Oct. 30, 1928. 1,689,698

I. TORNBERG

TIMING DEVICE FOR PNEUMATIC METAL PUMPS

Original Filed Dec. 8, 1924 3 Sheets-Sheet 1

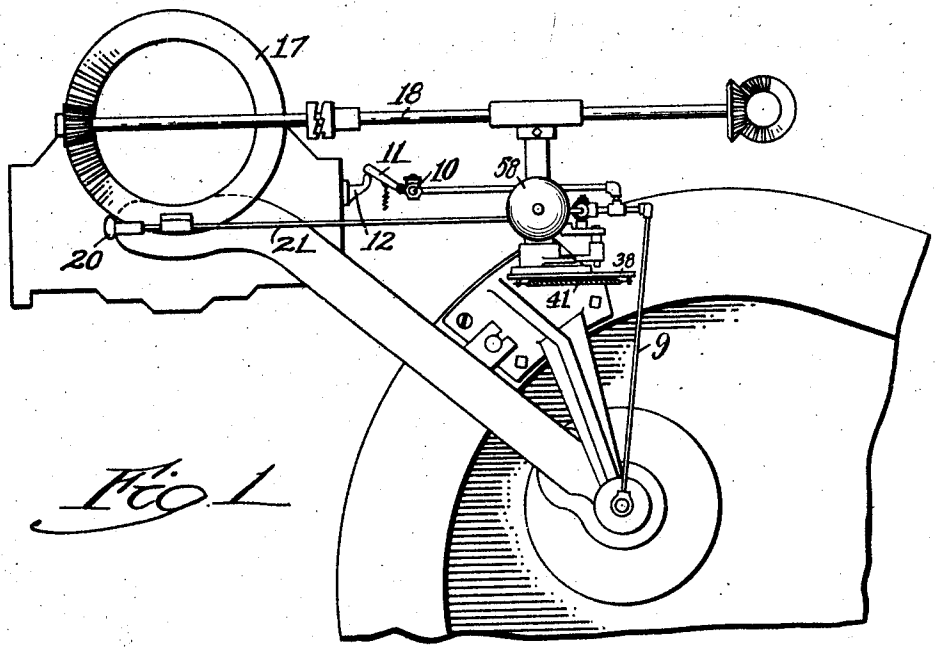


Fig. 1

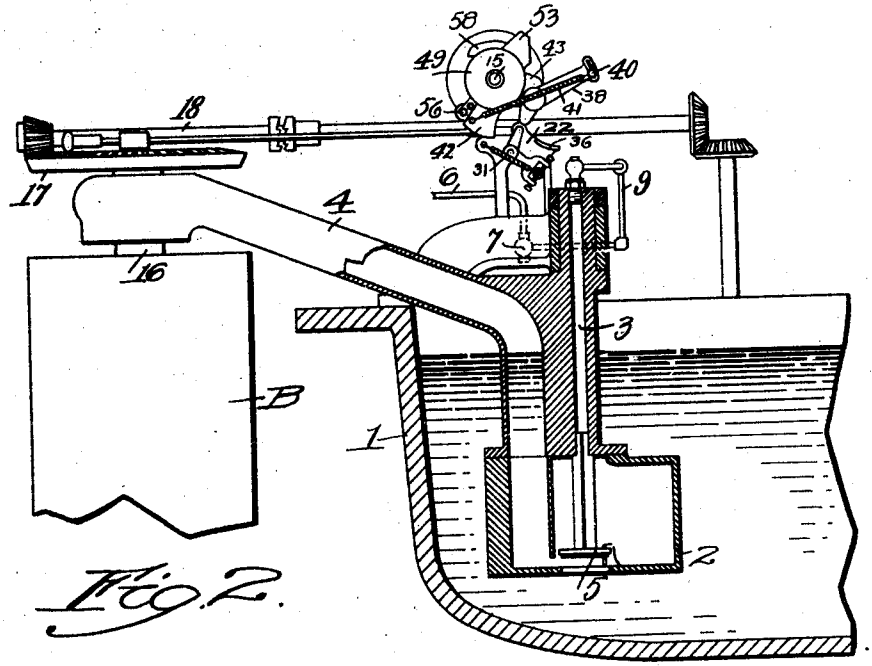


Fig. 2.

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TIMING DEVICE FOR PNEUMATIC METAL PUMPS

Original Filed Dec. 8, 1924 3 Sheets-Sheet 2

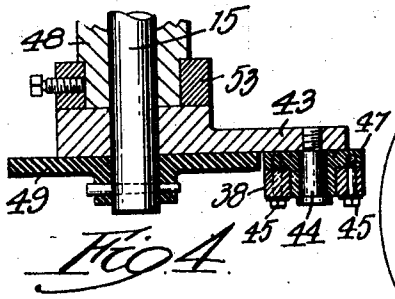


Fig. 4

Fig. 3

Fig. 5

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TIMING DEVICE FOR PNEUMATIC METAL PUMPS

Original Filed Dec. 8, 1924 3 Sheets-Sheet 3

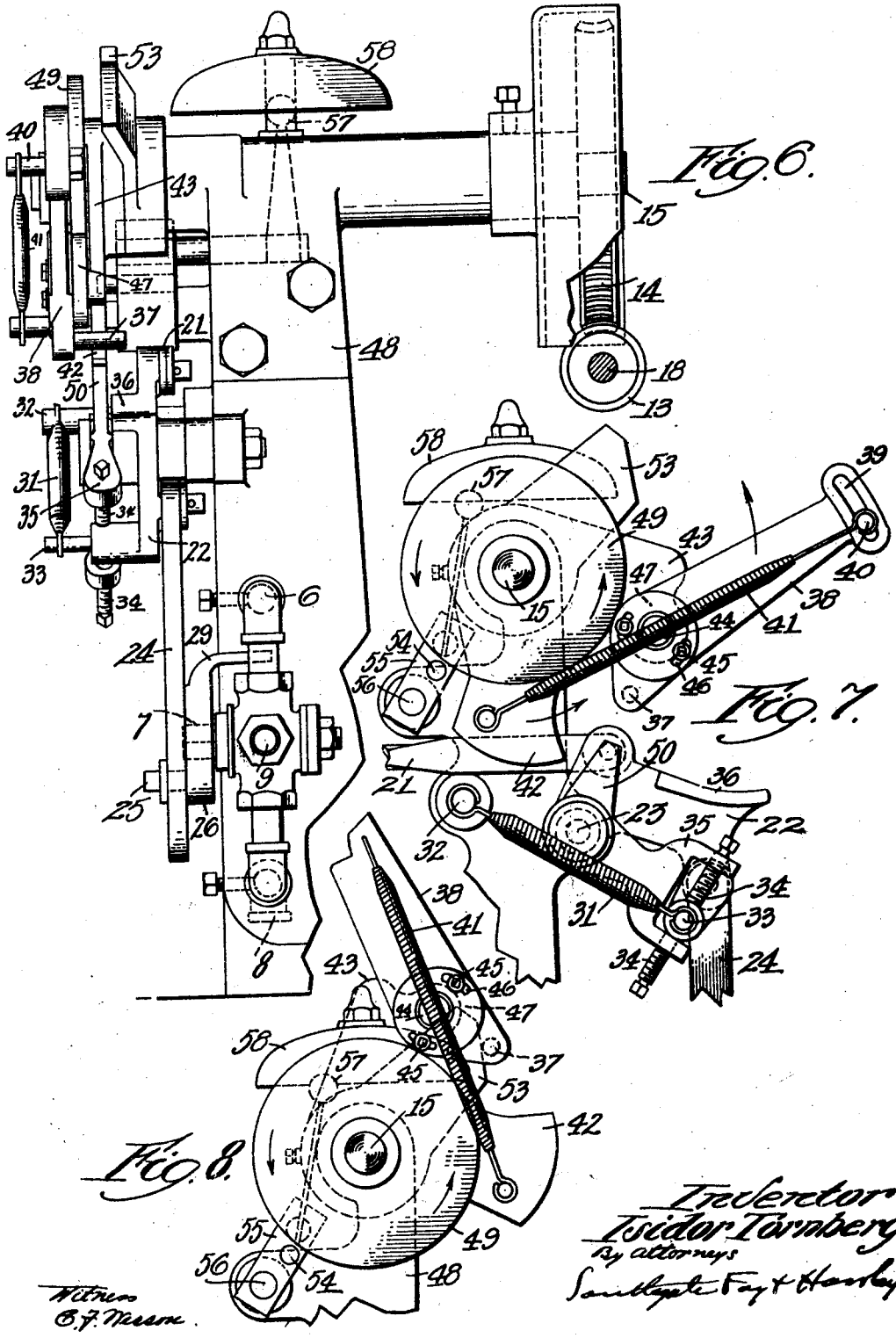


Fig. 6.

Fig. 7.

Fig. 8.

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UNITED STATES PATENT OFFICE.

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TIMING DEVICE FOR PNEUMATIC METAL PUMPS.

Application filed December 8, 1924, Serial No. 754,632. Renewed March 30, 1928.

This invention relates to a pneumatic pump for pumping molten metal into a casting box and is particularly adapted for the production of stereotype printing plates.

The principal objects of the invention are to provide a pneumatic pump for this purpose with means by which it can be started up by hand and will be stopped automatically after a certain amount of metal has flowed so that uniform plates may be obtained; and to provide means whereby an alarm is operated to notify the attendant when the plate has been cooled a certain length of time so that it can be removed from the casting box when in the right condition and there will be no danger of its being removed before it is sufficiently cooled and no time lost in allowing it to remain in the box afterwards.

Other objects and advantages of the invention will appear hereinafter.

Reference is to be had to the accompanying drawings, in which

Fig. 1 is a plan of a pump constructed in accordance with this invention and shown as supplying the metal to the mold;

Fig. 2 is a side view of the same partly in section;

Fig. 3 is a front view of the alarm and controlling mechanism on enlarged scale showing the parts in the same position as in Fig. 2, in which the pump is not operating;

Fig. 4 is a sectional view on the line 4—4 of Fig. 3;

Fig. 5 is a view similar to Fig. 3 showing the position of the parts when the operating handle is first pulled out to start the mechanism;

Fig. 6 is an end view taken in the direction of the arrow 6 in Fig. 3;

Fig. 7 is a fragmentary view similar to Fig. 3 but showing the parts in a position which they occupy while the plate is cooling after it is cast and before the signal has been given; and

Fig. 8 is a similar fragmentary view showin the position of the parts when they reach the limit of their motion in one direction, so as to be about to sound the signal to show that the plate is sufficiently cooled.

The invention is shown as applied to a stereotype metal pot 1 having a pneumatic pump cylinder 2 with a passage 3 for receivin the compressed air which is forced in to lift the metal. This air exerts pressure on the metal contained in the cylinder and forces down a valve 5 to prevent the issue of metal from the cylinder into the melting pot and cause it to flow up the spout 4 into the casting box B. The air is supplied to the pump through a pipe 6 leading to a controlling valve 7. When this valve is closed, it discharges through an outlet 8 and when it is open it delivers to piping 9 into the passage 3. The piping 9 has a connection to a safety valve 10. This valve has a handle 11 which is held by a spring so that the valve 10 is always open except when a finger 12 fixed on the casting box comes up with the casting box and moves this arm to close the valve. The closing of this valve therefore is automatic and controlled by the bringing of the casting box into proper position for pouring. The valve 10 affords an outlet to all the air admitted through the supply pipe 6 whenever the casting box B is not in pouring position. Thus, a simple and efficient safety device is provided to prevent the passage of metal through the spout 4 at all times except when the casting box is in registration with the outlet of that spout.

I have shown the casting box as of a type well known now and having a central shaft 16 on which the cylindrical core is fixed. This shaft is operated by gearing 17 from a horizontal shaft 18 which is operated constantly by mechanism not shown. On this shaft 18 there is a worm 13 operating a gear 14 on a cross shaft 15 so that this shaft 15 rotates constantly. This shaft is provided with controlling mechanism as will appear.

For the purpose of manually starting the pump, I provide a handle 20 on a sliding starting rod 21. This can be moved back and forth to the two positions indicated in Figs. 3 and 5. In Fig. 3 the starting rod 21 is pushed in and this prevents the flow of air and metal. It swings down a lever 22 connected to the end of the starting rod and pivoted on a stud 23 on the frame. In this position a link 24 pivoted to the bottom of this lever is forced down, as shown in Fig. 3, and a pin 25 on an arm 26 of the air valve 7 is pushed down by the upper end of a vertical slot 28 in the link. This closes the valve and brings a projection 29 thereon against the pipe 6 to limit its action in that direction.

Therefore the air from the pipe 6 cannot pass through the valve 7 to the pipe and passage 3 and the pump is not operated.

If, however, the handle 20 is pulled out and the rod 21 moved to the position shown in Fig. 5, the lever 22 is pulled up as shown in that figure and also the link 24. This operates on the pin 25 to open the valve 7 and air flows into the passage 3. It may be stated that when the parts are in the position shown in Fig. 5, the projection 29 comes up against a stop, namely the pipe 8.

It will be noted that there is a spring 31 connected with a point 32 on the stationary frame of the machine and adjustably connected at 33 by a pair of screws 34 with a yoke 35, which is a part of the lever 22, and swings with it. In the closed position shown in Fig. 3, this spring is at one side of the pivot 23, while in the open position shown in Fig. 5 it is at the other side. Therefore, the spring yieldingly holds the valve either closed or open as the case may be.

On the lever 22 there is a projection 36 which, in the position shown in Fig. 5 engages a pin 37 on a clutch arm 38. This clutch arm 38 has a slot 39 in which is adjustably mounted a pin 40 holding one end of a spring 41, the other end of which is held by a projection 42 on an oscillating element 43 and constituting a part thereof. This element is loosely pivoted on the shaft 15. The spring 41 acts like the spring 31 in moving to opposite sides of a stud 44 on which the clutch arm 38 is pivoted on the element 43 and holds the former in either of its extreme positions. The movement of the projection 36 into contact with the pin 37 as shown in Fig. 5 operates to turn the clutch arm 38. On the clutch arm 38 two bolts 45 are secured. These project through a pair of arcuate slots 46 in an eccentric clutch 47. This eccentric is mounted so that it can be adjusted the length of the slots about the stud 44 so as to bring its high point wherever desired with respect to the clutch arm 38. When the arm 38 is turned by the pin 37 the eccentric clutch turns with it into contact with a disc 49 pinned to the shaft 15 and rotates with it. Thus the clutch arm 38 and element 43 will be carried around with that disc part way. In the motion of the element 43 forwardly after the eccentric engages the disc the projection 42 on this element engages an arm 50 constituting a part of the lever 22 and forces it forward. The parts are so proportioned that this action takes place just when enough metal has been poured to fill the mold. The parts are shown in Fig. 5 in a position just before this action takes place. The projection 42 there is just about to strike the arm 50 and force the lever 22 over to the position shown in Fig. 3, in which the air is cut off from the pump. The projection 42 is just long enough so that it will then pass by the end of the arm 50 and the element 43 will continue to rotate as described. The spring 31 of course holds the valve 7 closed when moved to this position.

Loose on the shaft 15 but in fixed position is a cam 53, this being fixed to a stationary bearing 48 in which the shaft 15 is mounted. This cam 53 is in such position that when the element 43 is carried around by contact of the eccentric clutch 47 with the disc 49, the cam will engage the pin 37 as shown in Fig. 8 and turn the eccentric clutch on its axis 44 and bring it out of contact with the disc 49 on account of the eccentricity of the former. Therefore this element 43 will no longer rotate with the disc but will drop back by gravity.

In doing this the rear surface of the projection 42 constituting an integral part of the element 43, strikes a pin 54 on a lever 55 which is pivoted at 56. This forces that lever to swing suddenly about its pivot and cause a clapper 57 on the end of the lever to strike a bell 58. This gives an audible alarm. The parts are so timed that this occurs when the plate has had sufficient time to chill and become sufficiently solid to be removed from the casting box. Of course it will be understood that various other kinds of alarms can be used for this purpose.

It will be seen therefore that the pulling of the starting rod 21 from the closed position shown in Fig. 3 to the starting position shown in Fig. 5, opens the valve 7 and supplies air to the pump. The metal flows into the mold for a certain definite period of time. The opening of this valve results through the lever 22 in connecting the eccentric clutch with the rotating disc 49 and causes the element 43 with its projection 42 and other parts to rotate in the direction of the arrow in Fig. 5. The first and almost immediate affect of this rotation is to bring the projection 42 into contact with the arm 50 and rotate that arm with the lever 22 back into the position shown in Fig. 3 and also in Fig. 7 so that this closes the valve 7, as stated, and stops the pump but the element 43 continues to rotate until the pin 37 engages the cam 53. Then the element 43 is released from the disc 49 and drops back to the position shown in Fig. 3 and the alarm is operated as stated. A period of time has elapsed long enough to permit the casting to cool and harden in the casting box sufficiently to be removed. The casting is then removed by hand. In order to do this the casting box is moved out of position so that the finger 12 does not engage the handle 11 and the safety device described thus operates to avoid any possibility of the pump being operated. Whenever the casting device is turned back to casting position this safety device is closed and the parts are all ready to operate after the rod 21 is pulled out to starting position.

Although I have illustrated and described only a single form of the invention I am aware of the fact that modifications can be made therein by any person skilled in the art without departing from the scope of the invention as expressed in the claims.

Therefore I do not wish to be limited to all the details herein shown and described but what I do claim is:—

1. In a casting device, the combination with a metal pump and a movable casting box, of a finger on the box, a movable handle in position to be engaged and turned by the finger when the box moves to casting position, and means for rendering the pump inoperative at all times except when operated by said finger.

2. In a casting machine, the combination with a pneumatic pump and a movable casting box, of means for forcing compressed air into the pump, a starting device for the pump, a safety device for venting the air from the supplying means and taking the pressure off the pump, and means movable with the casting box for operating said safety device.

3. In a device for supplying molten metal to a movable casting box, the combination with the casting box, a pneumatic pump, and means for supplying air under pressure to the pump for operating it, of means for automatically stopping the flow of air to the pump and the flow of metal to the casting box when the casting box is not in casting position.

4. In a device for supplying molten metal to a casting box, the combination with a pneumatic pump, and means for supplying air under pressure to the pump for operating it, of a valve for controlling the admission of air to the pump, a rod for opening the valve, and means for automatically stopping the flow of air to the pump and the flow of metal to the casting box.

5. In a casting machine, the combination with a pump for supplying metal to the casting box, of means for cutting off the power from the pump and flow of metal to the casting box at a predetermined time after the pump starts, whereby all the castings will be supplied with the same amount of metal.

6. In a casting machine, the combination with a movable casting box and a pneumatic pump for supplying metal to the casting box, of means operated by the casting box for cutting off the supply of air to the pump after the flow starts, and automatic means for giving a signal at the expiration of a predetermined period after the casting box is filled to allow for the hardening of the casting.

7. In a casting machine, the combination with a puenmatic pump for supplying metal to the casting box and means for supplying air under pressure to the pump, of means on the casting box for cutting off the supply of air to the pump and flow of metal to the casting box at a predetermined period after the flow starts, and automatic means for giving a signal at the expiration of a predetermined period after the casting box is filled to allow for the hardening of the casting.

8. In a casting machine, the combination with a pneumatic pump and a shaft operating at a constant rate of speed, of means controlled by the shaft for cutting off the supply of compressed air to the pump and thus stopping the casting operation at a predetermined period after the beginning of the casting operation, said means being operative to continue to act after the flow of metal is stopped and to give a signal at a predetermined period after the box is filled to signal the operator when the casting is ready to be taken from the mold.

9. The combination with a pneumatic metal pump and a controlling valve, of a pull rod for starting it, means connected with the pull rod for opening said valve to direct compressed air into the pump, a constantly rotating shaft, and means on said shaft for actuating the valve operating means to close the valve after the shaft is rotated a predetermined length of time from the instant of the opening of the valve.

10. In a casting device, the combination with a pneumatic pump having a valve for controlling the admission of air under compression thereto, said pump being arranged to lift the metal when the air is admitted, of a starting device for the pump, a lever connected with the starting device and having connections for opening the valve when the starting device is operated, a constantly rotating shaft having a disc fixed thereon, an element pivoted on said shaft to freely swing on it, an eccentric clutch mounted on said element normally spaced from the disc, the first named lever having means for turning said eccentric clutch when it is moved to the valve opening position and bringing the eccentric clutch into contact with the disc, whereby the eccentric clutch and therefore the element on which it is mounted will turn with the disc, and means on said element for actuating the lever near the beginning of its motion to close the valve.

11. In a casting device, the combination with a pump having means for controlling it, of a starting device for the pump, a constantly rotating shaft having a disc fixed thereon, an element pivoted on said shaft to freely swing on it, an eccentric clutch mounted on said element normally spaced from the disc, the starting device having means for turning said eccentric clutch when it is moved to the pump operating position and bringing the eccentric clutch into contact with the disc, whereby the eccentric clutch and therefore the element on which it is mounted will turn with the disc, and means on said element for stopping the pump.

12. In a casting device, the combination with a pneumatic pump having a valve for controlling the admission of air under compression thereto, said pump being arranged to lift the metal when the air is admitted, of a starting device for the pump, a lever connected with the starting device and having connections for opening the valve when the starting device is operated, a constantly rotating shaft, an element pivoted on said shaft to freely swing on it, an eccentric clutch mounted on said element, the lever having means for turning said eccentric clutch when it is moved to the valve opening position and bringing the eccentric clutch into position to be carried around with the shaft, means on said element for actuating the lever near the beginning of its motion to close the valve, and adjustable yielding means for operating on the lever for holding it yieldingly either in position for closing or for opening the valve.

13. In a metal casting device, the combination with a pneumatic pump for forcing metal into a mold and a valve for controlling the admission of air under pressure to the pump, of a starting device for the pump having means for opening said valve, a constantly rotating shaft, means for closing the valve, an element rotatable part way around with the shaft for operating said closing means at a predetermined time after the valve is opened, whereby a predetermined quantity of metal will be pumped into the mold, a signal, said element having means for operating said signal when it drops back, and a stationary cam for disconnecting said signal operating means from the shaft and letting it drop after the shaft has completed a definite portion of its rotation, whereby the signal will announce the fact that the casting has cooled a predetermined length of time.

14. In a metal casting device, the combination with a pump for forcing metal into a mold, of a starting device for the pump, a constantly rotating shaft, an element rotatable part way around with the shaft for stopping the pump at a predetermined time after it is started, whereby a predetermined quantity of metal will be pumped into the mold, a signal, said element having means for operating said signal when it drops back, and a cam for disconnecting said signal operating means from the shaft and letting it drop after the shaft has completed a definite portion of its rotation.

15. In a casting device, the combination with a pneumatic pump for pumping metal into a mold and a valve for controlling the admission of air to the pump, of a lever, a link pivoted to said lever and having a slot providing a lost motion connection with the valve, whereby the turning of the lever through a certain arc will open or close the valve, operating means for turning the lever to open the valve, and automatic means for turning the lever to close the valve after the valve has been opened a predetermined length of time.

16. In a casting device, the combination with a pump for pumping metal into a mold, of a lever, a link pivoted to said lever and having a slot providing a lost motion connection, means whereby the turning of the lever through a certain arc will start or stop the pump, and automatic means for turning the lever to stop the pump after the pump has been operating a predetermined length of time, said automatic means comprising a constantly rotating shaft, an element loosely pivoted on the axis of said shaft, means on said element for connecting it with the shaft to rotate around with it, a fixed cam for disconnecting said means from the shaft to let the element drop back, and a signal device adapted to be operated by said element when it drops back.

17. In a casting device, the combination with a pneumatic pump for forcing metal into a mold, and a valve for controlling the admission of air to the pump to start and stop the flow of metal, of an arm on the valve having a pin, a link for operating said arm having a slot in which the pin is received, a lever to which the link is pivotally connected, means for yieldingly holding the lever in either of its extreme positions, a starting rod pivotally connected with the lever, whereby upon the pulling of the starting rod, the lever will be swung to a position to open the valve, a projection and an arm on said lever, a constantly rotating shaft having a disc fixed thereon, an element pivoted to swing freely on said shaft provided with a projection in a position to engage the arm on the lever when the element swings forward through a small arc and to move the lever to close the valve, a clutch arm pivoted on said element and having on one end a pin in position to be operated by the arm on the lever to swing the lever on its axis, an eccentric clutch fixed on the clutch arm and adapted to engage said disc when swung around to a certain position, whereby the clutch arm will move around with the disc and carry said element with it, a fixed cam in position for engaging the pin and swinging the clutch arm on which it is located to release the eccentric clutch from the disc, whereby the clutch arm and its associated parts will be free to swing back on the axis of the shaft, and an alarm device in position to be operated by the projection on said element when it swings back to that position.

18. In a casting device, the combination with a pump for forcing metal into a mold, of a lever, a starting rod pivotally connected with the lever, a projection and an arm on said lever, a constantly rotating shaft having

a disc fixed thereon, an element pivoted to swing freely on said shaft provided with a projection in a position to engage the arm on the lever when the element swings forward through a small arc and to move the lever to close the valve, a clutch arm pivoted on said element and having on one end a pin in position to be operated by the arm on the lever to swing the lever on its axis, an eccentric clutch fixed on the clutch arm and adapted to engage said disc when swung around to a certain position, whereby the clutch arm will move around with the disc and carry said element with it, a cam in position for engaging the pin and swinging the clutch arm on which it is located to release the eccentric clutch from the disc, whereby the clutch arm and its associated parts will be free to swing back on the axis of the shaft, and an alarm device in position to be operated by the projection on said element when it swings back to that position.

19. In a device for supplying molten metal to molds, the combination with a strokeless pump adapted to continue the supply of metal to the mold until the power is shut off, and means for automatically stopping the power when a predetermined quantity of metal has been delivered to make the castings all uniform in weight.

In testimony whereof I have hereunto affixed my signature.

ISIDOR TORNBERG.