Dec. 4, 1934. W. G. NEWTON 1,983,303

CASTING MACHINE

Original Filed Aug. 14, 1930 3 Sheets-Sheet 1

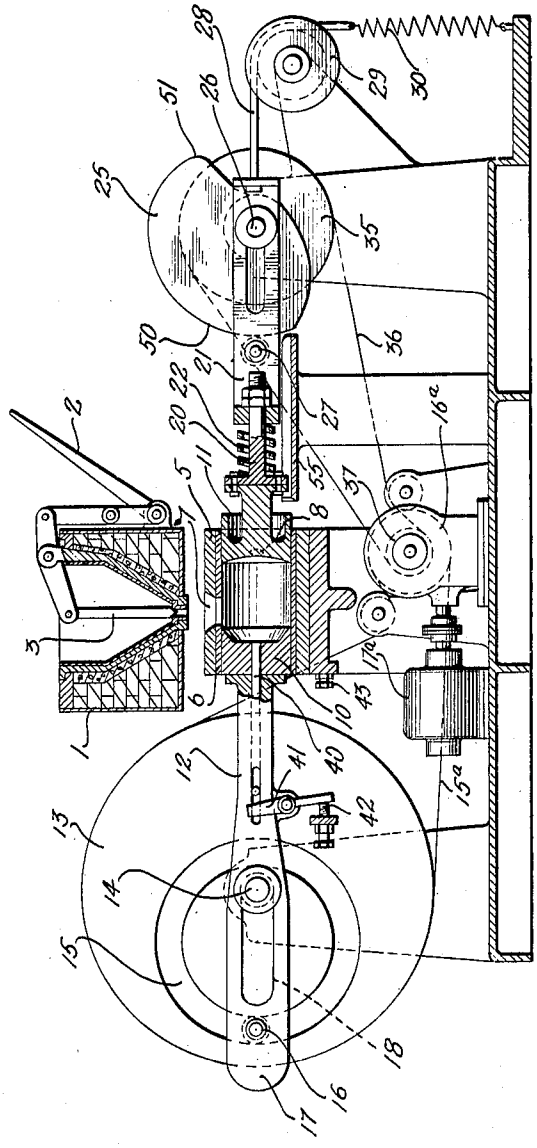


Fig. 1.

INVENTOR
WILLIAM G. NEWTON
BY Moses & Nolte
ATTORNEY

Dec. 4, 1934. W. G. NEWTON 1,983,303

CASTING MACHINE

Original Filed Aug. 14, 1930 3 Sheets-Sheet 2

Fig. II.

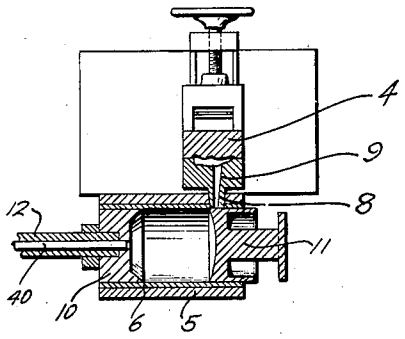


Fig. III.

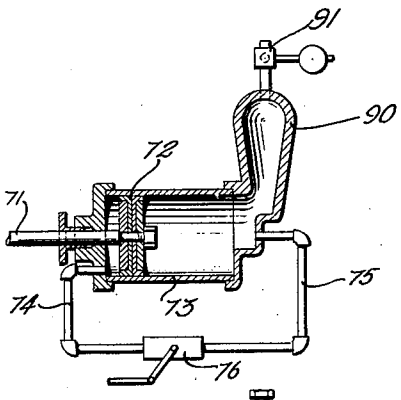
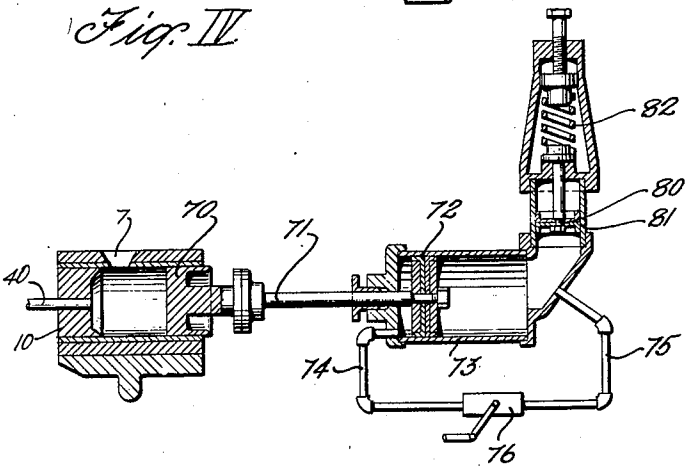


Fig. IV.



INVENTOR
WILLIAM G. NEWTON
BY Moses & Nolte
ATTORNEY

Dec. 4, 1934. W. G. NEWTON 1,983,303

CASTING MACHINE

Original Filed Aug. 14, 1930 3 Sheets-Sheet 3

Fig. V.

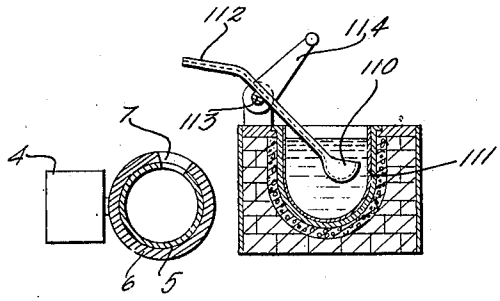


Fig. VI.

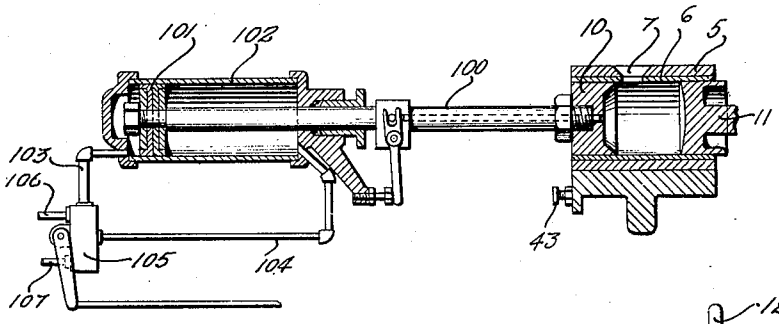
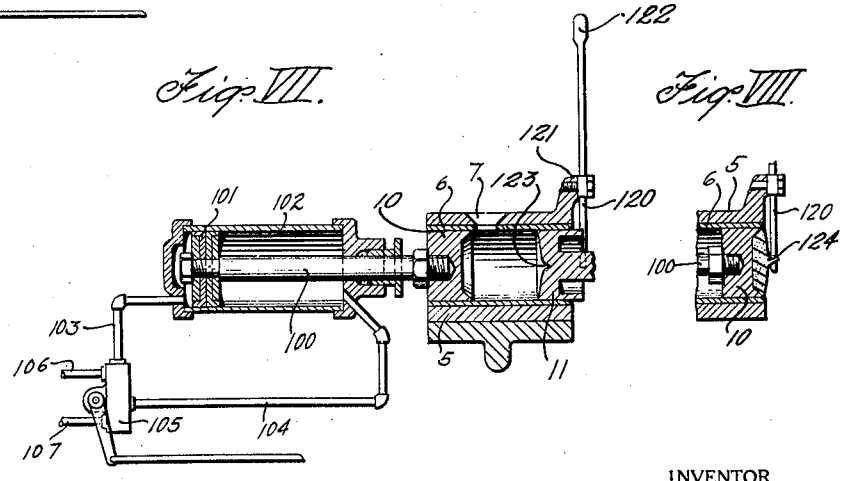


Fig. VII.

Fig. VIII.



INVENTOR
WILLIAM G. NEWTON
BY Howson & Howson
ATTORNEY

Patented Dec. 4, 1934 1,983,303

UNITED STATES PATENT OFFICE

1,983,303

CASTING MACHINE

William G. Newton, Hamden, Conn.

Application August 14, 1930, Serial No. 475,180
Renewed October 18, 1933

9 Claims. (Cl. 22—68)

This invention relates to casting machines, and particularly to machines in which the molten metal is forcibly ejected into a mold or die by pressure applied by a mechanical device, such as a piston or plunger. An object of the invention is to provide a simple and effective mechanism for this purpose which may be rapidly and economically operated. Specific objects and advantages of the invention will appear from the description of certain preferred embodiments thereof illustrated in the accompanying drawings forming part of this specification.

In the drawings:

Figure I is a side elevation, partly broken away, of one form of apparatus embodying the invention, parts being shown in vertical section;

Figure II is a horizontal sectional view of the pressure chamber, the piston, and movable abutment shown in Fig. I, a mold or die being shown in position adjacent to said pressure chamber.

Figure III illustrates in vertical section a modification of a part of the apparatus showing a piston acting against fluid pressure for controlling the movement of the movable abutment.

Figure IV is a view similar to Fig. III showing a further modification, and also illustrating the pressure chamber and parts working therein, in vertical section.

Figure V is a transverse section of a part of a modified form of machine showing a means for introducing molten metal into the pressure chamber by means of a tilting ladle.

Figure VI is a view in vertical section showing the pressure chamber and piston therein and fluid actuating means for operating the piston.

Figures VII and VIII are views in vertical section showing alternative means for removing the slug of superfluous metal left in the pressure chamber after the casting operation.

Referring to Figures I and II, the supply of molten metal is maintained in the melting pot 1 from which it may be discharged by gravity as desired by manipulating the lever 2 to raise the valve 3. The metal is discharged from the melting pot 1 into a pressure chamber 5 which is illustrated in the form of a hollow cylinder, although it may be of any other suitable shape. The chamber 5 is preferably provided with a liner 6 of refractory metal and has formed through its wall a port 7 located beneath the outlet opening of the melting pot 1. The pressure chamber is also provided with a discharge port 8 (see Fig. II) which communicates with the gate 9 with a die or mold 4 which may be of any suitable form and construction.

Arranged to reciprocate in the cylinder 5 are the pressure piston 10 and the movable abutment 11, between which the molten metal is subjected to pressure. The piston 10 is mounted on the piston rod 12, which is driven in any suitable manner. In Figure I mechanical means are shown for operating this piston rod in the form of a wheel 13 mounted on a shaft 14 and having a cam groove 15 in the face thereof which engages with a cam follower 16 mounted on a rear extension 17 of the piston rod 12, such extension being slotted at 18 so as to ride upon the shaft 14 and thus guide the piston rod in its reciprocatory motion. The wheel 13 may be rotated in any suitable manner, as by a chain 15*a* passing over a driving sprocket 16*a* driven by an electric motor 17*a*. Any other suitable mechanical devices than those illustrated may be utilized for reciprocating the piston 10 and applying any degree of force to the same as may be desired. The movable abutment 11, as shown in Fig. I, is attached to a plunger 20, which is mounted to have a limited reciprocating movement in the yoke 21, a spring 22 being provided to apply a yielding pressure to this plunger tending at all times to urge the plunger and movable abutment in a direction towards the piston 10. The yoke 21, carrying the plunger 20 and movable abutment 11, is arranged to be reciprocated by any suitable mechanism such as by the cam 25 fixed to the shaft 26 and engaging the cam follower 27 mounted in the yoke. The cam follower 27 is held in engagement with the face of the cam 25 by a suitable yielding means such as the cable 28 attached to the yoke 21, which cable passes over the pulley 29 and is attached to the tension spring 30. The cam 25 is rotated in any suitable manner, such as by the sprocket wheel 35 driven by the chain 36 passing around the driving sprocket 37 driven from the motor 17*a*. By properly proportioning the sizes of sprockets 35 and 37, and 13 and 16*a* the cams 15 and 25 may be driven in unison so that the proper cycle of movement is maintained between the pressure piston 10 and movable abutment 11, the exact relationship in the movement of these two members being determined by the configuration of the respective cams.

For ejecting from the chamber 5 the slug of metal remaining after the casting operation, a plunger 40 may be provided which reciprocates through a hole in the piston 10 and piston rod 12, the plunger being operated by a lever 41 fixed on the piston rod and which, at opposite

ends of the stroke of the piston 10, engages adjustable stops 42 and 43 respectively.

In operation, considering the parts in the position shown in Fig. I, it will be seen that the piston 10 is retracted so that the port 7 is open, while the movable abutment 11 is advanced into the cylinder sufficiently to cover the outlet port 8 which communicates with the gate 9 of the mold. Valve 3 of the melting pot, is now manipulated to permit a suitable charge of molten metal to flow into the pressure chamber and partly fill the same, whereupon the valve 3 is closed. The admission of metal into the pressure chamber is done while the piston 10 is in the outer part of its stroke. The wheel 13 and cam 15, of course, rotate constantly, but slowly enough to permit the pressure chamber to be filled while the piston is in retracted position. The piston now delivers its pressure stroke, forcing the metal in the pressure chamber towards the movable abutment and moving into a position where it closes the inlet port 7. The molten metal is compressed tightly between the piston 10 and the movable abutment 11, the latter being held substantially stationary during this part of the stroke of the piston by reason of the cam follower 27 being in contact with a dwell 50 in the cam 25. Finally the pressure of the piston 10 upon the metal causes the movable abutment 11 to yield by compression of the spring 22, the movable abutment being finally moved sufficiently to uncover the outlet port 8, whereupon the highly compressed metal is instantly ejected through the gate in the mold. After the "shot" has been made the region 51 on the cam 25 reaches the cam follower 27 and, with the latter, the yoke 21 and movable abutment 11 are withdrawn from the end of the cylinder, the movable abutment 11 being guided during such movement in any suitable manner, as by the guide 55. The piston 10 continues to advance its forward edge past the port 8, and, breaking the sprue, the piston eventually advances to the now fully open end of the cylinder, and carries with it the slug of metal remaining in the pressure chamber after the "shot", which slug has by this time solidified. At this point the lever 41 reaches and engages the stop 43 and thereby projects the plunger 40 to knock off the slug and cause it to fall from the machine. Upon the continuance of the cycle, the piston 10 is again retracted to the position shown in Fig. I in which the lever 41 engages the stop 42 and retracts the ejector or plunger 40. The movable abutment 11 advances into the cylinder 5, the parts being restored to the position in which they are again ready to receive a charge.

The pressures used in the machine to eject the metal and make the casting may be varied to suit particular conditions, such for instance as the nature of the casting to be made and the kind of metal employed. By way of example of the magnitude of the pressures which may be utilized, it may be stated that in the casting of brass the pressures reached may be in the neighborhood of seven thousand pounds per square inch.

Figure IV shows a modified method of interposing resistance to the movement of the movable abutment by the use of fluid pressure, instead of by means of a spring and a cam drive. In this instance the movable abutment 70 is attached to a piston rod 71 on which is mounted a piston 72 working in a cylinder 73. Air, water or other fluid under pressure may be introduced into the ends of the cylinder through pipes 74 and 75, controlled by valve 76 to operate the piston. Yielding resistance to the movement of the movable abutment is afforded by means of an auxiliary piston 80 working in a cylinder 81, and urged downwardly by a spring 82. The yielding of this spring permits the piston 80 to rise, and thereby allows the piston 72 and movable abutment 70 to move to the right.

Figure III shows a modification of the construction shown in Fig. IV in which in place of using auxiliary piston 80 and spring 82 an air chamber 90 is provided in which the air is compressed when the piston 72 moves. The air chamber 90 may be provided with a safety valve 91 if desired.

Figure VI shows a modification in which fluid pressure is utilized to operate the pressure piston 10. In this construction this piston is carried on a piston rod 100 upon which is attached a piston 101 operating in the cylinder 102 which is supplied with fluid pressure through pipes 103 and 104 controlled by a valve 105. Preferably a high pressure pipe 106 and a low pressure pipe 107 are provided which supply the valve 105 which is so constructed as to permit either the high pressure or low pressure to be supplied to the cylinder 102. In operation the low pressure is first supplied and the piston 101 moved to the right rapidly until the port 7 in the cylinder 5 has been closed. The valve is then manipulated to introduce the high pressure which applies the desired degree of pressure to the metal in the cylinder to eject it forcibly into the mold at the proper time. Upon the return stroke the low pressure is used to move the piston rapidly back to its initial position. The hydraulic piston arrangement shown in Fig. 6 may be utilized with either the mechanical or the hydraulic movement for controlling the movable abutment, and the hydraulic means for controlling the movable abutment may be used with either form of mechanism for operating the pressure piston.

Figure V shows an alternative arrangement for introducing molten metal into the pressure chamber, this being done in the present instance by means of a ladle 110 adapted to dip metal from the pot 111 mounted at the side of the pressure chamber 5. The ladle 110 is mounted on a trough-like arm 112 which is pivoted at 113, a hand lever 114 being provided by which the arm 112 may be swung about the pivot, thereby raising the ladle 110 and permitting the metal therein to run down the arm 112 and be discharged at the port 7 into the pressure chamber.

Figures VII and VIII show a modified construction for ejecting the slug of metal left in the pressure chamber after making the "shot". In this construction, instead of ejector plunger 40, a lever 120 is provided which is pivoted to a bracket 121 on the pressure chamber, a handle 122 being provided for operating the lever. The movable abutment is provided with a recess 123 into which the metal of the slug enters, forming the boss 124 on the slug. The pressure piston 10 is advanced carrying the slug with it until the boss 124 projects into the path of the lever 120 whereupon the latter is operated to knock the slug off the end of the piston 10.

While I have illustrated and described in detail certain preferred forms of my invention, it is to be understood that changes may be made therein and the invention embodied in other structures. I do not, therefore, desire to limit myself to the specific construction illustrated,

but intend to cover my invention broadly in whatever form its principle may be utilized.

I claim:

1. In a casting machine, a pressure chamber having an inlet port and a discharge port, to the latter of which a mold is adapted to be connected, a pressure piston working in said chamber, an abutment in the chamber, said abutment being movable to cover and uncover said discharge port, and said pressure piston being movable to cover and uncover said inlet port means for withdrawing the abutment from the chamber, means for advancing the pressure piston through the chamber to discharge the surplus metal remaining in the chamber at the conclusion of the casting operation, and means for removing such surplus metal from the pressure piston.

2. In a casting machine, a pressure chamber having an inlet port and a discharge port, to the latter of which a mold is adapted to be connected, a pressure piston working in said chamber, a movable abutment in the chamber, said pressure piston being movable to cover and uncover said inlet port, power means for actuating said pressure piston and yielding means for resisting the movement of said movable abutment, said means being arranged to yield in response to a predetermined pressure to permit said abutment to move and uncover said discharge port but being of sufficient power to yieldingly support and sustain said abutment during the making of the "shot".

3. In a casting machine in combination, a chamber having a port therein to which a mold is adapted to be connected, a pressure piston working in said chamber, power means for advancing said piston, a movable abutment in said chamber movable to cover and uncover said port, a power actuated movable support for the abutment and spring means for yieldingly supporting said abutment from said support, said spring means being of sufficient power to yieldingly support and sustain said abutment during the making of the "shot".

4. In a casting machine in combination, a chamber having a port in the wall thereof to which a mold is adapted to be connected, a piston member movable in said chamber, an abutment member movable in said chamber, power devices for urging the relative approach of the piston and abutment members in said chamber to apply pressure to the casting metal and force it through said port, the connection between at least one of said pressure applying members and one of said power devices including an elastic element arranged to yield to some extent in response to the applied pressure, but being of sufficient power to yieldingly support and sustain said member during the making of the "shot".

5. In a casting machine in combination, a chamber having a port therein to which a mold is adapted to be connected, a piston working in said chamber, power means for actuating said piston, a movable abutment in said chamber, and hydraulic means for controlling the retreat of the abutment before the piston, said means including an elastic element for limiting the pressure applied to the casting metal and for maintaining a yielding pressure thereon during the casting operation.

6. In a casting machine in combination, a chamber having intake and discharge openings, a piston working in said chamber adapted to cover and uncover said intake opening, an abutment working in said chamber adapted to cover and uncover said discharge opening, means for positively advancing the piston in said chamber to cause said piston to cover said intake opening and to apply pressure to the metal in the chamber, said means also acting to advance said piston entirely through the chamber after the making of the casting so as to discharge the surplus metal from the rear end of said chamber, means controlling the retreat of the movable abutment before the piston comprising a movable support, means operating in timed relation to the piston for maintaining said support in an advanced position while the piston is advancing to compress and discharge the casting metal through the discharge port, and spring means interposed between the abutment and said movable support for limiting the pressure applied to the casting metal and maintaining said pressure during the casting operation.

7. In a casting machine in combination, a cylinder having a discharge port therein to which a mold is adapted to be connected, a pressure piston working in said cylinder, power means for advancing said piston in said cylinder to apply pressure to the metal therein and for advancing said piston entirely through said cylinder so as to discharge the surplus metal through the rear end thereof, a movable abutment mounted in said cylinder, and means for movably supporting said abutment in said cylinder so as to permit the same to cover and uncover said discharge port, said means acting to withdraw said abutment from the rear end of said cylinder after the casting operation so as to permit the piston to discharge the surplus metal through the rear end of the cylinder.

8. In a casting machine in combination, a chamber having a port therein to which a mold is adapted to be connected, a pressure piston working in said chamber, power means for advancing said piston, a movable abutment in said chamber movable to cover and uncover said port, and elastic means for supporting said abutment during the advance of said piston prior to and during the making of the "shot", said elastic means yielding to permit said movable abutment to uncover said port but being of sufficient power to yieldingly support and sustain said abutment against the pressure exerted thereon by the metal compressed in the chamber by the piston during the making of the "shot".

9. A casting machine comprising a cylinder adapted to receive molten metal and having an opening in the walls thereof, a plunger movable in said cylinder for forcing the metal through said opening into the mold, a piston closing one end of said cylinder, means for retracting said piston after the casting stroke, means for moving said plunger for performing the casting stroke and continuing the movement in the said direction on retraction of said piston so as to force through the cylinder superfluous metal remaining therein after the casting stroke and an ejecting rod for removing said metal laterally from between said piston and plunger.

WILLIAM G. NEWTON.