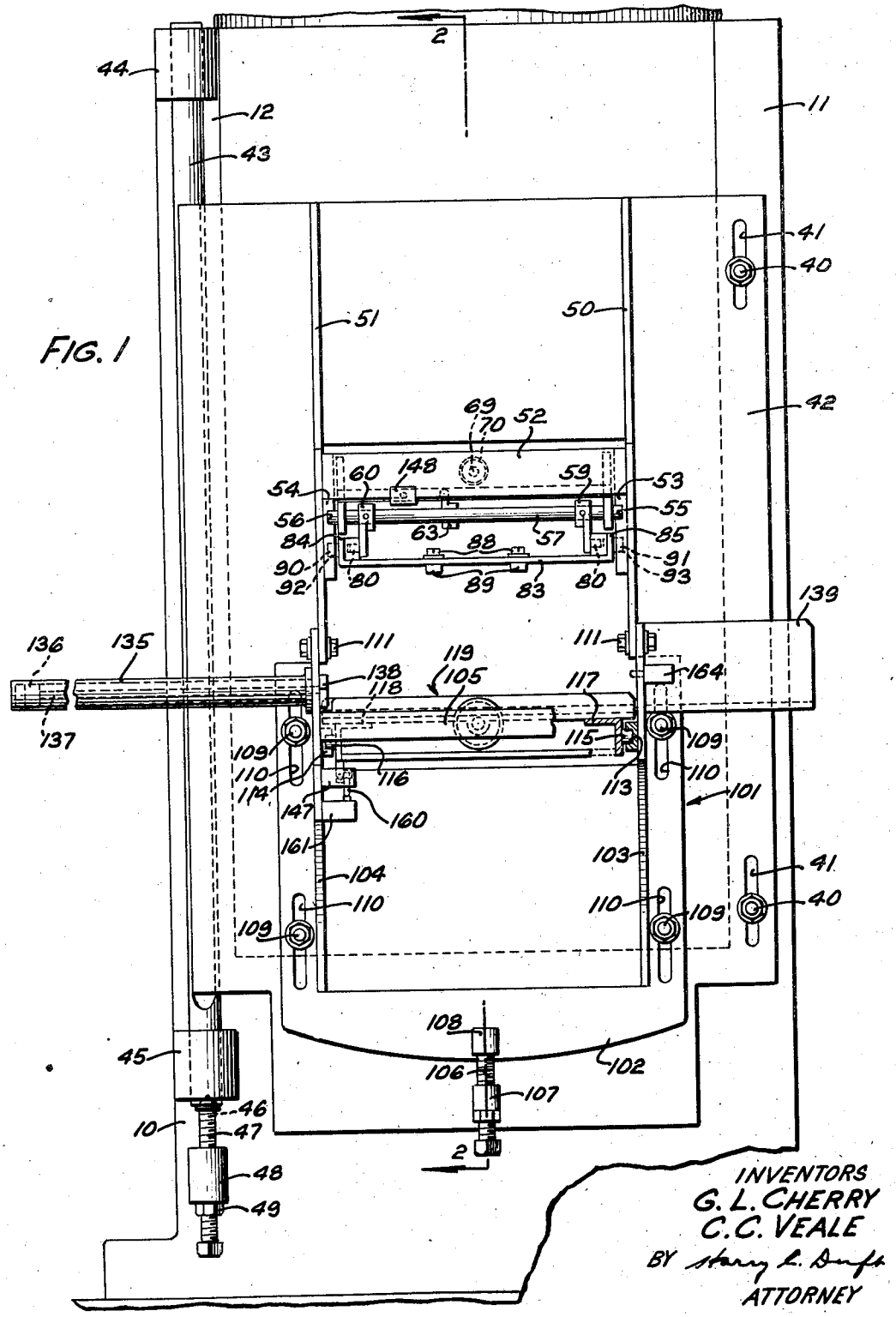
Aug. 12, 1947. G. L. CHERRY ET AL 2,425,362

UNLOADING APPARATUS

Filed Oct. 10, 1944 5 Sheets-Sheet 1

FIG. 1



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UNLOADING APPARATUS

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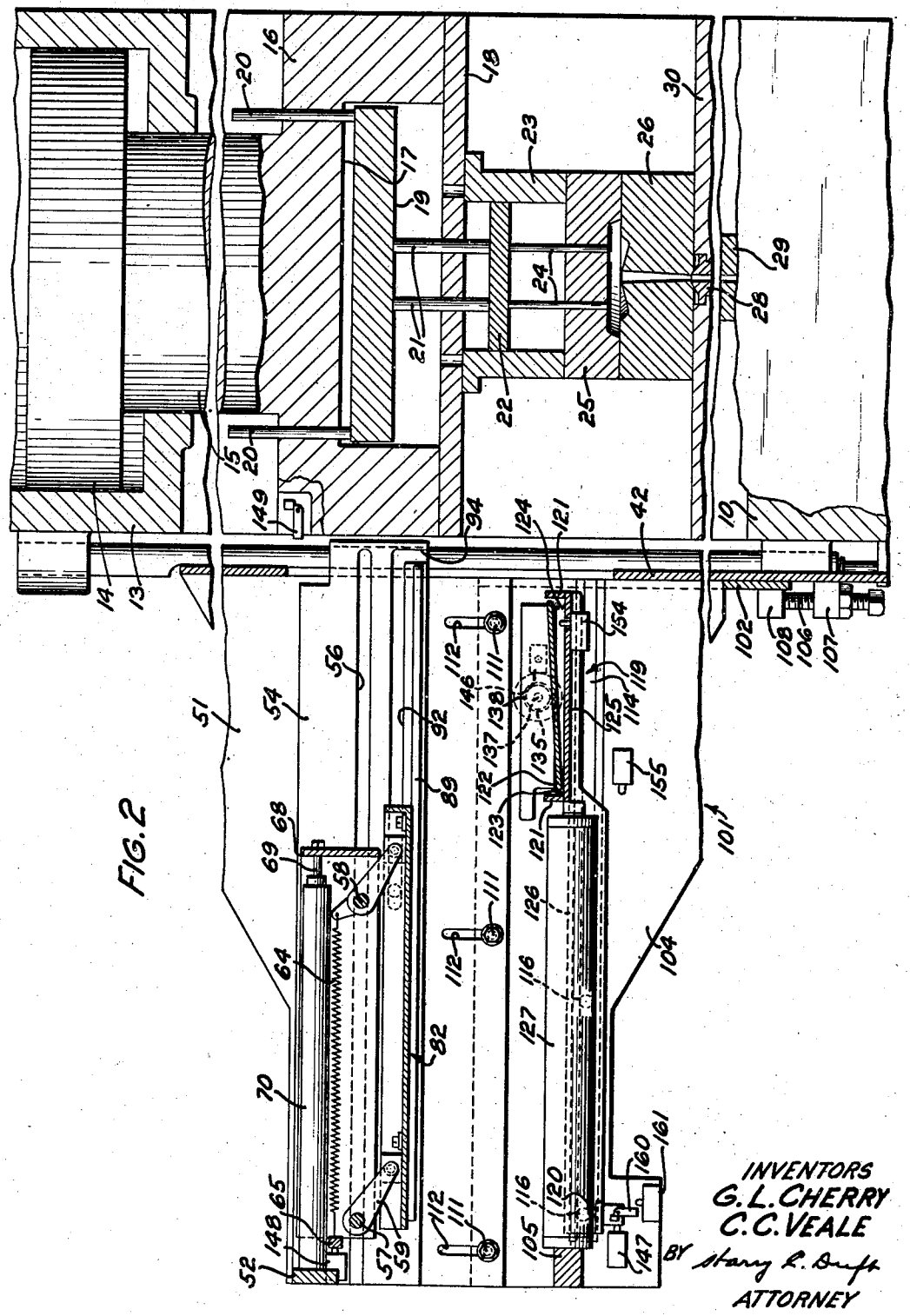

FIG. 2

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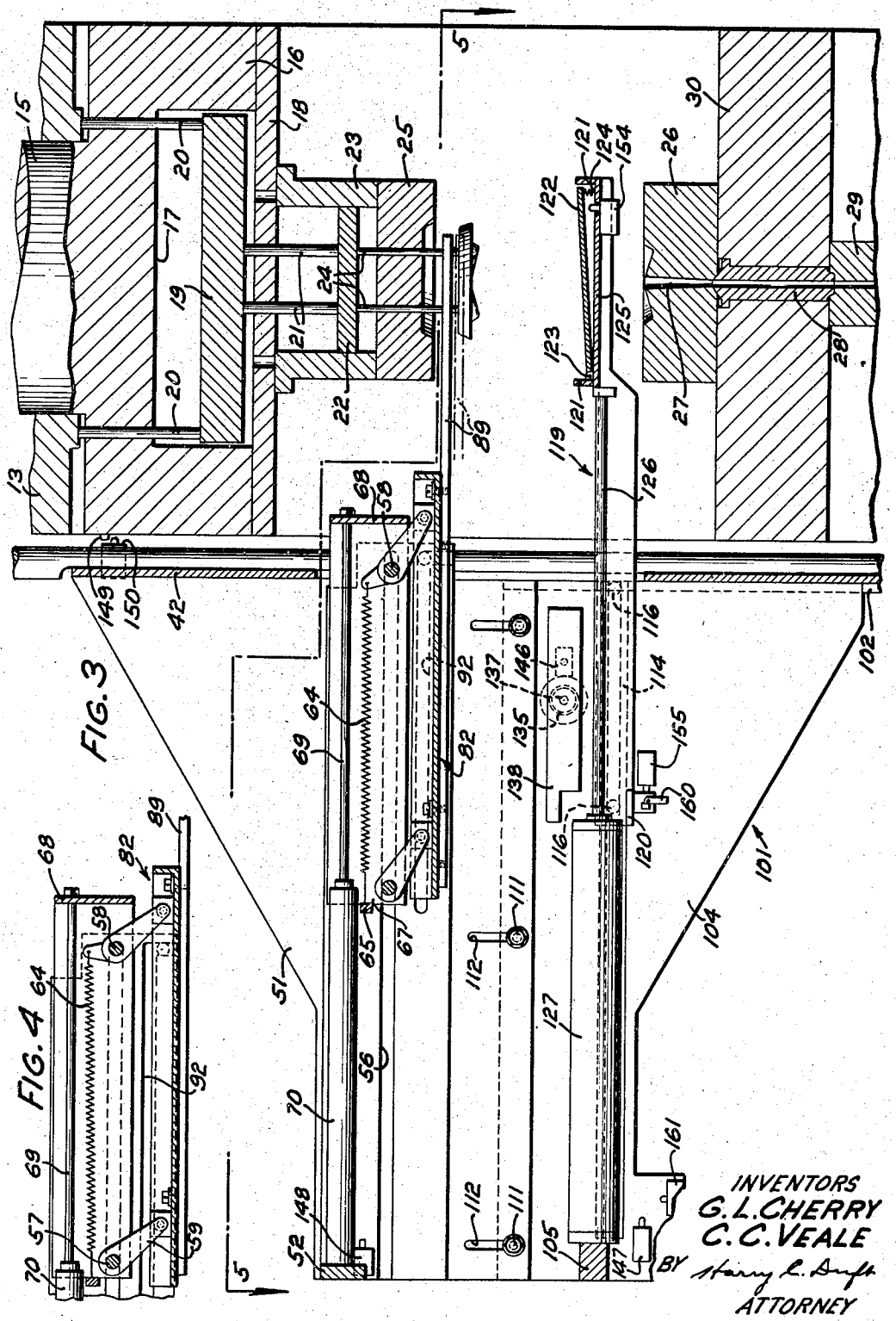

FIG. 3

FIG. 4

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UNLOADING APPARATUS

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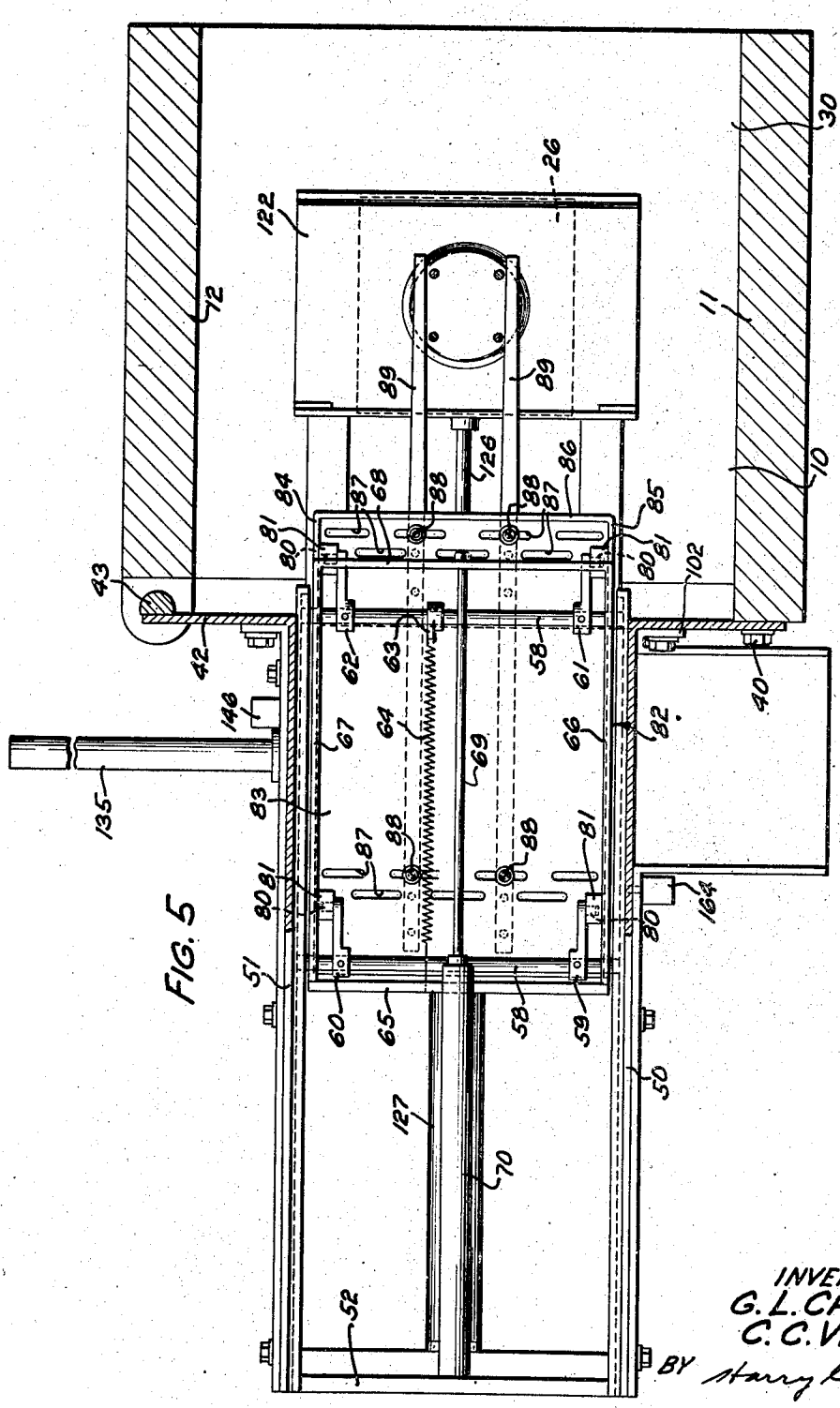

FIG. 5

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UNLOADING APPARATUS

Filed Oct. 10, 1944 5 Sheets-Sheet 5

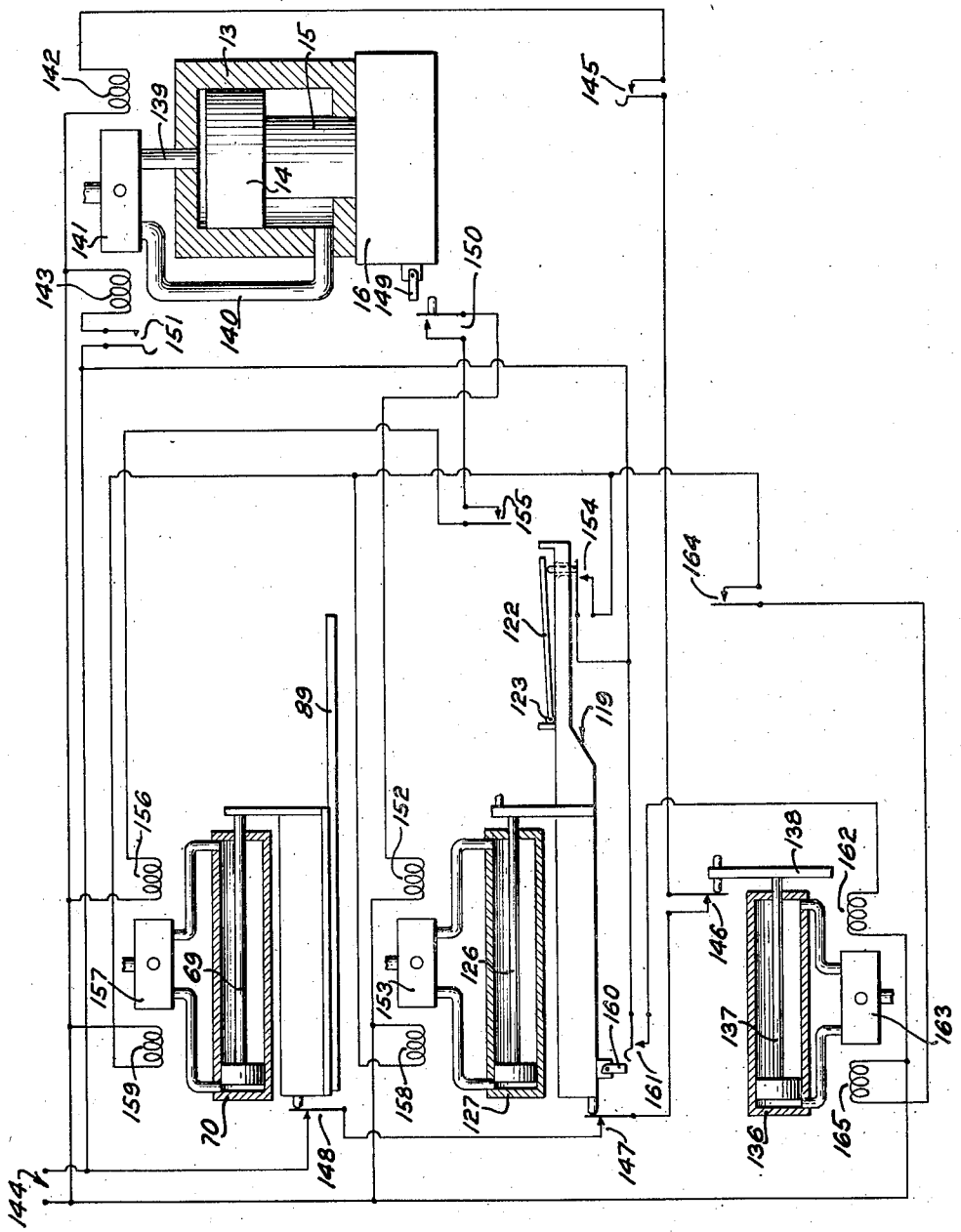

FIG. 6

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UNITED STATES PATENT OFFICE

2,425,362

UNLOADING APPARATUS

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Application October 10, 1944, Serial No. 558,008

3 Claims. (Cl. 214—1)

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This invention relates to unloading apparatus, and more particularly to an apparatus for removing castings from die casting machines.

It is an object of the present invention to provide a simple, rugged and effective unloading apparatus.

In accordance with one embodiment of the invention, as applied to an apparatus for removing die castings from a die casting machine, a main support plate is provided for carrying a framework on which a stripping mechanism is mounted for movement into engagement with a die cast part which has adhered to the knockout pins of the die casting apparatus. Adjustably mounted with respect to the stripper mechanism and carried by the mounting plate is a framework for supporting a transfer conveyor which is adapted to move into position between the dies of the die casting apparatus to receive a die casting stripped from the upper die of the casting machine either by the knockout pins or by the stripper mechanism. The transfer conveyor, upon receipt of the die casting, will be retracted to its inoperative position in alignment with an ejector plunger, mounted on the same framework that carries the transfer conveyor, which plunger is operable to eject the die casting from the conveyor to a guide chute for directing the casting out of the apparatus. Means are provided in the apparatus for synchronizing the movements of the various movable parts with the operation of the die casting machine.

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

Fig. 1 is a fragmentary front elevational view of a die casting machine having an unloading apparatus embodying the present invention mounted thereon;

Figs. 2 and 3 are fragmentary vertical sectional views taken substantially along the line 2—2 of Fig. 1 in the direction of the arrows and showing the dies of the die casting machine in their closed and open positions, respectively, and also showing the unloading apparatus in its unoperated and partially operated positions;

Fig. 4 is a fragmentary detail view also taken along the line 2—2 of Fig. 1 and showing the stripping mechanism in its completely operated position;

Fig. 5 is a plan sectional view taken substantially along the line 5—5 of Fig. 3 in the direction of the arrows; and

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Fig. 6 is a schematic diagram of a control circuit for synchronizing the operation of the various parts of the unloading apparatus with each other and with the die casting machine.

Referring to the drawings, wherein like reference characters designate the same parts throughout the several views, it will be seen that the die casting machine is provided with a base frame 10, from which extend upwardly a pair of side walls 11 and 12 for supporting a die operating cylinder 13 in a position to support and actuate a piston rod 15 carrying a die actuating block 16. The die actuating block 16 has a central cavity 17, the lower end of which is substantially closed by a platen 18. Mounted within the cavity 17 is a knockout pin actuating plate 19 having guide pins 20—20 fixed to it and slidable in suitable apertures formed in the die actuating block 16. The knockout pin actuating plate 19 carries actuator pins 21—21, on the lower end of which there is mounted a plate 22. The plate 22 is slidable in a die block 23 and carries knockout pins 24—24 in suitable apertures in an upper die 25, which is fixed to the die block 23 in any suitable manner.

Positioned in direct vertical alignment beneath the upper die 25 is a lower die 26 having an entrance gate 27 aligned with a nozzle 28, which is, in turn, aligned with the upper end of an injector gooseneck 29. The nozzle 28 and lower die 26 are supported by a cross member or platen 30, which is carried by the side walls 11 and 12. The mechanism described thus far comprises a conventional, vertical type die casting machine with which the apparatus of the present invention is designed to cooperate. It will be understood that any suitable die casting machine may be equipped with the unloading device of the present invention and that details of the die casting machine of themselves are not pertinent to the present invention except insofar as they cooperate with the specific embodiment of the invention to be described in detail hereinafter.

The front face of the side wall 11 is tapped to receive a pair of machine screws 40—40, which are adapted to pass through slots 41—41 formed in a framework supporting plate 42, the left end of which is attached to a pintle rod 43 rotatably and slidably mounted in a pair of hinge members 44 and 45 suitably fixed to the wall 12. The lower

end of the pintle rod 43 has a conical seat 46 formed in it for receiving the tapered tip of a pivot screw 47, which is threaded into a boss 48 fixed on the base 10 and which is locked in place by a locking nut 49. From the foregoing, it will be apparent that the framework supporting plate 42 may be adjusted vertically with respect to the die casting machine and, when adjusted, may be locked in place thereon by means of the machine screws 40—40 and that the framework supporting plate 42, upon removal of the screws 40, may be swung out of position on the front of the die casting machine to make the dies and other parts of the die casting machine readily accessible.

Formed integrally with or suitably secured to the front face of the plate 42 are a pair of side frame members 50 and 51, which are connected at their outer or forward ends by a cross brace 52. The side frame members 50 and 51 have rail plates 53 and 54, respectively, secured to them in which there are formed a pair of slots 55 and 56 for receiving the outer ends of a pair of support shafts 57 and 58. The shaft 57 has a pair of levers 59 and 60 attached to it and the shaft 58 has a pair of levers 61 and 62 attached to it. In addition to the levers 61 and 62, the shaft 58 also has a lever 63 fixed to it, to which there is attached a contractile spring 64 having its opposite end attached to a cross brace 65. The cross brace 65 serves to interconnect the forward or left-hand end (Figs. 2, 3, and 5) of carriage side plates 66 and 67, through which the shafts 57 and 58 extend and which are interconnected at their right ends, as shown most clearly in Figs. 2, 3 and 5, by a back plate 68. The back plate 68 has attached to it a piston rod 69, which is adapted to be actuated by fluid under pressure in a cylinder 70 mounted upon the cross brace 52.

Each of the levers 59, 60, 61 and 62 carries a pin 80—80, which extends into a boss 81—81 mounted on a stripper carrying frame, designated generally by the numeral 82, whereby the frame 82 is suspended on the levers 59 to 62, inclusive. The stripper carrying frame 82 comprises a bottom portion 83 and side flanges 84 and 85 and an end flange 86, the bosses 81 being mounted on the side flanges and the bottom flange being provided with a plurality of slots 87 adapted to receive machine screws 88—88. The slots 87 are spaced apart on the bottom portion 83 of the stripper carrying frame in such manner that a pair of stripper fingers 89—89, into which the machine screws 83 may be threaded, may be adjustably mounted on the bottom of the frame 82 to properly space the stripper fingers to engage and strip castings of various shapes and sizes from the knockout pins 24. The side flanges 84 and 85 of the frame 82 have pins 90 and 91, respectively, attached to them which extend into slots 92 and 93 cut into the rail plates 54 and 53, respectively. The slots 92 and 93 extend horizontally throughout most of their length and terminate in downwardly extending slots 94—94, as shown most clearly in the rail plate 54 in Fig. 2.

In the operation of the apparatus, the stripper carrying frame 82 will move to the right to the position shown in Fig. 3 and at that position the pins 90 and 91 will reach the end of horizontally disposed slots 92 and 93. As the piston rod 69 continues to move to the right (Fig. 3), the pins 90 and 91 will reach the end of the horizontal slots 92 and 93 and will move into the vertically disposed slots 94—94 and the stripper carrying

frame 82 will be moved downwardly to the position shown in Fig. 4, the levers 59, 60, 61 and 62 being rocked in a clockwise direction against the action of the contractile spring 64. In this manner, the stripper fingers 89, after being moved into position above a casting, as shown in Fig. 3, will be moved downwardly to the dot and dash position, as shown in Fig. 3, to strip a casting from the knockout pins 24.

The side frame members 50 and 51, in cooperation with the framework supporting plate 42, adjustably support a conveyor frame 101 comprising a substantially U-shaped base plate 102 (Fig. 1), having fixed to it a pair of side members 103 and 104, which are interconnected adjacent their outer ends by a cross brace 105. The conveyor frame 101 may be adjusted vertically with respect to the plate 42 and side frame members 50 and 51 by means of an adjustment screw 106, which engages an abutment member 108 fixed to the plate 102 near the bottom of it and which is threaded into a boss 107 on the framework supporting plate 42. The conveyor frame 101 may be locked in any of its adjusted positions by means of a plurality of machine screws 109—109 threaded into the framework supporting plate 42 and extending through slots 110—110 in the upwardly extending portions of the base plate 102. In addition to the machine screws 109 for holding the conveyor frame 101 in its adjusted position, a plurality of bolts 111 fixed in the side members 103 and 104 extend through slots 112—112 in the side frame members 50 and 51.

The side members 103 and 104 have rails 113 and 114 attached to them for receiving pins 115—115 and 116—116, respectively, which are mounted on angle members 117 and 118 forming part of a conveyor assembly, designated generally by the numeral 119. The angle members 117 and 118 are interconnected at their left ends (Figs. 2 and 3) by a cross brace 120 and at their right ends by a cross plate 125 having flanges 121—121 (Fig. 3). Mounted directly above the cross plate 125 is a casting receiving plate 122 hinged on the cross plate 125 at 123 and normally urged to the position shown in Fig. 3 by a compression spring 124. Connected to the left flange 121 of the cross plate 125 is a piston rod 126, which extends into a cylinder 127 mounted on the cross brace 105. When fluid under pressure is admitted to one end of cylinder 127, piston rod 126 will move plate 122 to the position shown in Fig. 3 and when fluid under pressure is admitted to the opposite end of cylinder 127, the piston rod 126 will be retracted to move the plate 122 back to the position shown in Fig. 2.

Mounted upon the side member 104 is a cylinder 135, in which there is positioned a piston 136 for actuating a piston rod 137 carrying at its right end (Fig. 1) an ejector plate 138, which, at the proper time in the cycle of operation of the apparatus, is advanced by the piston rod to push a casting off of the casting receiving plate 122 onto a chute 139 suitably mounted on the side member 103 in position to receive the casting and direct it to conveyor mechanism (not shown).

The flow of fluid pressure to the various cylinders in the apparatus is controlled and synchronized by an electrical circuit including switches mounted to be operated by moving parts of the apparatus, as will be described in connection with the following description of the mode of operation of the apparatus. Fluid under pressure may be supplied to the upper end of the die operating

cylinder 13 through a pipe 139 (Fig. 6) and to the bottom end of the cylinder 13 through a pipe 140. The pipes 139 and 140 are in communication with ports in a solenoid operated valve 141, which may be operated by either of two solenoid coils 142 or 143. Energization of the coil 142 will shift valve 141 to a position where fluid will be fed to upper end of cylinder 13, through the pipe 139, and the valve will remain in position to continue to supply fluid to the upper end of the cylinder 13 until the coil 143 is energized to shift the valve 141. Each of the valves provided in the apparatus for controlling the flow of fluid to the cylinders 13, 70, 127 and 136 is of the type which, when shifted from one operated position to the other, will remain in that position until the opposite solenoid coil associated therewith is energized.

In the operation of the apparatus, a circuit may be completed to energize the coil 142 to cause the piston 14 to move downwardly over a circuit from a current source 144 upon closure of a manually operable switch 145 through series connected switches 146, 147 and 148, which operate under control of the piston rods 69, 126 and 137 when the piston rods are in their normal retracted position, as shown in Fig. 6. The switches 146, 147 and 148 are positioned to be closed by abutments on the apparatus adapted to be actuated by the respective piston rods and when all of the piston rods are in their retracted positions, these switches will be closed. Thus if all of the unloading apparatus is in its normal inoperative position, closure of the manually operative switch 145 will complete a circuit to energize solenoid coil 142, thereby to actuate the valve 141 and direct fluid under pressure to the upper end of the cylinder 13. The die actuating block 16 has a switch operating member 149 mounted thereon which is ineffective to close its associated switch 150 on downward movement of the piston 14, but which is effective to close its switch 150 momentarily just before the piston 14 reaches the upper end of its travel in moving upwardly.

From the foregoing, it is believed apparent that the switch operating member 149 will not be operative on the downward movement of the piston 14 and parts carried thereby, but, upon the upward movement of the piston 14, will close the switch 150. After a part has been die cast in the die casting machine, a switch 151 may be closed manually or by any suitable control mechanism (not shown) to reverse the valve 141 and direct fluid under pressure to the lower end of the cylinder 13, thus to retract the die actuating block 16 to its inoperative position, as shown in Fig. 3. Just prior to the time that the die actuating block 16 reaches its uppermost position, it will momentarily close the switch 150 to supply current from the source 144 for energizing a valve actuating coil 152 to shift a valve 153 to position to supply fluid under pressure to the left end of the cylinder 127. When fluid is supplied to the left end of the cylinder 127, the conveyor assembly 119 will be moved to the right into position to receive a casting formed in the die casting machine on the plate 122 upon ejection of the casting from the upper die 25, either by the knockout pins 24 or by the stripper fingers 89. If a part or casting is ejected from the upper die 25 onto the plate 122, the plate will pivot about its hinge 123 and will effect the closure of a switch 154. The position of the switch 150, with respect to its operating member 149, is so arranged that the plate 122 will be directly under a casting held by the upper die member 25 before the knockout pins 24 are effective to strip casting from the die member 25 and as soon as the plate 122 is directly under the die member 25, an abutment carried by the conveyor assembly 119 will close a switch 155, which will complete a circuit to a coil 156 associated with a reversible valve 157. The valve, upon energization of the coil 156, will be shifted to position to direct fluid under pressure to the left end of the cylinder 70, thus to move the stripper fingers 89 over to position to engage a casting and then downwardly to strip the casting from the knockout pins 24, if the casting has adhered to the knockout pins. If, in the operation of the apparatus, the knockout pins strip the casting from the die member 25 before the stripper fingers reach their farthest actuated position, the switch 154, being closed due to the presence of a casting on the plate 122, will supply energizing current from the source 144 to coils 158 and 159 associated with the solenoid actuated valves 153 and 157 to direct fluid under pressure to the right ends of the cylinders 70 and 127, thus to return the pistons 69 and 126 to their normal inoperative position. In the event that the casting adheres to the knockout pins 24, the stripper finger will strip the casting from the knockout pins onto the plate 122, which will then close switch 154 to effect the retraction of the stripper fingers and conveyor assembly to their inoperative position.

Mounted on the conveyor assembly 119 is a switch actuating member 160, which is operative to operate a switch 161 when the conveyor assembly 119 approaches the end of its travel to the left, but which is ineffective to operate the switch 161 during movement of the conveyor assembly 119 to the right. Thus, as the conveyor assembly 119 approaches its normal inoperative position, it will close the switch 161 momentarily to supply current to a coil 162 associated with the reversible valve 163, which, upon energization of the coil 162, will supply fluid to the cylinder 136 to cause the piston 137 to move outwardly and carry the ejector plate 138 across the casting receiving plate 122, thus to push a casting off of the plate 122. When the ejector member 138 reaches the extreme end of its travel in pushing a casting off the plate 122, it will close a switch 164, which will supply current to a coil 165 for reversing the valve 163, and cause the retraction of the ejector plate 138 to its normal inoperative position, as shown in the drawings. When the piston rods 137, 126 and 69 are retracted to their normal inoperative position, they will close the switches 146, 147 and 148, whereby another cycle of the casting machine may be initiated.

What is claimed is:

1. An unloading apparatus for a die casting machine comprising a casting conveyor movable into the casting machine to receive a casting therefrom, a stripper operable to strip a casting from said machine onto the conveyor, means responsive to the conveyor for initiating a stripping operation of the stripper, and means responsive to a part on the conveyor for initiating a retraction of the stripper.

2. An unloading apparatus for a die casting machine comprising a casting conveyor movable into the casting machine to receive a casting therefrom, a stripper operable to strip a casting from said machine onto the conveyor, means responsive to the conveyor for initiating a stripping operation of the stripper, and means responsive to a part on a conveyor for initiating a retraction

of the stripper and for initiating withdrawal of the conveyor from the casting machine.

3. An unloading apparatus for a die casting machine comprising a casting conveyor for receiving parts cast in the machine, means for moving said conveyor into position to receive parts, an ejecting device comprising a comb for engaging an article, a pantograph leverage mechanism operable to move said comb in one plane and then in another plane to strip a part from the machine onto the conveyor, and actuating means for said ejecting means.

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