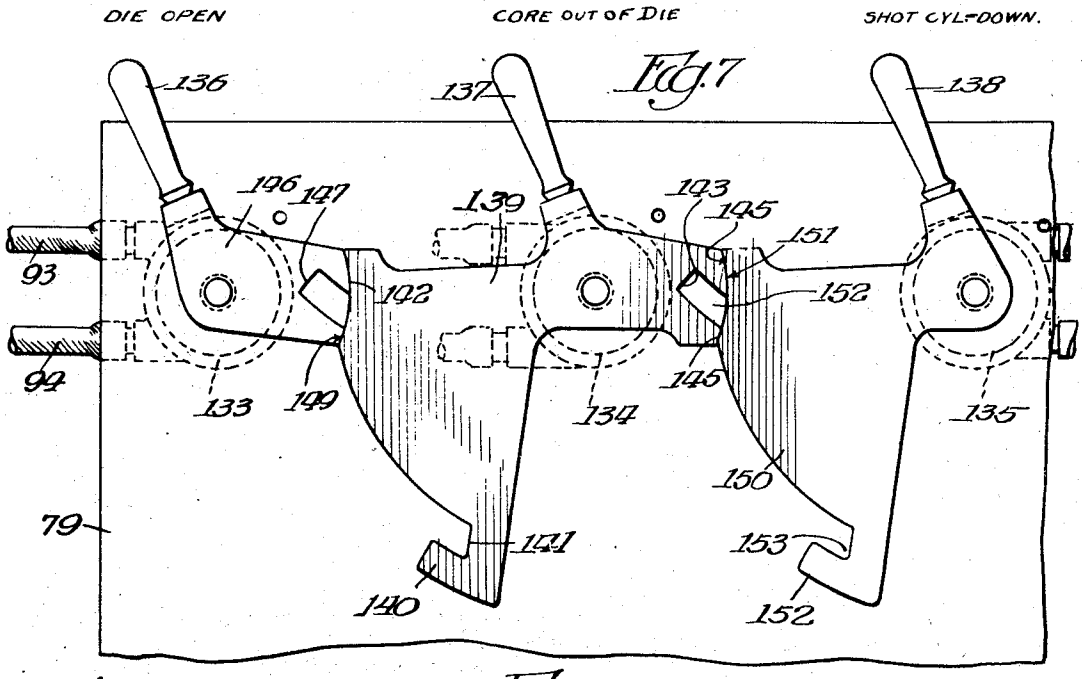


Fig. 7

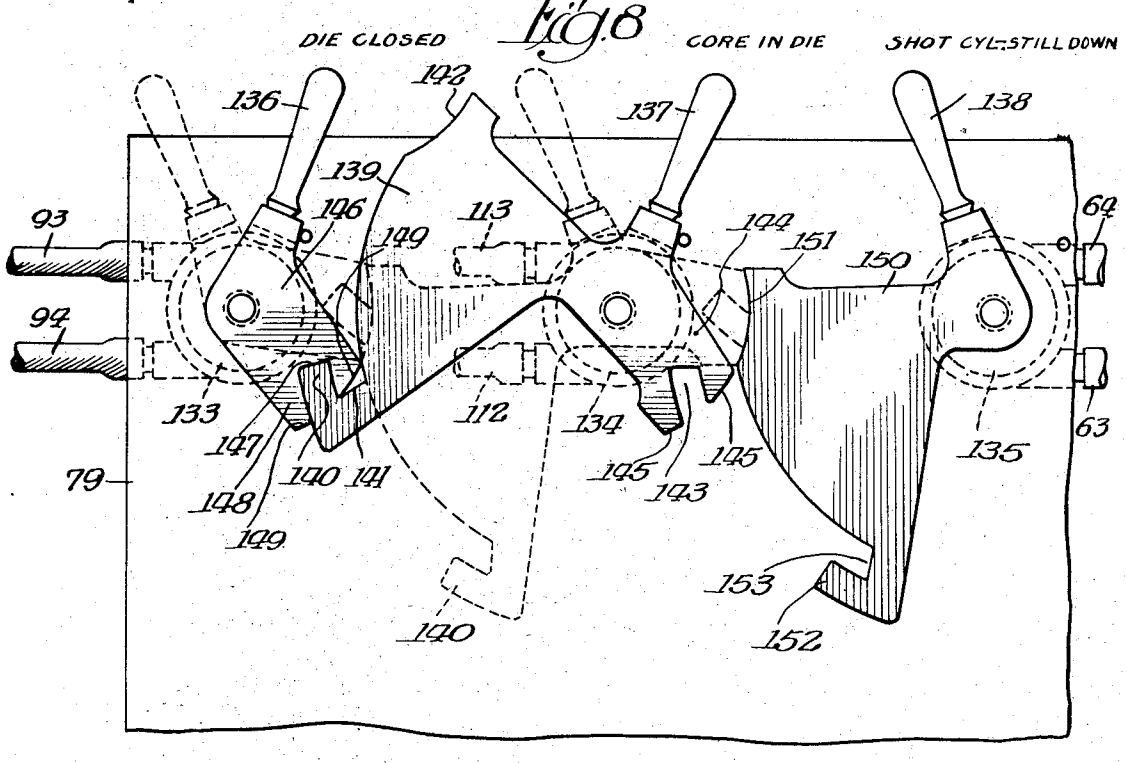


Fig. 8

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2,214,638

UNITED STATES PATENT OFFICE

2,214,638

CASTING MACHINE

Albert S. Kux, Chicago, Ill.

Application January 24, 1938, Serial No. 186,540

7 Claims. (Cl. 22—70)

This invention relates in general to improvements in casting machines, particularly adapted for use in forming articles of molten metal forced into the dies or molds, although it is not necessarily limited to such use as it is well adapted to operate with equal efficiency in forming articles from other suitable materials, and one of the objects of the invention is to improve and simplify the construction of such machines.

A further object is to provide improved means for supporting portions of the machine, and improved means for inserting and withdrawing cores into and out of molds or dies.

A further object is to provide improved valve locking mechanism for locking the controlling valves, thereby rendering it impossible to operate the incorrect valve during the cycle of operation of the machine.

To the attainment of these ends and the accomplishment of other new and useful objects as will appear, the invention consists in the features of novelty in substantially the construction, combination and arrangement of the several parts, hereinafter more fully described and claimed and shown in the accompanying drawings illustrating this invention, and in which—

Figure 1 is a side elevation of a machine of this character constructed in accordance with the principles of this invention, and showing some of the parts in different positions.

Figure 1A is a detail sectional view taken on line 1A—1A, Figure 1, on an enlarged scale.

Figure 2 is a detail sectional view, on an enlarged scale, taken on line 2—2, Figure 1, with parts omitted.

Figure 3 is a detail sectional view taken on line 3—3, Figure 1, on an enlarged scale and with parts omitted.

Figure 4 is a view partly in elevation and partly in vertical section, taken on line 4—4, Figure 3.

Figure 5 is a detail sectional view taken on line 5—5, Figure 4, on an enlarged scale.

Figure 6 is a detail perspective view, on an enlarged scale, of the packing for the ejecting plunger.

Figure 7 is a view in elevation of the actuating and the locking means for the control valves.

Figure 8 is a view similar to Figure 7 showing the parts in different positions.

Referring more particularly to the drawings, the numeral 10 designates generally a supporting base upon which all of the parts of the machine are mounted. Arranged adjacent one end of the base are laterally spaced uprights 11 (see particularly Figure 3) which may be of any desired size and configuration and supported by the upper ends of these uprights is a cross-beam or saddle 12 which may be secured in position in any desired or suitable manner, such as by means of fastening bolts 13 passing through flanges 14 and also engaging in flanges 15 upon which the flanges 14 rest. The flanges 15 preferably are formed integral with the uprights 11.

These uprights 11 are spaced laterally for any desired or suitable distance and are provided with oppositely disposed brackets 16 upon which a furnace or heater 17 rests, this furnace being of any desired or suitable construction and being provided with heat insulating material.

Ribs or projections 18 may be provided on the uprights 11 above the bracket 16 so as to maintain the furnace or heater 17 in proper position and spaced from the uprights.

The numeral 19 designates a pot or container for the material from which the articles are to be formed and which projects into the heater 17, heat being supplied so as to maintain the material in the pot 19 heated, from any suitable source, preferably through the medium of a burner 20 which projects through an opening 21 in one of the walls of the heater 17.

The pot 19 is preferably provided with a circumferential flange 22 and the flange projects over the upper edge of the walls of the heater and may be anchored in position in any suitable manner, such as by means of bolts 23 passing through the flange and into the walls of the heater.

The pot 19 is provided with a spout 24 (see particularly Figure 4) which projects through an opening 25 in one of the walls of the heater.

Supported by the saddle 12 is a plunger device which preferably embodies a cylinder 26 having a closed bottom 27 and an open top around which latter is provided a flange 28. The cylinder 26 projects through an opening 29 in the saddle 12 so as to extend into and terminate in proximity to the bottom of the pot 19.

A tubular extension 30 open at its bottom and provided with a circumferential flange 30A thereabout forms a continuation of the cylinder 26 and projects for any desired distance above the saddle 12. The flange 30A rests upon the flange 28 and these parts are held together by means of fastening bolts 30B passing through the flanges.

The top of the extension 30 is open as at 31, and a bearing member or nut 32 is inserted in the opening 31, being held in position in any suitable manner.

Arranged within the cylinder is a piston 33 which is provided with a reduced upper end 34 to form a shoulder 35. The reduced end 34 of the piston passes loosely through the bearing or member 32 while the other portion of the piston is reciprocable in the cylinder 26. The lower portion of the cylinder 26 is of a diameter only slightly greater than the external diameter of the piston 33 so that the piston may reciprocate freely therein, and this portion of the cylinder is provided with openings 37 which form communications between the pot 19 and the interior of the cylinder.

The upper portion 38 of the cylinder is of an internal diameter somewhat greater than the diameter of the piston and this portion of the cylinder is provided with one or more openings 39 forming communication between the pot 19 and the enlarged portion 38 of the cylinder. This opening, or openings, 39 is, or are, arranged substantially at the normal level of the material 40 in the pot 19.

Leading from the portion 36 of the cylinder is an outlet passage 41 which inclines upwardly to a point in proximity to and for any desired distance above the nozzle 24 and then extends outwardly as at 42 in a substantially horizontal direction constituting therewith a goose-neck so that when the piston 33, after having been raised to admit material into the cylinder, is then forced downwardly, in a manner to be described, the material in the cylinder will be ejected with considerable force through the outlet passage 41—42 and into the mold.

The cylinder and plunger are supported upon the saddle 12 and in order to properly position the same with respect to the mold and so as to hold the nozzle 43 in position, in a manner to be described, the flange 14 (see particularly Figure 1) of the saddle through which the bolts 13 pass being provided with slots 44.

This adjustment may be effected by means of screws 45 which pass through ears 46 carried by the uprights 11 and these screws abut the end of the saddle and are provided with heads 47 by means of which they may be adjusted. Lock nuts 48 may also be provided to hold the screws in their adjusted positions.

The plunger 33 is provided with a recess 49 opening through the lower end thereof and with which recess passages 50 communicate and these passages extend laterally, transverse to the axis of the plunger and communicate with a circumferential recess 51 opening through the periphery of the plunger.

The piston packing ring embodying semicircular elements 53, is provided with overlapping ends 54 and shouldered and overlapping extremities 55. These elements are seated in the recess 51 and form a packing for the piston and they also extend across the passage 50.

When the plunger is raised they will not interfere with such movement but when the plunger is forced downwardly against the material in the portion 36 of the cylinder, the pressure of the material in the recess 49 and passages 50 will force the sections 53 outwardly and against the wall of the cylinder to form a fluid tight packing so as to prevent the material from flowing between the cylinder wall and the periphery of the plunger.

The plunger 33 may be reciprocated in any desired or suitable manner such as by means of a lever 51A pivotally mounted as at 52 intermediate its ends and preferably upon the saddle 12. One end of the lever 51A is preferably provided with a rounded surface 53 which projects into a slot 54 in the plunger, and the wall of the extension 30 is provided with a slot 55 through which the lever 51A projects and which latter slot is provided so as not to interfere with reciprocation of the plunger.

The other end of the lever is pivotally connected as at 56 preferably to a block 57 disposed in a slot 58 in the end of a bar or member 59. The other end of the member 59 is connected to a piston (not shown) which reciprocates in the cylinder 60, a coupling 61 being preferably provided between the rod 59 and the piston rod.

A bearing 62 may also be provided for guiding the rod 59 in its movements.

Fluid pressure is supplied to the cylinder 60 from any suitable source, in a manner to be described, and is adapted to flow first on one side of the piston and then on the other side to control the movement of the piston, through pipes 63—64.

If desired, and in order to accentuate or impart a quick movement to the piston in the cylinder 60, supplemental means may be provided in the way of fluid pressure. To that end there may be provided a tank or container 65 which may be mounted upon a bracket 66 connected to one of the uprights 11. This tank is provided with a control valve mechanism 67 through which fluid under any desired or suitable pressure is admitted, the tank serving as an accumulator tank for accelerating the action of the piston 33. The bottom of the tank is connected by means of a pipe 68 to the cylinder 60 below the piston. When liquid flows into the tank or container 65 through the pipe 68 the fluid in the tank or container will be compressed and at a predetermined time in the cycle of operation of the machine the expansion of the compressed fluid will discharge the liquid from the tank or container into the cylinder 60 against the piston to rock the lever 51A, thereby "speeding up" or accelerating the "shot" or discharge of the contents of the pot 19 through the outlet passage 41.

The dies or molds 69—70 are respectively mounted upon supports 71—72 and are connected to such supports as is usual with devices of this character. The support 71 is pivotally mounted as at 73 upon the support 16 (see particularly Figures 1 and 4) and has co-operating therewith a head or member 74 (see particularly Figure 1). This head or member 74 is secured in position by means of tie rods 75 which pass through the support 71 and are held in position by means of nuts 76 threaded thereonto.

The other ends of the tie rods 75 pass through the head or member 74 and nuts or collars 77—78 are threaded on to the ends of the tie rods on opposite sides of the member 74.

The numeral 79 designates generally a casing or tank for containing the fluid which operates the machine and the member 74 is supported by the same, preferably upon a track 81.

With this construction of support it will be manifest that inasmuch as the support 71 is pivotally mounted as at 73, the proper or desired adjustment of the entire die holder unit may be obtained. That is, in the assembling of the machine, if these parts are not properly alined, the support 74 may be adjusted so as to swing the support 71 about its pivot 73. This may be accomplished in any desired or suitable manner, such as by means of an adjusting screw 80, the ends of which are threaded respectively into the wall of the casing 79 and also into the supple-

mental support or track 81 upon which the support or member 74 rests.

By adjusting this screw 80 in one direction it will be manifest that the member 74 may be elevated and by adjusting the screw 80 in the opposite direction the member 74 will be permitted to be lowered.

The support 72 is freely movable upon the tie rod 75 by means of the rod passing loosely therethrough and in order to assist in supporting the support 72 during its movement there may be provided a bracket 82 which is secured to any suitable support, such as the casing or tank 79.

This bracket may be provided with slots 83 through which fastening bolts 84 pass, the slots being provided to permit adjustment of the bracket. It will therefore be manifest that when the support 72 is moved laterally, in a manner to be described, it will slide upon the bracket 82.

Movement is imparted to the support 72 by means of links 85—86 pivotally connected by one end as at 87. The free end of the link 85 is pivotally connected as at 88 to the support 72. The link 86' is pivotally supported as at 89 to arms or bracket 90 on the head or member 74.

The numeral 91 designates a cylinder in which a piston (not shown) is reciprocable. The piston rod 92 which is connected to the piston is in turn connected to an arm on the link 86 so that when the piston is moved in one direction the links 85—86 will be caused to knuckle, thereby retracting or drawing back the support 72 to separate the molds or move the mold 70 away from the mold 69 to permit extraction of the formed article. When, however, the piston is moved in the opposite direction the links 85—86 will operate to advance the support 72 to move the mold 70 into co-operative relation with the mold 69.

The piston in the cylinder 91 is moved first in one direction and then in the other by means of fluid pressure and to that end the cylinder 91 is provided with pipe connections 93—94 which communicate with the cylinder on opposite sides of the piston.

The support 71 (see particularly Figure 4) also serves as a means for assisting in supporting the nozzle 43, the exposed end of which latter is preferably convexed as at 95 so as to enter and be seated in a concaved seat 96 which encompasses the outlet end of the discharge passage 42 leading from the cylinder 27.

A guard or shield 97 may, if desired, be disposed over the nozzle 43. A lug or projection 98 may be provided on the support 71 to extend over the nozzle 24 to assist in positioning the heater and pot 19. This lug will also serve as a means for limiting the movement of the support 71 about its pivot 73 in one direction.

In an apparatus of this character any desired or suitable number of cores may be provided, according to the nature of the article being formed.

In the present exemplification of the invention and in Figure 4 as well as in Figure 2 one of such cores 99 is disclosed.

Suitable mechanism is provided for inserting and withdrawing the cores and where a plurality of cores are employed they may be arranged to be shifted either simultaneously or successively. As the mechanism which inserts and withdraws each of these cores is the same, the specific description of one will apply equally as well to all of them. The core inserting and withdrawing mechanism may be located in any desired or convenient position about the molds.

Referring to Figures 1 and 4, the core controlling mechanism consists of a cylinder 100 in which a piston is reciprocable and this piston has connected to it a piston rod 101 which extends through the top of the cylinder. A crosshead 102 is provided with an opening through which a shouldered end of the piston rod 101 passes and the crosshead is connected to the piston rod 101 in any suitable manner so as to move with the piston rod. Passing through the crosshead and through suitable openings 103 therein are bars or rods 104 which are provided with threaded extremities 105. Nuts or collars 106 are threaded upon the rods 104 on one side of the crosshead and similar nuts or collars 107 are threaded on these rods on the other side of the crosshead. The respective nuts 106 are spaced from the respective nuts 107 so as to permit an independent movement of the crosshead with respect to the rods.

These rods 104 pass through suitable guides 108 and also through another crossbar or member 109 which latter is disposed below the cylinder 100 and in proximity to the molds 69—70.

The cross member 109 is secured to the rods 104 preferably by means of nuts or collars 110 threaded on to the rods on opposite sides of the cross member 109. The core 99 is secured to the member 109 in any suitable manner, such as by means of nuts 111 threaded on one extremity thereof on opposite sides of the cross member 109 and through which cross member one end of the core 99 passes.

Thus it will be seen that when fluid enters the cylinder 100 through a pipe connection 112 on one side of the piston, the piston will be raised from the position shown in full lines in Figure 2 to the position shown in dotted lines in the said figure. During this movement of the piston the fluid above the piston will be discharged through the pipe connection 113. When, however, the flow of the fluid is reversed, that is, when it is exhausted through the pipe connection 112 and admitted through the pipe connection 113 into the cylinder 100, the piston will be lowered and the core 99 will be inserted through suitable openings in the mold sections 69—70, as shown in Figure 4.

It will be noted that there is a lost motion between the crosshead 102 and the rods 104. This is provided in order that locking mechanism for holding the core in position may be provided so as to operate to lock the cores after they have been properly positioned and during the operation of forcing a charge into the molds, and then unlocked so as to permit the cores to be withdrawn.

Any suitable locking means may be provided for that purpose but a simple and efficient locking means embodies a bell crank lever 114 pivotally mounted as at 115 on a suitable support. To one arm of the bell crank lever a rod 116 is pivotally connected, as at 117 while the other end of the rods or links 116 are pivotally connected as at 118 to ears or projections 119 on the crosshead 102.

Carried by the crossbar 109 are seats 120 which are concaved and are struck on an arc described from the center of the pivots 115.

The free extremity of the arm 121 of the bell crank lever 114 is curved as at 122 and these curved extremities coincide with the seats 120 and are adapted to be seated therein when the parts are in the full line position shown in Figure 2, that is, when the core 99 is in position in the mold 69—70.

In this position it will be noted that the collars 107 are out of contact with the crosshead 102 and the parts will be held in this position by reason of the fluid in the cylinder 100 exerting its pressure upon the top of the piston, until the article has been formed by the material injected into the mold.

After the casting operation, fluid is exhausted from the top of the piston and admitted into the cylinder beneath the piston which will immediately cause the crosshead to be raised and this raising movement will continue causing the bell crank lever 114 to swing about its pivot 115 with the result that the ends 122 of the arms 121 of the bell crank levers will be moved out of engagement with the seats 120, thereby unlocking the core 99.

By the time the unlocking has been completed, the crosshead 102 will have assumed the position shown in dotted lines in Figure 2, that is, until it contacts with the nuts 107. Thereafter a further movement of the crosshead 102 in the same direction will raise the rods 104 and with them the crossbar 109 so that the core 99 will be withdrawn from the mold.

To insert the core 99 into the mold the operation of these parts will be just reversed.

The cylinder 100 may be supported in any suitable manner, such as by means of a bar or rod 123, one end of which may be secured to the stationary support 71 by being sleeved through a portion thereof and clamped or secured against movement with respect thereto by any suitable clamping or securing device 124. The rod 123 passes loosely through a bearing 125 in the support 72 (see particularly Figures 1 and 4) so that the movement of the support 72 will not be interfered with.

The cylinder 100 is supported so that it may be adjusted to any desired position, either uprightly as shown in Figures 1 and 4 in full lines, or into an inclined position as shown in dotted lines in Figure 1.

To that end the cylinder may be provided with a bifurcated base (see particularly Figure 2) 126 in which is a split or divided bearing block 127 through which the bar or rod 123 passes. A clamping bar or rod 128 may be provided for supporting the cylinder for movement about the rod 123 as a pivot and this bar or rod forms a pivot about which the cylinder 100 may be moved. A slot 129 may be provided in the block 127 through which fastening bolts 130 pass to clamp or secure the cylinder 100 in its adjusted position. Thus by loosening the clamping bolt 130 the cylinder may be swung about its pivotal support 128 to any desired position and then secured against further movement by means of the clamping bolts 130. This adjustment is provided in order to permit the core 99 to be properly positioned according to the shape of the article to be formed and the angle in which it is to be inserted into the mold.

The controlling or operating fluid is supplied to the various cylinders 60, 91 and 100, as well as to the container 65, from the tank or supply 79 by means of a suitable pump or circulating device (not shown) which is operated by means of a suitable motor 132. The pump forcing the liquid through the respective pipes to the respective cylinders and the operation of the pistons in these cylinders is controlled according to the side of the piston on which the fluid is admitted to the cylinders, as will be fully understood, and the direction of flow of the fluid through the pipes is controlled by the valve mechanism of any ordinary or well known construction, suffice it to say that the valve is of such a construction that when moved to one position it will cause one of the pipes of the respective cylinders to operate as an inlet for the cylinder and the other of the pipes as an outlet, and vice versa. These valves are all located in a convenient position for the operator, preferably in proximity to each other, such as shown in Figures 1, 7 and 8.

The valve for controlling the fluid with respect to the mold closing cylinder 91 is designated generally by the reference numeral 133 in Figure 8, while the valve for controlling the fluid with respect to the core pulling and inserting cylinder 100 is designated generally by the reference numeral 134, and the valve for controlling the fluid with respect to the shot delivering or ejecting cylinder 60 is designated generally by the reference numeral 135.

Handles 136, 137 and 138 are provided for the respective valves 133, 134 and 135.

In order to provide an arrangement which will insure the correct series of operation of the valves for the different mechanism and to prevent the inaccurate operation of any one of the valves at any time in the cycle of operation of the machine, suitable locking or controlling means is provided for the valve.

These valves are located preferably in alinement with each other and in close proximity, and connected to the valve 134 is a member 139 provided with a hook shaped extremity 140 forming a seat 141. This member 139 is also provided in its periphery with a concaved seat 142, all disposed on one side of the pivot of the valve. The member 139 also extends to the opposite side of the pivot and is provided with a seat 143 in a portion 144, the extremity of which latter is convexed as at 145. When the valve is rotated by the handle 137 this member 139 with the extension 144 will swing about the pivot with the valve.

On the valve 133 is a plate or member 146 which is provided with a seat 147 in a portion 148 that is adapted to receive the projection or hooked end 140 on the member 139. The extremity of the member 146 is concaved as at 149 and adapted to be seated in the concaved seat 142 on the member 139.

Connected to the valve 135 is a plate or member 150 in the edge of which is provided a concaved seat 151. Spaced from this seat 151 and in alinement therewith is a hook shaped extremity 152 on the member 150 forming a seat 153.

When the valves are in the position shown in Figure 7, the valves 134 and 135 will be locked against operation as the concaved extremity 145 of the member 144 will be seated in the seat 151 of the member 150, thereby locking the valve 135. At the same time the concaved extremity 149 of the member 146 will be seated in the concaved seat of the member 139 and this will lock the valve 134 against operation until the valve 133 is actuated.

When the valve 133 is operated to cause the member 146 to assume the position shown in the full lines in Figure 8 the valve 134 may be operated or moved to the position shown in dotted lines in Figure 8, but until the valve 134 is moved to such a position the valve 135 will be locked against operation, that is, until the extremity 145 of the member 144 is moved out of the seat 151 in the member 150.

Thus it will be seen that these valves will be interlocked and it will only be possible to oper-

ate predetermined ones of the valve in a predetermined order or sequence. This will insure a proper operation of the machine.

By the provision of the container 65 with the compressed fluid above the actuating fluid, the plunger 33 will be given a sudden movement, thereby causing the material in the pot 19 to be suddenly forced or injected into the mold.

In the present form of the invention the mold section 69 (see Figure 4) is held stationary while the mold section 70 is moved toward and away from the mold during the operation of the machine.

While the preferred form of the invention has been herein shown and described, it is to be understood that various changes may be made in the details of construction and in the combination and arrangement of the several parts, within the scope of the claims without departing from the spirit of the invention.

What is claimed as new is:

1. In a casting machine a frame embodying spaced uprights, a member pivotally mounted upon said frame, a second member spaced from the first said member, means connecting said members for maintaining them in fixed spaced relation, an adjustable support upon which the second said member rests and by means of the adjustment of which both of said members and the said connecting means will be moved about said pivot, an intermediate member disposed between the other said members and movably supported by the said connecting means, co-operating mold members carried by the first said member and said intermediate member, means for effecting relative movements of the said mold members into and out of co-operative relation, and an additional support for supporting and guiding the said intermediate member in its movements.

2. In a casting machine a frame embodying spaced uprights, a member pivotally mounted upon said frame, a second member spaced from the first said member, means connecting said members for maintaining them in fixed spaced relation, an adjustable support upon which the second said member rests and by means of the adjustment of which both of said members and the said connecting means will be moved about said pivot, an intermediate member disposed between the other said members and movably supported by the said connecting means, co-operating mold members carried by the first said member and said intermediate member, means for effecting relative movements of the said mold members into and out of co-operative relation, an additional support for supporting and guiding the said intermediate member in its movements, and means adapting said additional support for independent adjustment.

3. In a casting machine, co-operating mold members, means individual to the members for supporting them, fluid actuated means for effecting a relative movement of the mold members, core inserting and withdrawing means embodying a cylinder and a piston to one of which the core is connected, a support maintained in a fixed position with relation to the mold members, means mounting said cylinder upon the last said support for pivotal adjustment to vary the angular plane in which the core is inserted into and removed from the mold, means for supplying fluid pressure to said cylinder, and means operating automatically to lock the core pulling means against operation at a predetermined time in the cycle of operation of the machine and in any position of the said cylinder.

4. In a casting machine, co-operating mold members, means supporting the mold members for relative movements into and out of co-operative relation, means for effecting such movements, core supporting means, means for actuating the core supporting means, means mounting the core supporting means for angular adjustment with respect to the mold members to compensate varying angles at which the core may be inserted into and withdrawn from the mold, and means operating automatically to lock the core pulling means against operation, at a predetermined time in the cycle of operation of the machine.

5. In a casting machine, co-operating mold members, means supporting the mold members for relative movements into and out of co-operative relation, means for effecting such movements, core supporting means, means for actuating the core supporting means, means mounting the core supporting means for angular adjustment with respect to the mold members to compensate varying angles at which the core may be inserted into and withdrawn from the mold, and means responsive to the operation of the movable one of the cylinder and piston elements for locking and unlocking the core inserting and pulling means at predetermined times in the cycle of operation of the machine.

6. In a casting machine, a mold, core inserting and pulling means embodying a cylinder, a piston movable in the cylinder, a loose but operative connection between said piston and the core, whereby the piston will have a predetermined movement independent of the core, and locking means for maintaining the core against movement during a predetermined time in the cycle of operation of the machine, the said locking means being controlled in its operation by the said independent movement of the said piston.

7. In a casting machine, a mold, core inserting and pulling means embodying a cylinder, a piston movable in the cylinder, a loose but operative connection between said piston and the core, whereby the piston will have a predetermined movement independent of the core, and locking means for maintaining the core against movement during a predetermined time in the cycle of operation of the machine, the said locking means being controlled in its operation by the said independent movement of the said piston, the said locking means embodying a swinging member and a seat into and out of which latter a portion of said swinging member is movable.

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