G. M. CLARK, Jr.

APPARATUS FOR MAKING CASTINGS.

APPLICATION FILED FEB. 28, 1912.

1,160,973.

Patented Nov. 16, 1915.

3 SHEETS—SHEET 1.

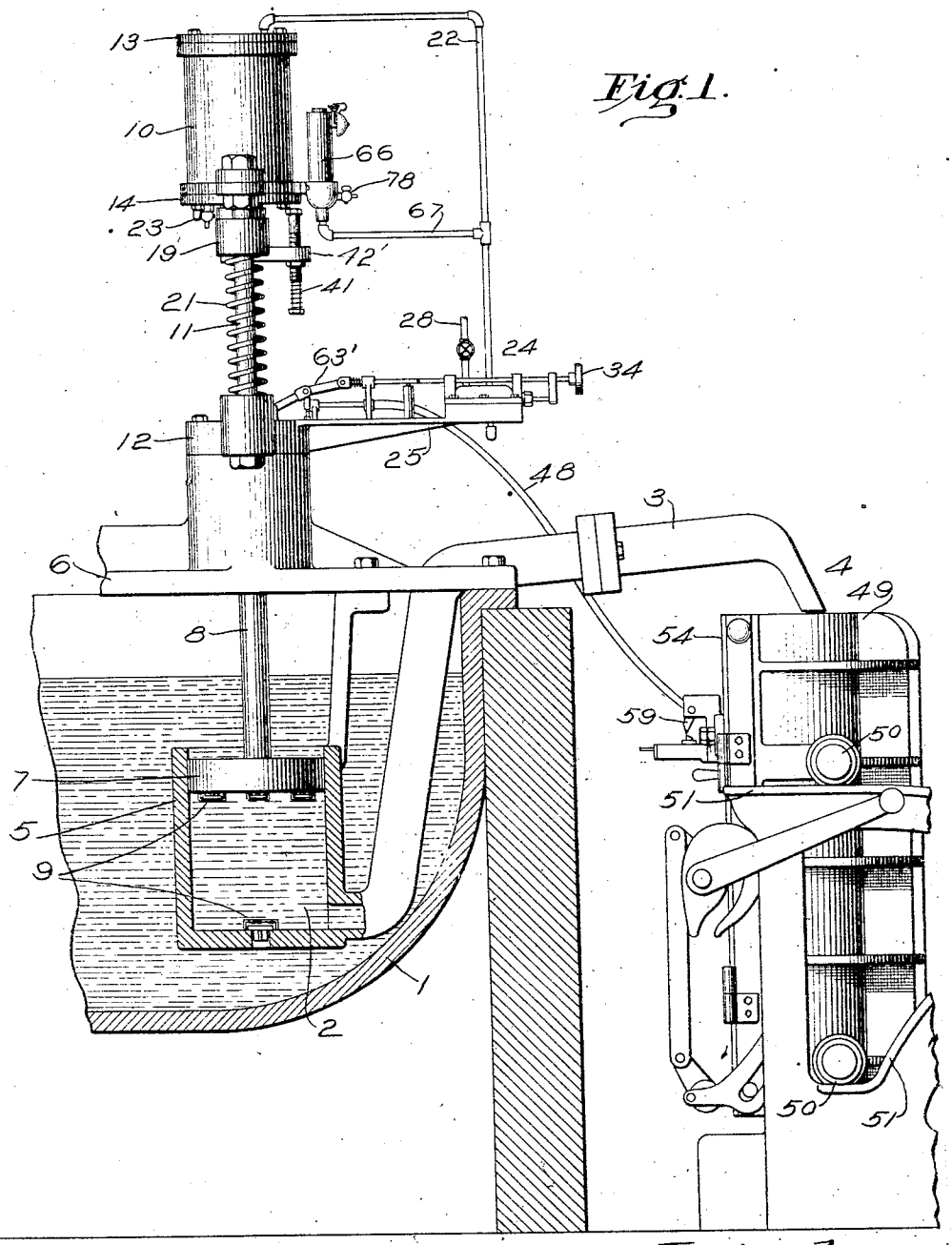



Fig. 1.

Witnesses:
Benj. B. Blanchard
Marion L. Hatch

Inventor:
George M. Clark, Jr.
By Roswell F. Hatch
Atty.

G. M. CLARK, Jr.

APPARATUS FOR MAKING CASTINGS.

APPLICATION FILED FEB. 28, 1912.

Patented Nov. 16, 1915

1,160,973.

3 SHEETS—SHEET 2.

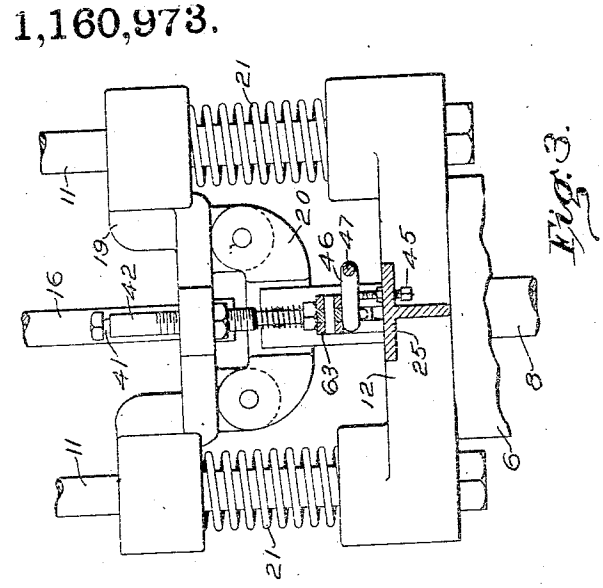


Fig. 3.



Fig. 2.

Witnesses:
Benj. B. Blanchard
Marion S. Holt

Inventor:
George M. Clark, Jr.
By Powell F. Hatch
Atty.

G. M. CLARK, Jr.

APPARATUS FOR MAKING CASTINGS.

APPLICATION FILED FEB. 28, 1912.

1,160,973.

Patented Nov. 16, 1915.

3 SHEETS—SHEET 3.

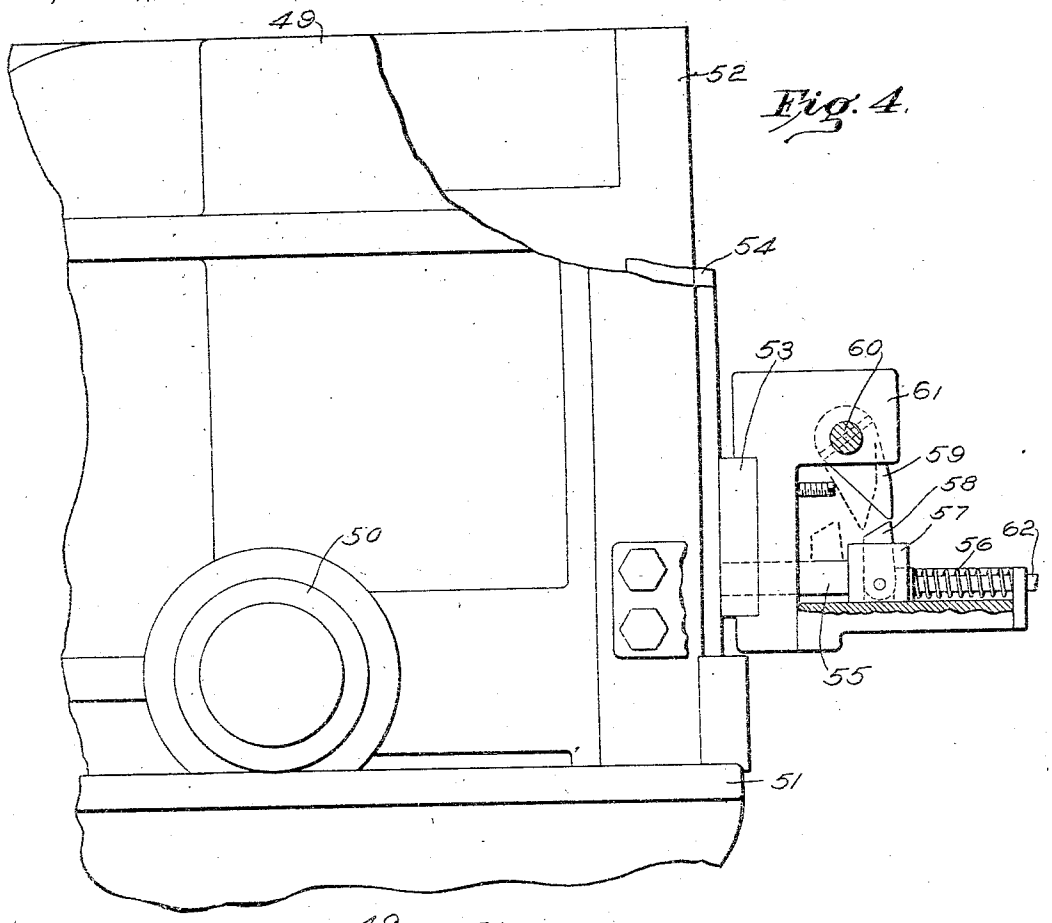



Fig. 4.

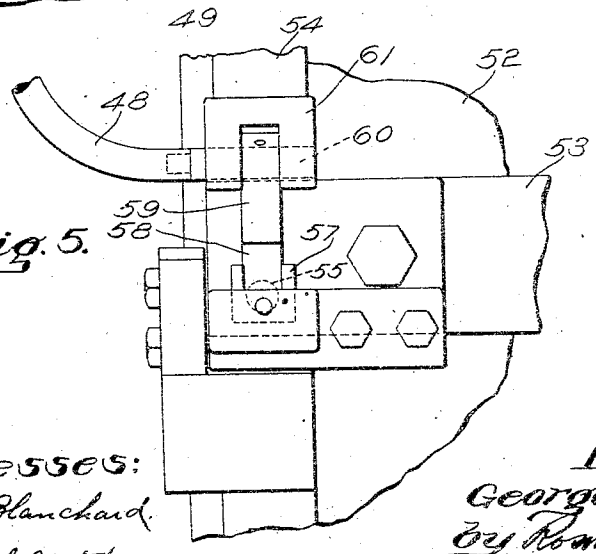



Fig. 5.

Witnesses:
Benj. B. Blanchard.
Marion L. Hatch

Inventor:
George M. Clark, Jr.
By Rowell F. Hatch
Atty.

# UNITED STATES PATENT OFFICE.

GEORGE M. CLARK, JR., OF NAHANT, MASSACHUSETTS, ASSIGNOR TO R. HOE AND CO., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

## APPARATUS FOR MAKING CASTINGS.

1,160,973. Specification of Letters Patent. Patented Nov. 16, 1915.

Application filed February 23, 1912. Serial No. 680,497.

*To all whom it may concern:*

Be it known that I, GEORGE M. CLARK, Jr., of Nahant, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Apparatus for Making Castings, of which the following is a specification.

This invention relates to apparatus for making castings and more particularly to apparatus for casting stereotype plates.

The object of the invention is to provide means in an apparatus of the character described, for producing castings of a greater degree of perfection and of a more uniform character.

It is also an object of the invention to increase the speed with which such castings are produced.

To the accomplishment of these objects and such others as may hereinafter appear, the invention comprises the features and combinations of parts hereinafter described and particularly pointed out in the claims.

It is to be understood that, while the invention is illustrated and described as embodied in an apparatus for making stereotype plates, it is equally applicable to apparatus for making any other form of casting from molten material.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which:

Figure 1 is a side elevation of the improved apparatus for making castings, the metal pot being shown in section; Fig. 2 is an enlarged section showing the mechanism for operating the pump to cause a flow of metal to the mold or casting box; Fig. 3 is a section on the line 3—3 of Fig. 2; Fig. 4 is an enlarged detail view of a portion of the mold or casting box, looking from the opposite side from that shown in Fig. 1; and Fig. 5 is an elevation of certain parts of Fig. 4, which will be hereinafter described.

The apparatus for casting stereotype plates which has been selected for the purpose of illustration, comprises a metal pot 1 which contains a supply of molten type metal and a pump 2 which is connected by a spout 3 with a casting box or mold 4. The cylinder 5 of the pump is supported by a bridge member 6 and contains a piston 7 having an upwardly extending rod 8. The pump is provided with valves 9 through which the metal flows when the piston is raised.

It is customary to provide hand actuated means such as a lever to operate the pump to force the metal through the spout to the casting box. The skill of the operative is relied upon to work the pump in such a manner as to produce the best results. He endeavors to operate the pump with the same speed at each operation in order that the metal shall be delivered to the casting box in a uniform time. He also endeavors to operate the pump at the same speed from beginning to end of the stroke in order that the momentum of the metal delivered to the casting box may be constant. The reason for desiring a uniform and constant momentum is that the force of the metal, as it is delivered to the casting box, is relied upon to press the matrix smooth against the box. If the momentum of the metal varies there may be places where the matrix will spring slightly away from the box thereby producing a low spot in the stereotype plate. A constant momentum is desirable in order to produce more nearly perfect castings of any kind in which there may be no matrix employed. It is important that the metal shall be delivered in the same time at each operation of the pump. The reason for this is that a comparatively low heat metal, approximately 575 degrees, may be employed which will produce a better plate than metal which is hotter. The metal has to be hot enough, however, to allow for a drop in temperature during the slowest delivery from the pump without cooling too much to give a satisfactory result. It is therefore usual to keep the metal at a temperature of about 700 degrees so that it will still be hot enough to produce good results when the pump is moved slowly. If the operative were able to actuate the pump so as to deliver the metal at a uniform speed it would be possible to effect a considerable saving in fuel for heating the metal and in the metal itself which goes to waste quite rapidly under a high temperature.

It is an object of this invention to insure the delivery of metal to the casting box in the manner toward which the operative directs his efforts. To this end automatic

mechanism is provided under the control of the operative to actuate the pump. The inventor prefers to use fluid pressure as a source of power for the pump actuating motor, and as compressed air is usually installed in foundries, it is utilized to actuate the pump.

The pump actuating motor comprises a cylinder 10 secured to the upper ends of two guide rods 11, the lower ends of which are fixed in a plate 12 permanently secured to the bridge member 6 extending across the metal pot 1. The cylinder has an upper head 13 and a lower head 14 which is provided with a stuffing box 15 through which passes a rod 16 secured to a piston 17. The lower end of the rod 16 is secured by a nut 18 to a cross head 19 which is adapted to slide upon the rods 11. The cross head is connected by a yoke 20 with the pump rod 8 which is, in effect, a continuation of the rod 16. The cross head 19 is supported by two springs 21 surrounding the rods 11 between the cross head and the plate 12. Air may be admitted above the piston 17 through a pipe 22 and the lower side of the piston is vented through a cock 23. The speed with which the piston descends under the air pressure may be varied by adjusting the cock 23 to allow air to escape with greater or less rapidity.

A valve 24 is provided by which the operative may admit compressed air to the cylinder 10 to actuate the pump. The valve may be conveniently mounted as shown in Figs. 1 and 2 on an arm 25 projecting from the plate 12. A cover 26 is bolted to the end of the arm and chambered to receive the valve slide 27. Air pressure from any convenient source of supply is admitted to the chamber through a pipe 28. The slide 27 has a projecting stud 29 which passes through a stuffing box 30 on the cover 26 and is connected by a block 31 with a rod 32. This rod is adapted to slide in lugs 33 projecting from the cover 26. A handle 34 is secured to the rod 32 in position readily accessible to the operative. The valve 24 is similar to the slide valve of a locomotive. When the slide 27 is in the position shown in Fig. 2 the opening to the pipe 22 is covered by the slide but open to the atmosphere through an exhaust port 35. When the slide is moved to the left the air pressure communicated to the chamber through the pipe 28 is admitted to the pipe 22 and thence to the cylinder 10, the exhaust port 35 being closed.

Mechanism is provided to automatically cut off the air supply to the cylinder as the pump completes its working stroke. Means is also provided for varying the time at which this mechanism operates in order that the length of the working stroke of the pump may be adjusted to discharge the desired quantity of metal to the casting box. For this purpose the rod 32 is extended from the cover 26 and connected with one end of the toggle joint 63' consisting of two links 36 and 37. The other end of the toggle is pivoted between ears 38 on the plate 12. The normal position of the toggle is shown in Fig. 1 where the middle joint of the links is slightly elevated from the straight arm position. The handle 34 may then be pushed to admit air to the pipe 22 which will break the toggle still further. In order that the parts may not be accidentally displaced from this position a spring pressed plunger 39 is constructed to engage a groove 40 in the rod 32. As the cross head 19 descends the toggle is straightened by an abutment carried thereon which moves the rod 32 to the right and closes the valve 24. The abutment is preferably in the form of a spring pressed plunger 41. The plunger is carried in a sleeve 42 threaded into a projection 42' on the cross head. It is apparent from Fig. 2 that the sleeve may be adjusted vertically in the cross head so as to permit greater or less travel before the plunger straightens the toggle and thereby cuts off the air supply to the pipe 22 and opens the pipe to atmospheric pressure. By this construction the stroke of the pump may be adjusted to give a greater or less flow of metal to the casting box.

After a casting has been made it is necessary to allow it to cool somewhat before it is removed from the casting box or mold. It sometimes happens that workmen in the foundry will attempt to pour a second casting while the first is cooling. This is known as a "spill" and it is a source of danger to the foundry men as well as causing the loss of a casting.

It is a further object of this invention to provide means for preventing a second discharge of metal to the casting box before the box is prepared to receive another supply of metal. In accordance with this object one feature of the invention contemplates the provision of a locking device whereby the metal supplying pump is rendered inoperative until after the casting box has been emptied and closed again to receive a new charge of metal.

It is apparent from Fig. 2 that with the toggle links 36 and 37 in a straightened position, no force applied to the rod 32 will break the toggle and allow the rod to slide thereby opening the valve 24 and actuating the pump. A stop screw 45 projecting through the arm 25 supports a finger 46 below the center of the toggle. The toggle is left in a straightened position against the finger 46 when the cross head rises under the impulse of the springs 21. That is, after a single stroke of the pump the valve is locked to prevent a second operation. Con-

nection is made with the casting box so that the toggle is slightly broken when the box is closed. This connection is made by a rock shaft 47 upon which the finger 46 is mounted which is joined by a flexible shaft 48 with the casting box 4.

The casting box illustrated in Figs. 1 and 4 is of a well known type in which a box 49 is mounted upon rolls 50 which travel upon ways 51 to move the box toward or from a core 52. The core supports a bar 53 which forms an abutment for the box by engaging side gages 54 which are employed to secure the matrix to the box 49, all of which parts are well known to those skilled in the art to which this invention relates. In the best form at present known to the inventor, the pump is unlocked through the motion of a movable member of the casting box, in this instance, the movement of the box 49 is employed to break the toggle and unlock the pump actuating valve.

A plunger 55 passes through the bar 53 and when the casting box is opened it projects from the bar 53 and toward the box 49 under the impulse of a spring 56. A block 57 integral with the plunger carries a pivotally mounted finger 58 which is constructed to engage the end of a trip 59 which is secured to a stud 60 freely mounted in a block 61 attached to the bar 53. The other end of the flexible shaft 48 is secured to this stud. When the box 49 is in its closed position and the pump is discharging metal to the casting box, the toggle which was broken when the operative pushed the handle 34, is about to be straightened by the plunger 41. The finger 58 is in the full line position of Fig. 4 and the trip 59 may be in either the full or dotted line position. If the trip is in the full line position it will be turned to the other position by the straightening of the toggle to close the valve 24 which will depress the finger 46. After the pump has discharged a supply of metal to the casting box the valve 24 is locked by the toggle as has been described. The box 49 is then opened to remove the casting. As the box moves away from the bar 53 the plunger 55 is projected therethrough by the spring 56. The spring is preferably mounted upon a stud 62, one end of which is enlarged and bears against the finger 58. This will allow the finger to turn if necessary to pass under the trip 59, the parts then assuming the dotted positions in Fig. 4. The pump is still held inoperative but as soon as the box 49 is again closed the finger 58, on its movement to the right, will turn the trip 59 which, through the flexible shaft 48 and rock shaft 47, will lift the finger 46. This will slightly break the toggle which will be held against straightening by a short spring 63 (Fig. 2) surrounding the rod 32. These parts are now in the position shown in Fig. 1 and the mold 4 may be operated to make another casting.

The feature of this invention which relates more particularly to increasing the speed of production of castings contemplates the provision of an indicator or alarm to indicate the expiration of the necessary interim between the pouring of the casting and its removal after the metal has set. The duration of the cooling period is at present determined by the judgment of the operative and, in order to insure against spoiling a casting by opening the casting box before the plate has set, this period is unnecessarily prolonged.

In the present embodiment of the invention the indicator comprises a cylinder 66 attached to the cylinder 10 and a pipe 67 leading from the bottom of the cylinder to the pipe 22. This cylinder contains a piston 68 having a piston rod 69 surrounded by a spring 70 compressed between the piston and the cylinder head 71. The upper portion of the cylinder is vented at 72 so that air can escape when the piston is lifted by air pressure from the pipe 67. Air is admitted from the pipe 67 but restrained from escape therethrough by a ball valve 73. A ring 74 is secured to the piston rod 69 near its upper end so that as the piston descends the ring will cause a hammer 75 to strike a bell 76. The ring is engaged by a trip 77 pivoted on the hammer in order that the ring may pass on its upward motion. The air confined below the piston escapes through a cock 78 which may be adjusted to allow the air to escape with greater or less rapidity.

The piston 68 is lifted to the limit of its upward movement as soon as the valve 24 is opened to actuate the pump. When the valve is closed the pipe 22 is vented to the atmosphere, but the air in the cylinder 66 is confined by the ball valve 73 and can escape only through the cock 78 which is set so that the bell will be struck after a sufficient time to allow the casting to set.

In describing the operation of this invention it will be assumed that the parts are in the position shown in Fig. 1, the casting box 4 having been closed with the matrix secured therein. The operative will push the handle 34, which will admit air through the valve 24 to the pipe 22 and break the toggles 63' as has been described. Air pressure is admitted above the piston 17 in the cylinder 10 which at once descends, actuating the pump 2 and causing a flow of metal through the spout 3 to the casting box. As soon as the valve 24 is opened, air pressure is communicated to the cylinder 66 through the pipe 67 and the piston 68 is lifted against the tension of the spring 70. As the piston 17 descends at a speed gov-

erned by the escape of air through the cock 23, the plunger 41 engages the middle of the toggle and straightens the links until further movement is arrested by the finger 46 and stop screw 45. Any excess movement of the vertically moving parts is taken up by the spring on the plunger 41. The straightening of the toggle closes the valve 24, as has been hereinbefore made plain, and opens the pipe to the atmosphere.

The parts are now in the position shown in Fig. 2. The piston 17 at once starts to rise under the impulse of the spring 21 and the piston 68 commences to descend under the impulse of the spring 70 as rapidly as the air confined in the lower part of the piston is allowed to escape through the cock 78. It will be observed that the valve 24 is locked against a second operation. The casting is allowed to remain in the casting box until a blow on the bell 76 indicates that a sufficient time has elapsed for the casting to have become hard enough to be removed. The operative will then open the box and remove the casting. As the box is closed again the trip 58 turns the finger 59, which motion is transferred to the finger 46 to lift the center of the toggle slightly above a straight arm position where it is held by the spring 63, in a position to be further broken by pressure upon the handle 34 to again open the valve 24.

It is obvious that various features of this invention as defined in the claims may be used in making castings of other material than type metal and in connection with other forms of molds than the casting box illustrated and described. Therefore in the appended claims where the context so permits, the term "casting box" is to be understood as including within its meaning any of the well known forms of molds, flasks, or analogous devices. It is evident that non-metallic matter may be substituted for type metal without departing from the spirit of the invention.

What is claimed as new, is:—

1. In an apparatus for making castings, the combination with a supply of molten metal, of a casting box, means for supplying metal to the box under a constant momentum, and automatic means for stopping the movement of the metal supplying means after a predetermined operation of the latter.

2. In an apparatus for making castings, the combination with a supply of molten metal, of a casting box, fluid pressure means for supplying metal to the box under a constant momentum, and automatic means for rendering the fluid pressure means inoperative after a predetermined operation of the latter.

3. In an apparatus for making castings, the combination with a supply of molten metal, of a casting box, means for supplying metal to the box under a constant momentum, means for varying the momentum, and automatic means for rendering the metal supplying means inoperative after a predetermined operation of the latter.

4. An apparatus for making castings, having, in combination, a supply of molten material, a casting box, a pump for discharging the material to the casting box, a fluid pressure motor for actuating the pump, a valve for admitting fluid pressure to the motor, and automatic means for closing the valve after a predetermined actuation of the pump.

5. An apparatus for making castings, having, in combination, a metal pot, a casting box, a pump to discharge the metal to the casting box, a fluid pressure motor to actuate the pump, and a locking device to prevent a second operation of the motor before the casting box has been prepared to receive another casting.

6. In an apparatus for making castings, the combination with a supply of molten metal, of a casting box, fluid pressure means for supplying metal to the box under a constant momentum, means for varying the momentum, and automatic means for rendering the fluid pressure means inoperative after a predetermined operation of the latter.

7. In an apparatus for making castings, the combination with a reservoir holding a supply of molten metal, a casting box, a pump in the reservoir, fluid pressure means for causing the pump to deliver a supply of metal to the casting box under a constant predetermined momentum, and means operated by the pump for cutting off the fluid pressure.

8. In an apparatus for making castings, the combination with a reservoir holding a supply of molten metal of a casting box, a pump in the reservoir, fluid pressure means for causing the pump to deliver a supply of metal to the box under constant momentum, means for varying the momentum, and means operated by the pump for cutting off the fluid pressure.

9. An apparatus for making castings, having, in combination, a metal pot, a casting box, a pump to deliver metal from the pot to the casting box, and locking means for preventing a stroke of the pump after a single operation thereof.

10. An apparatus for making castings, having, in combination, a metal pot, a casting box, a pump to deliver metal from the pot to the casting box, locking means for preventing a stroke of the pump after a single operation thereof, and means operated by the casting box for unlocking the pump.

11. An apparatus for making castings,

having, in combination, a metal pot, a casting box, a pump to deliver metal to the casting box, a piston and cylinder connected with the pump, means for admitting fluid pressure to the cylinder on one side of the piston, and an adjustable vent on the other side of the piston for controlling the speed of the piston in the cylinder during its working stroke.

12. An apparatus for making castings, having, in combination, a metal pot, a casting box, a pump, a fluid pressure actuating device for the pump, a valve to control the fluid pressure, a lock to prevent the opening of the valve, and connections between the lock and the casting box whereby the lock is rendered inoperative for a single operation of the valve after the casting box has been closed to receive the metal.

13. An apparatus for making castings, having, in combination, a casting box, a pump to supply metal to the casting box, a fluid pressure motor to actuate the pump, a time indicator having connections with the motor by which it is thrown into operation, said indicator comprising a cylinder and spring actuated piston, and a vent to regulate the escape of air confined in the cylinder.

14. An apparatus for making castings, having, in combination, a metal pot, a casting box, a pump to deliver metal to the casting box, a fluid pressure motor to actuate the pump, a valve to control the supply of fluid pressure, a toggle connected with the valve, means to straighten the toggle after a delivery of metal by the pump, and means operated by the casting box for breaking the toggle when the box is in metal receiving condition.

15. An apparatus for making ca tings, having, in combination, a casting box, a pump to deliver metal to the casting box, a time indicator, a fluid pressure motor to actuate the pump, a valve to control the fluid pressure supplied to the motor, and connections between the fluid pressure and the indicator to throw the indicator into operation to indicate a period of time after the valve is operated.

16. An apparatus for making castings, having, in combination, a metal pot, a pump, a motor to actuate the pump, means to control the power supplied to the motor, and a time indicator rendered operative by the means for controlling the power supplied to the motor.

17. In an apparatus for making castings, the combination with a supply of molten metal, of a casting box, a pump actuated by fluid pressure for supplying metal to the box under a constant momentum, a manually opened valve for supplying fluid under pressure, and connections from the pump whereby the valve is automatically closed after a predetermined action of the pump.

18. In an apparatus for making castings, the combination with a metal reservoir, of a casting box, a pump, a piston and cylinder actuated by fluid pressure devices for operating the pump, means for supplying fluid under pressure to the cylinder, and means operated by the pump at the end of its working stroke for shutting off the supply of fluid under pressure.

19. In an apparatus for making castings, the combination with a metal reservoir, of a casting box, a pump, a piston and cylinder actuated by fluid pressure devices for operating the pump, a valve for admitting fluid under pressure to the cylinder, and connections whereby the piston closes the valve and locks the same in closed position at the end of the working stroke of the piston.

In testimony whereof, I have affixed my signature, in the presence of two witnesses.

GEORGE M. CLARK, JR.

Witnesses:

FRANKLIN F. CLARK,

E. C. MARKS.