

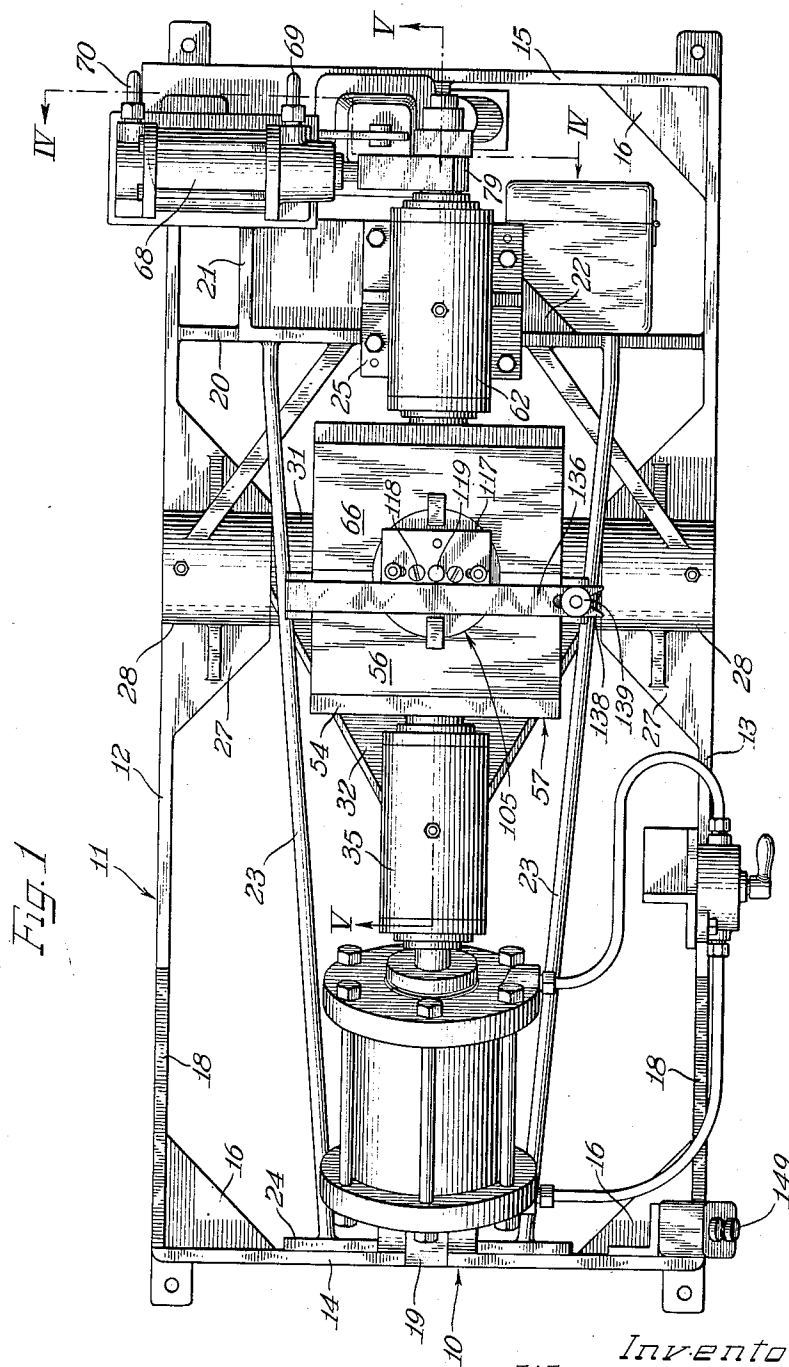
May 22, 1951

W. N. BRAMMER
CASTING MACHINE

2,553,744

Filed Jan. 15, 1949

5 Sheets-Sheet 1



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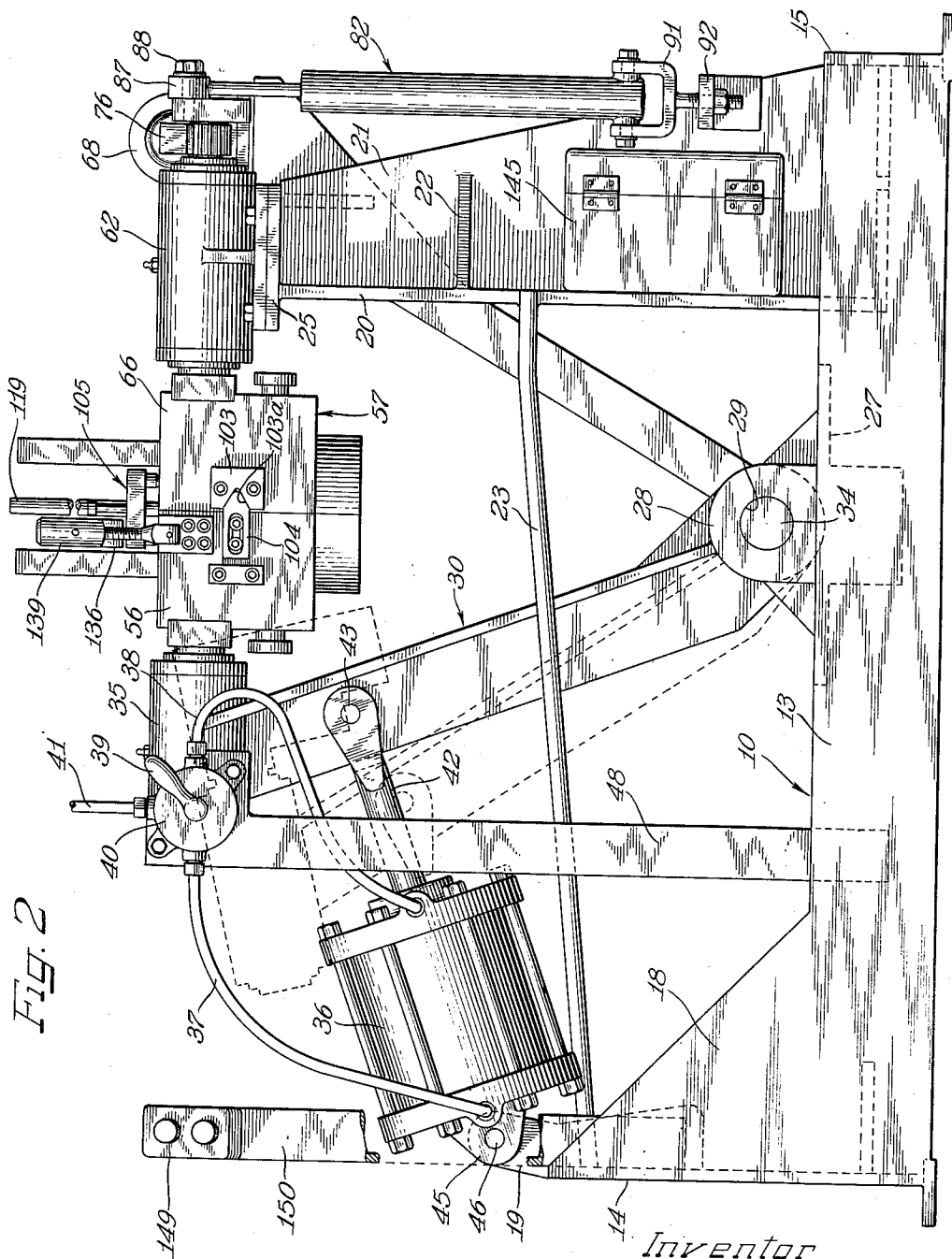


Fig. 2

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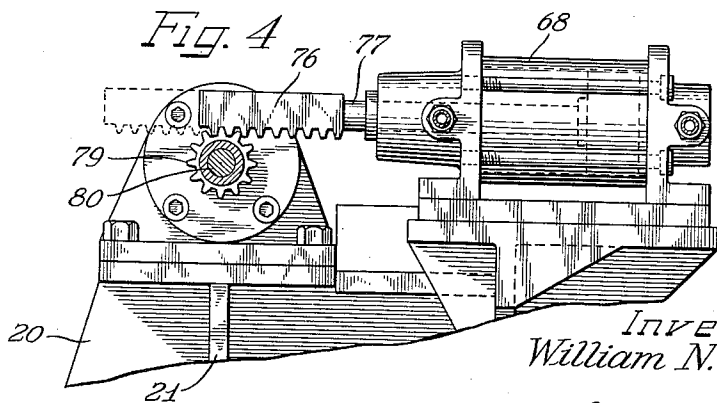
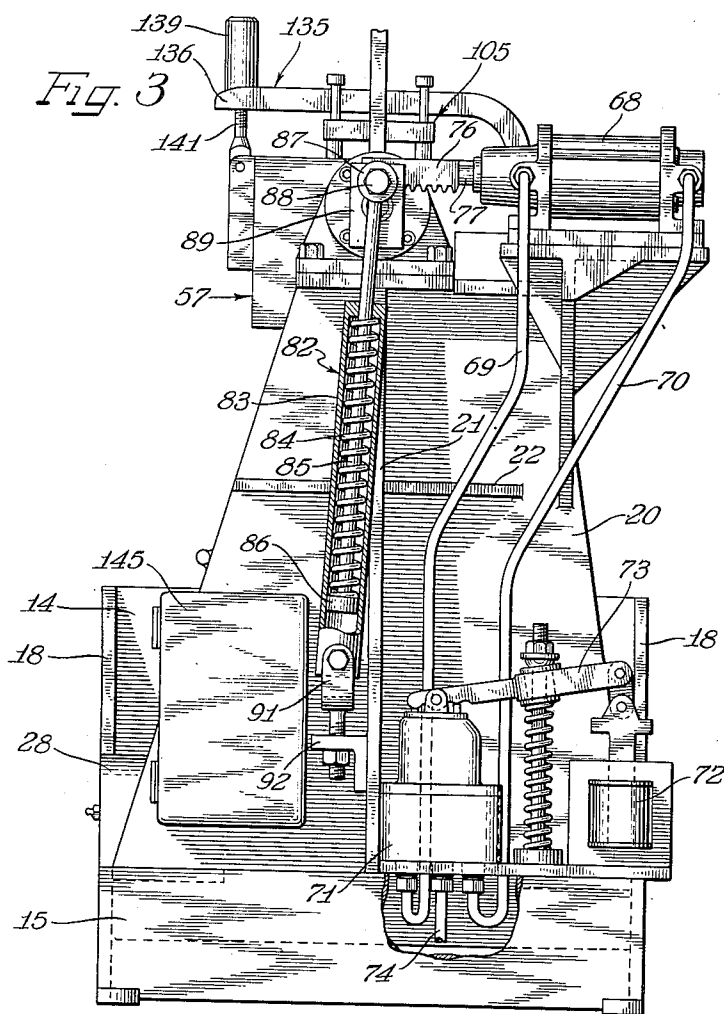
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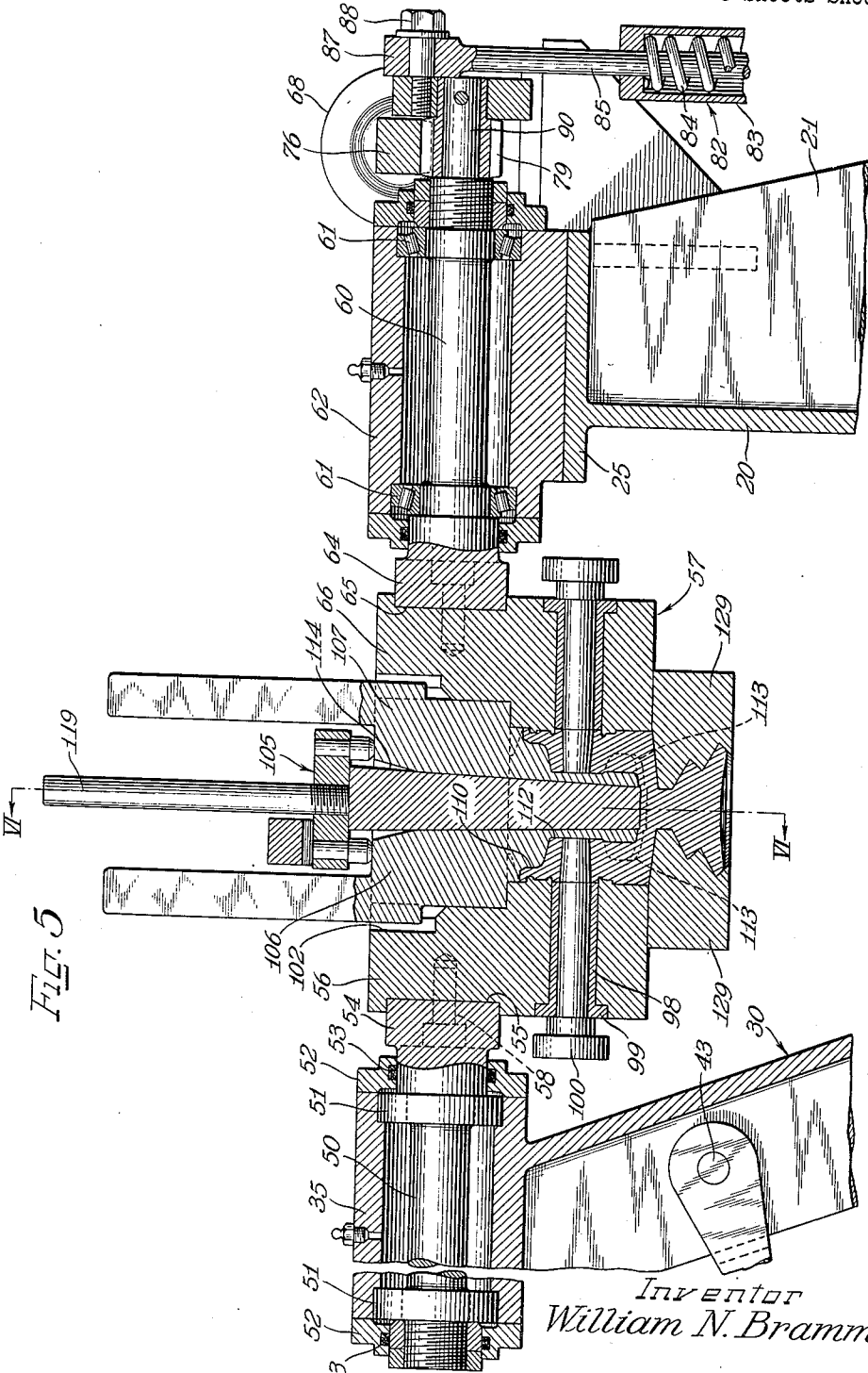


FIG. 5

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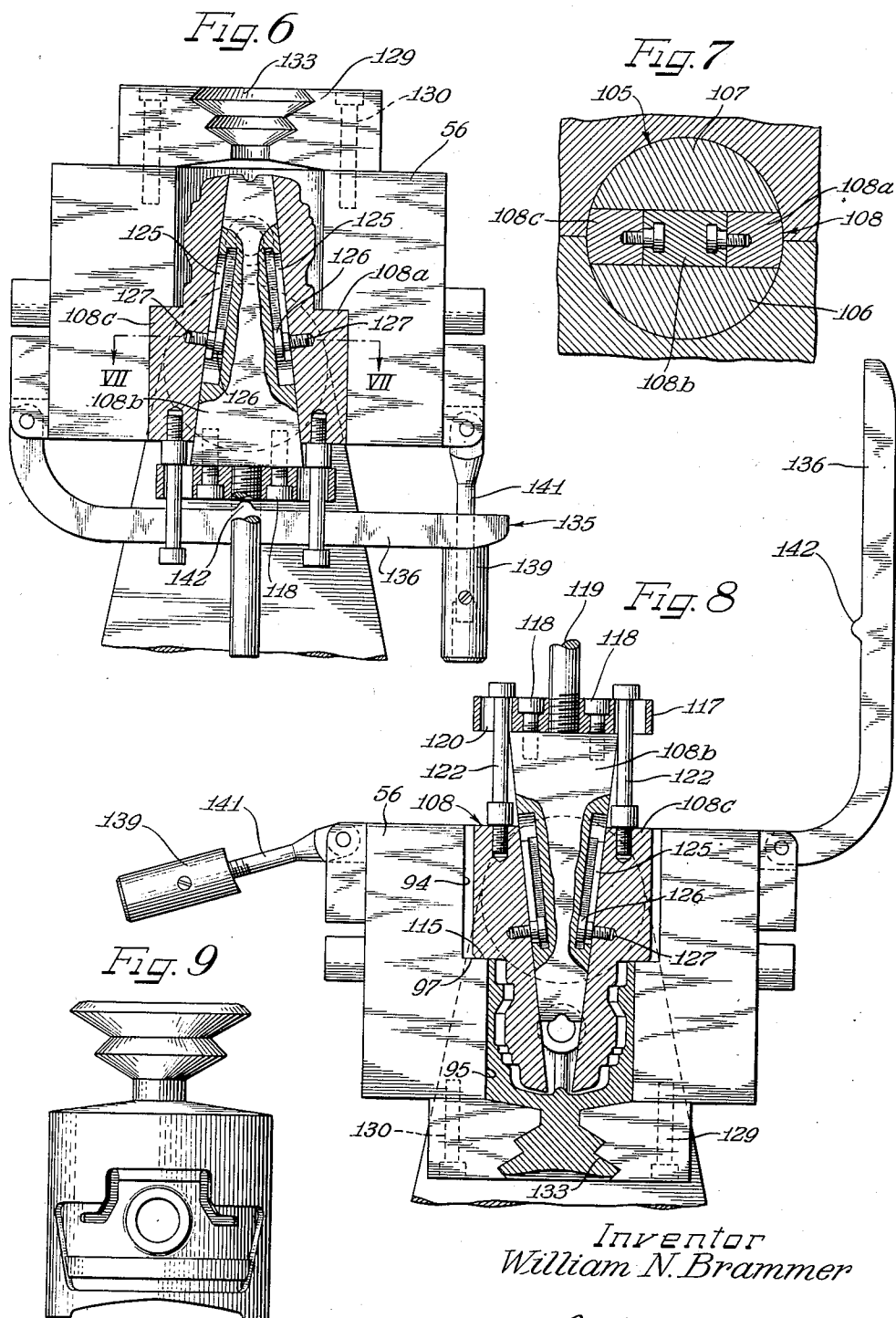
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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

2,553,744

CASTING MACHINE

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5 Claims. (Cl. 22—91)

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This invention relates to a casting machine. More particularly it has to do with a semi-automatic casting machine using permanent molds and cores and having novel features of design and operation which permit efficient casting of metals.

Casting machines have heretofore been used which employ a split mold having the portions of the mold slidable in ways toward or away from each other for making or breaking the mold. These casting machines have enjoyed a limited degree of success. However, they are usually complicated machines and are seldom adapted to efficient production casting.

According to the features of the present invention there is provided a casting machine in which a two piece permanent mold is used. One portion is rotatably mounted on a shaft journaled in a housing rigidly secured to an upright wall member. The second portion of the mold is mounted for rotation in a housing rigidly secured to a pivoting arm which is effective to move the second portion into and out of aligned engagement with the first portion.

When the two portions of the mold are aligned in an inverted position they define an upper cavity, in which permanent type cores are clamped, and a lower metal receiving cavity. After the mold is assembled, a pneumatically operated mechanism rotates it through 180° to the pouring position. Rotation of the mold starts a timing mechanism which rotates the mold 180° back to the assembly position after a predetermined pouring and solidifying period.

When the cores have been removed from the mold, a power cylinder pivots the movable portion of the mold away from the pouring station, permitting easy removal of the casting.

It is therefore an important object of the present invention to provide a casting machine that is simple in construction and operation and lends itself readily to production casting.

Another object of this invention is to provide a casting machine having a power actuated mechanism for rotating the mold from an assembly position to a pouring position and return it to the assembly position.

A still further object of this invention is to provide a casting machine employing a split mold in which one portion of the mold is stationary while the other portion is mounted for pivoting toward and away from the first portion.

Another and further object of this invention is to provide a novel method of casting including a semi-automatic control cycle.

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Other and further objects, features, and advantages of the present invention will be apparent to one skilled in the art from the following detailed description of the annexed sheets of drawings.

On the drawings:

Figure 1 is a top plan view of a casting machine constructed according to the teachings of the present invention.

Figure 2 is a side elevational view of the casting machine of Figure 1.

Figure 3 is an end elevational view of this machine.

Figure 4 is an enlarged fragmentary end sectional view taken on line IV—IV of Figure 1.

Figure 5 is a fragmentary vertical sectional view taken substantially on the line V—V of Figure 1.

Figure 6 is a vertical sectional view taken on line VI—VI of Figure 5 but showing the mold after it has been rotated to the pouring position which is 180° from that position shown in Figure 5.

Figure 7 is a fragmentary horizontal sectional view taken on line VII—VII of Figure 6.

Figure 8 is a fragmentary vertical sectional view similar to Figure 6 but showing the mold rotated to the assembly position.

Figure 9 is an elevational view of a piston which has been cast in the casting machine constructed according to the features of the present invention.

As shown on the drawings:

The casting machine illustrated in the accompanying drawings employs a mold and cores which are particularly adapted for casting pistons and it will be described as used for this purpose. However it will be understood that various other types of castings may be formed in this casting machine merely by substituting the correct molds and cores.

In Figures 1 and 2 the reference numeral 10 indicates the frame of this machine having a base 11 defined by side walls 12 and 13 and end walls 14 and 15. Connector plates 16 are suitably secured, as by welding, across the corners of the base frame members to rigidify the structure.

The end wall 14 extends upwardly from the base portion, being braced by side plates 18 and receiving at its upper end an ear member 19 which is secured, as by welding, to the inner side of the wall 14 midway between the side walls 12 and 13.

A supporting cross wall 20 is secured between the walls 12 and 13 at a point spaced from the

end wall 15. This wall 20 is provided with reinforcing ribs 21 and 22 and also is braced by two rods 23 which extend longitudinally of the casting machine and are secured at the opposite end to a plate 24 which is secured to the end wall 14. At the upper end of the support wall 20 there is provided a flat table-like portion 25.

At either side of the base of this machine a plate portion 27, integrally formed with the side walls 12 and 13, extends inwardly therefrom to provide a support for a journal block 28 which has longitudinal apertures 29 therethrough. A pivoting arm 30, having a lower cylindrical journal portion 31 and a substantially triangular shaped body portion 32, is pivotally mounted on a rod 34 which extends through the journal blocks 28 and the cylindrical journal portion 31 of the pivot arm. At the upper end of the pivotable arm 30 there is formed a cylindrical housing member 35 which has a central longitudinal aperture.

The movements of the pivoted arm 30 are controlled by a power cylinder 36 which may be operated by air under pressure which enters said cylinder at either end through inlet lines 37 and 38 which are controlled by a hand operated valve 39 disposed in a housing 40 which also receives a line 41 leading to a source of air under pressure. The power cylinder 36 has a piston rod 42 extending from one end thereof which is pivotally connected on a pin 43 to the arm 30. The cylinder 36 is also provided at one end with ear portions 45 which have openings 46 arranged to receive a pivot pin 47 which also extends through the ear 19 secured to the end wall 14.

Thus when the handle 39 is thrown in one direction air under pressure is directed from the line 41 through the line 37 to one end of the power cylinder 36 to move the piston rod 42 outwardly of the cylinder and pivot the arm 30 into its upper position as seen in Figure 2. When the lever 39 is thrown in the opposite direction the supply of air is vented from the line 37 and the line 38 is connected with the inlet line 41 and air under pressure is introduced to the opposite end of the cylinder to retract the rod 42 and draw the pivoted arm 30 downwardly to the dotted position as shown in Figure 2.

The valve 40 may be mounted on an upstanding arm member 48 which is secured to the side wall 13 of the base.

As best seen in Figure 5 a shaft 50 is journaled in the housing 35 on bearings 51. The housing has end cap members 52 containing oil seals 53 arranged to prevent oil from moving along the shaft out of the housing. The shaft 50 has an end portion 54 outside of the housing which is of generally rectangular shape and extends laterally of the casting machine Figure 1. The end member 54 fits into a groove 55 cut in one portion 56 of a split mold assembly 57. A plurality of bolts 58 secure the mold portion 57 to the end 54.

A second shaft 60 is disposed for rotation on bearing assembly 61 in a hollow cylindrical housing 62 which is secured to the table-like portion 25 of the upstanding support member 20. The shaft 60 has a laterally extending, generally rectangular end portion 64 which is secured in a groove 65 of the other portion 66 of the split mold assembly.

It will be seen that the permanent mold assembly 57 is made up of two members which are secured to rotatable shafts. The shaft 60 is rotated by means of a pneumatic power cylinder 68 (Figures 3 and 4) which is supplied with air under pressure through lines 69 and 70. Delivery of

air under pressure to lines 69 and 70 is controlled by a valve 71 which is operated by a solenoid 72 through a linkage 73. A line 74, also connected through the switch 71, is connected to a source of air under pressure.

A rack 76 is secured to the end of the piston rod 77 of the power cylinder 68. The rack 76 is in mesh with the teeth of a gear 79 Figure 4 which is secured to or integrally formed with a reduced end portion 80 of the shaft 60. When power is applied to one end of the cylinder 68 the rack 76 is moved to the left as seen in Figure 4 to rotate the shaft 80 and thereby move the mold from the assembly position shown in Figure 5 to the pouring position shown in Figure 6. When power is applied to the other end of the power cylinder 68 the action is reversed and the mold is rotated back to the assembly position.

It will be recognized that after casting has been poured and the mold is ready for rotation back to the assembly position, the mold assembly will be in a top heavy condition since the major portion of the weight of the mold and the casting itself is above the pivot axis of the casting machine. Thus it is necessary only to move the mold assembly slightly from the vertical to permit the weight of the assembly to swing it around to the assembly position. It is therefore necessary to provide a shock absorber assembly 82 which will resist this downward pivoting of the mold sufficiently to slow the movement up and prevent the mold from pivoting past the assembly position. This shock absorber assembly 82 comprises a hollow cylindrical casing 83 in which a coil spring 84 is disposed around a shaft 85. The shaft 85 has, at one end, a head portion 86 against which the spring 84 is bottomed and at the other end an eye portion 87 pivotally disposed over a pin 88 which is threaded into a rectangular plate 89 that is pinned to a reduced portion 90 of the shaft 60. The lower end of the shock absorber is pivotally connected to a bracket 91 which is threaded into an angle support brace 92.

In Figure 3 the mold assembly is shown in the assembly position and thus the spring 84 has been compressed by the upward movement of the shaft 85 as the plate 89 was rotated. When the power cylinder 68 is next actuated, the coiled spring 84 will assist the rack 76 in rotating the mold assembly to the upright pouring position.

As may be seen in Figures 1 and 2, the mold sections 56 and 66 are mated in their assembly position on a parting plane which passes through the pivot rod 34 about which the arm 30 rotates. As this parting plane is normal to the journal axes of the mold sections, the axis of rotation of the arm member is likewise normal or perpendicular to the common journal axis. When the faces of the two mold sections are brought into contact with each other by actuation of the power cylinder 36, the pressure between the mold sections is normal to their parting plane.

The two sections 56 and 66 of the mold assembly are identical except that they have oppositely disposed elements. In Figures 6 and 8 the mold section 56 is illustrated. The mold section is a substantially rectangular block member having a semi-cylindrical cavity 95 disposed in aligned relation along one side of the mold. Between these semi-cylindrical openings there is formed a shoulder 97. In a direction longitudinally of the casting machine the mold section 57 is provided with an aperture 98 (Figure 5) in which a sleeve portion 99 is disposed. This sleeve

portion is arranged to receive a wrist pin core member 100 during the casting operation. Directly above the aperture 98 in the section 57 there is provided a recessed portion 102 which, as will be seen hereinafter, provides space accommodating a portion of the core.

It will then be seen that when the two mold sections 56 and 66 are assembled and moved into the pouring position ready to receive the cores there is defined by the semi-cylindrical openings therein, a pair of aligned semi-cylindrical apertures through the mold in a vertical direction. The wrist pin core apertures 98 in each mold section are of course aligned so that the wrist pin holes in the piston will be aligned.

For the purpose of aligning the two mold sections 56 and 66 there is provided, on each side of the section 66, a plate 103 that has a V-shaped notch 103a arranged to receive the V-shaped end of an alignment dowel 104 that is adjustably mounted on each side of the mold section 57.

A three piece core assembly 105 is used in this casting machine. As best seen in Figures 5 and 7 the core assembly 105 comprises two side members 106 and 107 and a central member 108. The central member 108 is in turn made up of three portions 108a, 108b and 108c. The side core members 106 and 107 are identical, but oppositely disposed, and are of generally segmental circular cross-section having an inwardly stepped construction at their lower end. Each core has a wall portion 110, Figure 5, which coacts with the wall of the mold to determine the thickness of the piston wall and a second wall portion 112 which determines the depth of the wrist pin boss inwardly of the piston. At the extreme lower end of each of the side core members 106 and 107 there is provided a plurality of spaced fin members 113 which are effective to form reinforcing ribs on the interior of the piston.

The central core member 108 has slanted wall portions 114 which engage slanted wall portions of the side core members and, when the central member 108 is pushed downwardly, the side core members tend to expand and move into correct position in the mold.

The central portion 108b, of Figure 8, of the center core 108, has a wedged shaped configuration with inwardly and downwardly slanted wall portions which engage the slanted walls of the portions 108a and 108c and urge them outwardly as the center member is pushed downwardly. The side members 108a and 108c have a generally rectangular configuration in a horizontal plane and are provided at their lower end with various shoulder portions which cooperate with the wall of the mold to define the contour of the inner wall of the piston. A shoulder portion 115, Figure 8, formed on the members 108a and 108c, is arranged to rest on the shoulder 97 formed in the cylindrical cavity of the mold. Thus the positioning of the core axially of the cylindrical opening of the mold is determined by this shoulder engagement. The center portion 108b of the core 108 also has a generally rectangular cross-section in a horizontal plane but has inwardly and downwardly slanted wall portions which engage the sides of the core members and urge them outwardly to position in the mold cavity. It will be noted in Figure 6 that when the inner member 108b is pressed downwardly into the mold the side members 108a and 108c are urged against the side walls of the cylindrical cavity defined by the semi-cylindrical cavities 102 in the mold sections. Thus the positioning of

the mold in a lateral direction is also positively fixed by this core assembly.

A plate 117 is secured by bolts 118 to the top of the wedge-shaped member 108b. This plate receives a pull rod 119 in threaded engagement therein and is provided with a pair of slots 120 which have an elongated configuration and receive the shank portion of a pair of bolts 122 which are threaded into the top surfaces of the side core members 108a and 108c.

It will be seen in Figure 8 that, before the side core members 108a and 108c of the center core 108 can be removed from the mold after the casting has solidified, they must be pivoted inwardly so that the irregular shoulder portions at the lower end will be clear of the ridges formed in the inner surface of the piston. This operation is provided for by means of slots 125 disposed in the side walls of the center member 108b which receives the heads 126 of set screws 127 which are threaded into the side members 108a and 108c.

In Figure 8 the center member 108b of the center core 108 has been moved upwardly and the side members 108a and 108c have been moved inwardly so that they are ready to be moved out of the casting. In the position illustrated in Figure 8 of the cover 117 is engaging the heads of the bolts 122 preparatory to pulling the side core portions 108a and 108c out of the mold. Thus the center unit 108 may be retracted bodily from the mold as a unit.

A plate-like member 129 is secured by means of screws 130 to one face of each mold section. These plates have cooperating recessed portions 133 which coact to define a gate into which the molten metal is poured for direction into the mold.

In order to clamp the cores tightly in the mold there is provided an assembly 135, Figure 3, which includes an arm 136, Figure 1, which is pivotally mounted on the mold section 57 at one side thereof and has at its other end a bifurcated end portion 138. A locking lever 139 having an upper portion adjustably threaded on a shank 141 is pivotally mounted on the other side of the mold section 57 and is arranged to be pivoted through the bifurcated end of the lever 136 to lock the lever in position. The lever 136 is provided with a downward projection 142, Figures 6 and 8, which bears on the top of the core and urges it downwardly.

As previously mentioned, after the casting has been poured and has solidified for a predetermined period, the mold is automatically rotated to the assembly position. This automatic operation is accomplished by means of a control box 145, Figure 3, which contains suitable timing mechanisms for actuating the solenoid 72 at the proper time.

A control button 149 is mounted at the end of the casting machine adjacent the power cylinder 36 on an upright post 150. This control button, when pressed by the operator, actuates the solenoid 72 to rotate the mold from the assembly position seen in Figure 2 to the pouring position of Figure 6.

The casting machine of this invention is put into operation in the following manner. The casting cycle begins with the pivoted arm 30 in the retracted position shown in dotted lines in Figure 2. The operator actuates the control valve 39 to direct air under pressure through the line 37 to one end of the power cylinder 36 and thus moves the pivoted arm with the attached

mold section 56 into aligned engagement with the other mold section 66. It is to be noted that the air pressure on this cylinder 36 will hold the mold sections in aligned clamped position during the casting operation. The side cores 106 and 107 are then positioned in the mold cavity on the shoulder 97 of the mold. The center core member 108 is then inserted between the side core members and pressed downwardly into position. As the center portion 108c of the center core 108 moves downwardly into place, the side portions 108c and 108a are expanded outwardly to engage the sides of the mold and, since the center core 108 as a unit has tapered sides, the side core members 107 and 106 are also moved outwardly into their correct position in the mold. The clamp 135 is then locked in position over the cores urging the cores tightly into the mold. The wrist pin hole insert cores 100 are now inserted in the bushings 99 in the wall of the mold.

When the mold is thus assembled the operator pushes the button 149 which actuates the solenoid 72 and causes the rack, connected to the piston rod of the power cylinder 68, to rotate the mold 57 to the pouring position, seen in Figure 6. The mold is held in the pouring position during the pouring operation due to the pressure in the air cylinder 68. Molten metal is poured into the gate 133 and flows downwardly around the cores and forms the piston.

When the operator pushes the button 149 to cause rotation of the mold from the assembly position to the pouring position, the timer control 145 was energized so that the timing cycle began. After a predetermined time interval has elapsed, which covers the time required for pouring the molten metal into the mold and for solidifying of the metal in the mold, the control 145 de-energizes the solenoid 72 causing the switch 71 to vent the air from the line 70 and introduce air under pressure to the line 69 which results in the rack 76 rotating the mold in an opposite direction 180° to the initial assembly position.

To remove the casting from the mold the wrist pin cores 100 are removed from the bushing 99 and the clamp 135 is removed from the top of the mold. The cores are then removed. It will be noted that the center core 108 must first be removed in order that the side cores 106 and 107 may be moved radially inwardly to permit their lower shoulder portions to be free of the irregular ring-like shoulders formed on the inside of the piston. Also it will be seen in Figure 3 that the center portion 108b of the center core 108 must be pulled upwardly before the side portions 108a and 108c can be removed since they too must be moved radially inwardly to permit removal from the casting. Thus the center portion 108b is first pulled out and after it moves upwardly a distance determined by the length of the rods 122 the side portions 108a and 108c are automatically drawn inwardly by means of the screws 126 so that they clear the sides of the piston. Then the center core 108 is removed as a unit. When the center core is removed, the side cores 106 and 107 are moved radially inwardly and are removed from the mold. Then the operator actuates the valve 39 to vent air from the line 37 and introduce air under pressure to the line 38 which actuates the piston in the air cylinder 36 and retracts the pivotable arm with the attached mold section 56 to the position indicated in dotted lines in Figure 2. The casting may then be removed from the mold section 66 by a slight jarring movement.

The casting machine is then in starting position ready for the next casting cycle.

From the foregoing description it will be seen that there is provided in this invention a simple casting machine which may be efficiently operated by a relatively unskilled operator. It is contemplated that one operator will be able to service at least two of these machines since after the molten metal is poured into the mold the operator need not return to the scene until the mold has been rotated to its original assembly position.

This machine features a power cylinder for rotating the mold to the forward position and back to the assembly position. Also this casting machine features the use of a two part mold, one part of which is pivotable toward and away from the other stationary part.

It will of course be understood that although I have resorted to details in the description of my invention for the sake of clarity, it will be understood that the present embodiment is shown by way of example only, and, therefore, it should be understood that I desire to be limited only by the scope of the appended claims and prior art.

I claim:

1. In a support for a two-section permanent mold of the type which is assembled and disassembled in upright position and is charged in inverted position, a frame, a first bearing in said frame having a first mold section rotatably mounted therein, a pivot carried on said frame in a plane perpendicular to the axis of said first bearing, an arm mounted on said pivot for movement toward and away from said first mold section, and a second bearing in said arm having a second mold section rotatably mounted therein, said second bearing being positioned in said arm on a common axis with said first bearing when the faces of the two mold sections contact each other.
2. In a support for a two-section permanent mold of the type which is assembled and disassembled in upright position and is charged in inverted position, a frame, a first bearing in said frame, a pivot on said frame, an arm mounted on said pivot, a second bearing in said arm positioned to lie on a common axis with said first bearing in one position of said arm, first and second mold sections rotatably mounted in said bearings with their faces contacting each other on a parting plane when said bearings lie on the common axis, said pivot lying in said parting plane, and power cylinder means pivotally connected to said support structure and said arm member to press said mold sections together during pouring operations.
3. In a support for a two-section permanent mold of the type which is assembled and disassembled in upright position and is charged in inverted position, a frame, a first bearing in said frame having a first mold section rotatably mounted therein, a pivot carried on said frame in a plane perpendicular to the axis of said first bearing, an arm mounted on said pivot, a second bearing in said arm having a second mold section rotatably mounted therein, said second bearing being positioned in said arm to have a common axis with said first bearing when the faces of the two mold sections contact each other, power means operatively connected to one of said mold sections to rotate said mold sections from their upright position to their inverted position, and means operatively connected between one of said mold sections and its bearing to restrain movement of said mold sections to their inverted position.

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4. In a support for a two-section permanent mold of the type which is assembled and disassembled in upright position and is charged in inverted position, a frame, a first bearing in said frame, a pivot on said frame, an arm mounted on said pivot, a second bearing in said arm positioned to lie on a common axis with said first bearing in one position of said arm, and first and second mold sections rotatably mounted in said bearings with their faces contacting each other in a parting plane perpendicular to said common axis when said mold sections are moved to lie thereon, said pivot lying in said parting plane.

5. A casting machine comprising a two-section permanent mold of the type which is assembled and disassembled in upright position and is poured in inverted position, a frame, a bearing in said frame having a first mold section rotatably mounted therein, a pivot on said frame, an arm mounted on said pivot, and a second bearing in said arm having a second mold section rotatably mounted therein, said bearings being positioned to have coincident horizontal axes when the faces of the two mold sections contact each other, said mold sections being faced to contact on a parting plane perpendicular to the coincident axes, said

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pivot extending horizontally in said parting plane beneath said mold sections, whereby said second mold section will move in a downward arc when said arm is moved away from said first mold section.

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