May 5, 1953 A. J. KEMPPE 2,637,079

CENTRIFUGAL CASTING DEVICE

Filed Sept. 16, 1950 3 Sheets-Sheet 1

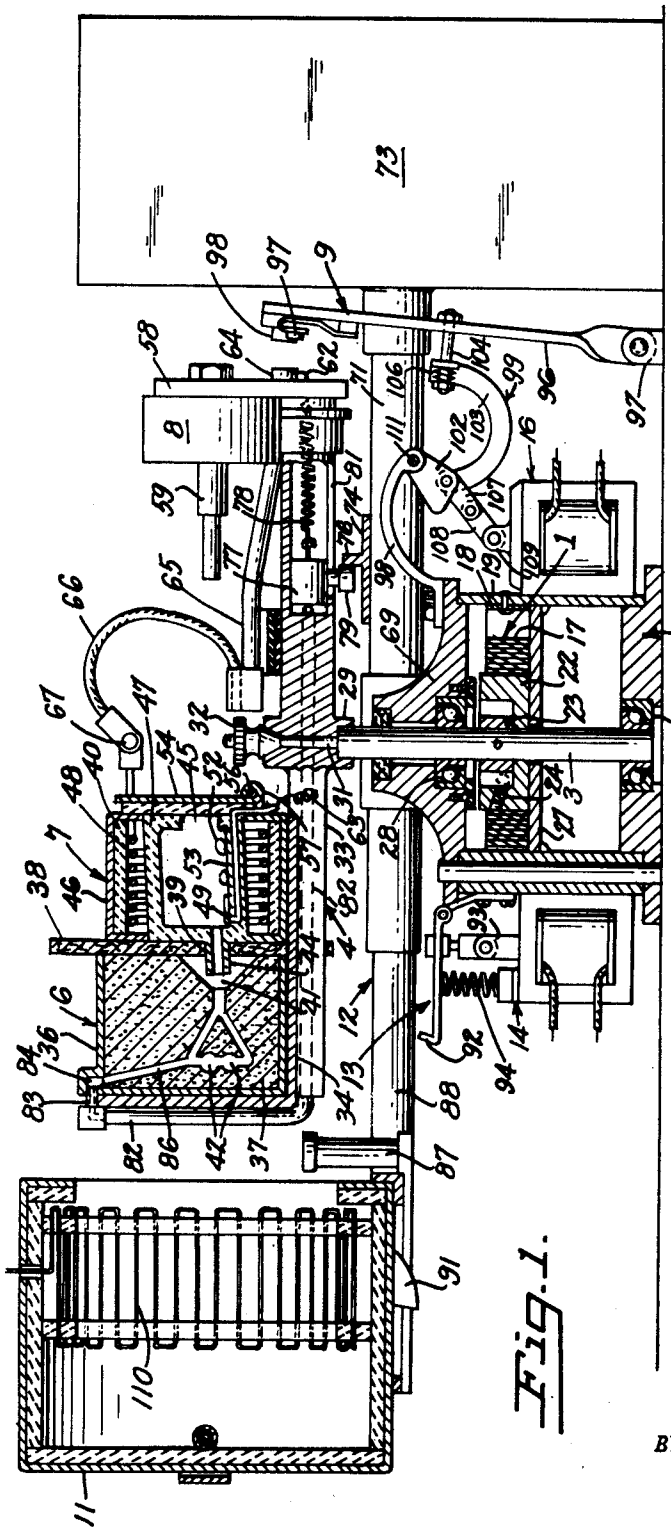


Fig. 1.

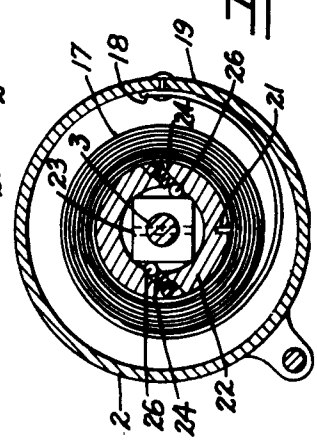


Fig. 2.

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3 Sheets-Sheet 2

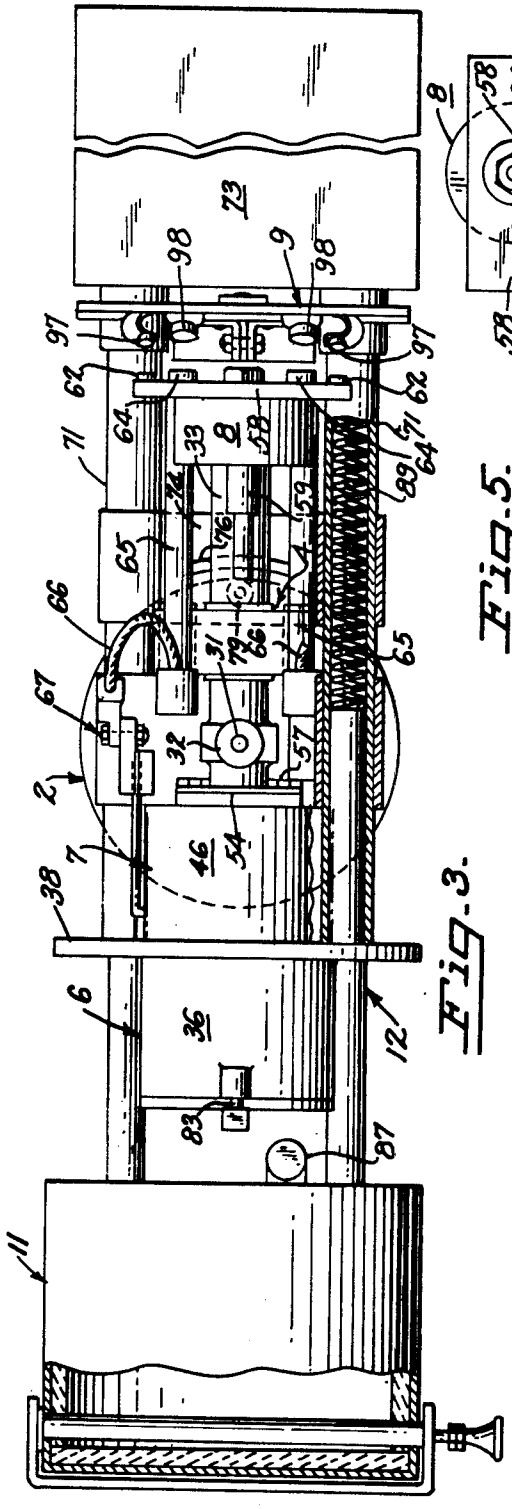


Fig. 3.

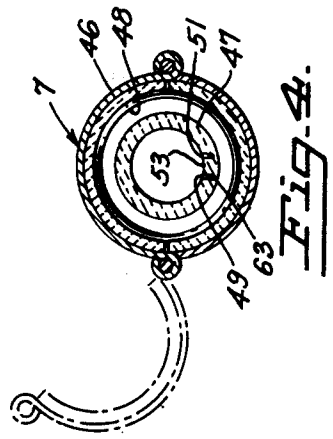


Fig. 4.

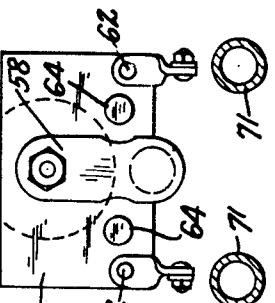


Fig. 6.

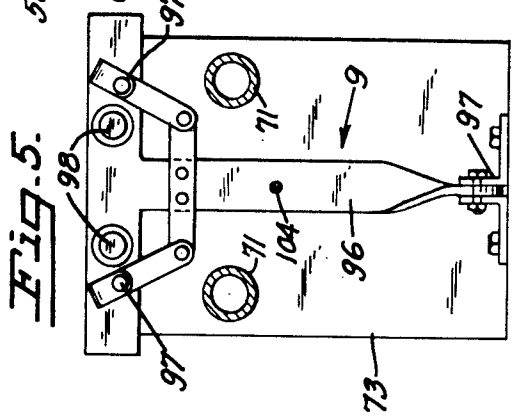


Fig. 5.

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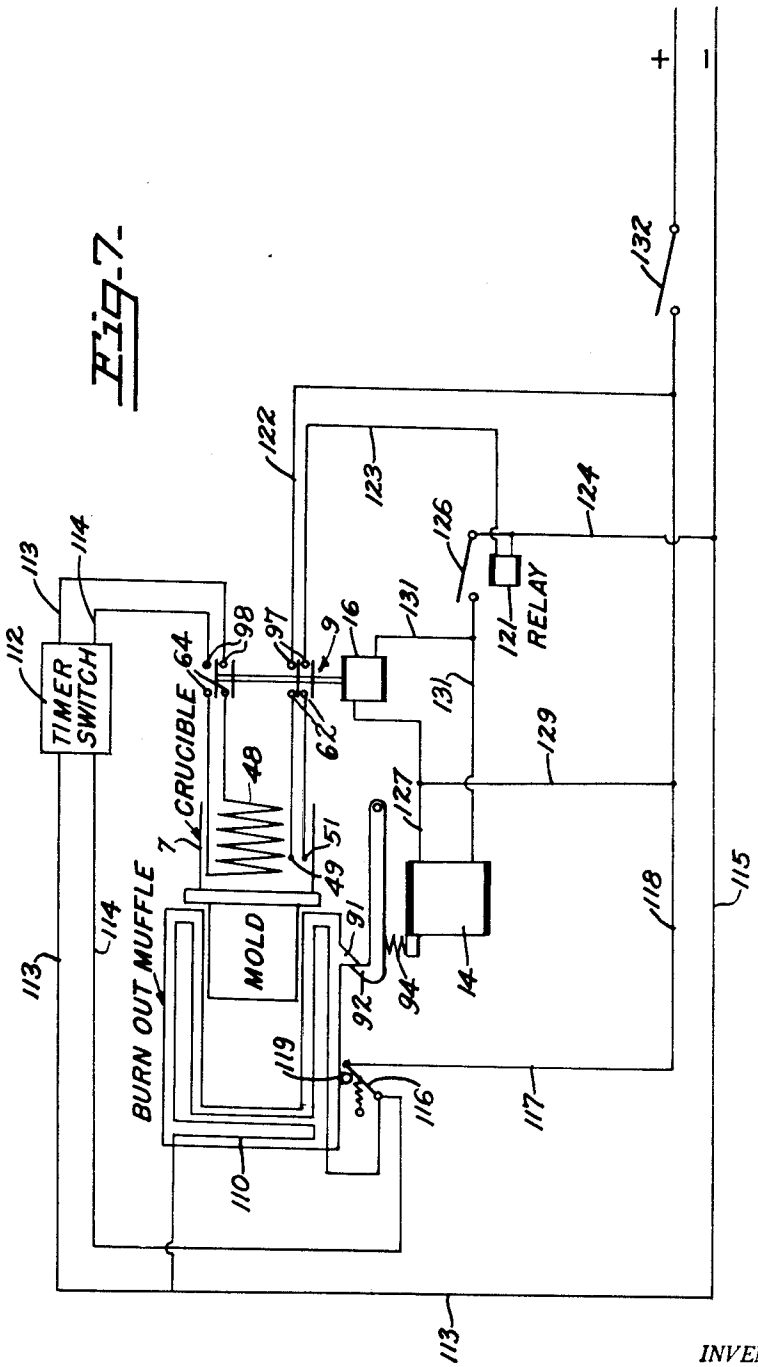
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CENTRIFUGAL CASTING DEVICE

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3 Sheets-Sheet 3

Fig-7-



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2,637,079

CENTRIFUGAL CASTING DEVICE

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Application September 16, 1950, Serial No. 185,195

8 Claims. (Cl. 22—65.1)

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This invention relates to a centrifugal casting device.

The primary object of the invention is to provide a centrifugal casting device which can be preset so as to heat a wax mold for a predetermined period, then to melt the metal for injection into the mold cavities, and then be automatically set into spinning operation by the molten metal so as to simultaneously release the first heating element and to trip a rotating device in such a manner as to spin the mold with the crucible thereon in which the metal is melted, thereby to inject by centrifugal force the metal into the mold cavities.

Another object of the invention is to provide a device which can be preset so that the burn-out muffle operates for a predetermined period necessary to melt the wax out of a wax mold and after the predetermined period to set in operation a crucible for melting the gold or other metal used in the casting, then utilizing the molten metal as a conductor for actuating release mechanisms for disconnecting said currents and devices and releasing a preset spinning mechanism to spin the crucible and the mold together and by centrifugal force transfer the molten gold or metal from the crucible into the wax mold, means being provided to draw out gases or air or other matter trapped in said cavities.

I am aware that some changes may be made in the general arrangements and combinations of the several devices and parts, as well as in the details of the construction thereof without departing from the scope of the present invention as set forth in the following specification, and as defined in the following claims; hence I do not limit my invention to the exact arrangements and combinations of the said device and parts as described in the said specification, nor do I confine myself to the exact details of the construction of the said parts as illustrated in the accompanying drawings.

With the foregoing and other objects in view, which will be made manifest in the following detailed description, reference is had to the accompanying drawings for the illustrative embodiment of the invention, wherein:

Fig. 1 is a cross-sectional view of an illustrative embodiment of my centrifugal casting device.

Fig. 2 is a sectional plane view of the circular base and the spinning device therein.

Fig. 3 is a top plane view partly in section of my casting device.

Fig. 4 is a cross-sectional view of the crucible of my device.

Fig. 5 is a sectional view through the frame bars

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of the device viewing the end circuit breaker and its contacts.

Fig. 6 is a sectional view through the frame viewing the end contacts on the end of the whirling shaft, and

Fig. 7 is a wiring diagram of the electric circuits of my device.

In its general organization my centrifugal casting device includes a spinning device 1 contained in a base 2, the shaft 3 of which carries on its top a whirling or spinning frame 4. On one end of the spinning frame is suitably supported a casting or wax mold 6 in operative relation to a crucible 7. At the other end of the whirling or spinning frame 4 is a counterweight 8 and suitable circuit breaker device 9 for the circuit control. A burn-out muffle 11 is mounted on a guide frame 12 so that it can be slid over the casting or wax mold 6, and held there by a suitable releasable catch device 13 to be tripped or released after a predetermined period.

A solenoid release device 14 mounted on the base 2 controls the release of the burn-out muffle 11. Another solenoid release device 16 controls the circuit breaker device 9. The entire electric circuit of the device being controlled by suitable timing device as shown in the wiring diagram in Fig. 7.

The spinning mechanism 1 in the present illustration includes a flat coil spring 17 which has its outer end 18 anchored to the wall 19 of the cylindrical hollow base 2. The inner end 21 of the spring 17 is anchored in a drive ring 22 around the shaft 3. On the shaft 3 is a substantially rectangular collar 23 which is located inside of the drive ring 22. Generally tangential holes 24 extend from the outer periphery to the inner periphery of the ring 22 on opposite sides of the ring and each hole 24 has a ball 26 therein adjacent a side of the rectangular collar 23. This arrangement permits the shaft 3 to rotate freely in a contraclockwise direction viewing Fig. 2, but the collar 23 jams the balls 26 when the collar 23 is rotated in a clockwise direction so as to connect the ring and the collar together. The ring 22 and the flat spring 17 rest upon a partition plate 27 spaced above the bottom of the base 2. Ball bearings 28 in the bottom and in the top of the base 2 suitably support the shaft 3 in said base 2.

The whirling or spinning frame includes a hub 29 mounted on the top of the shaft 3. In the present illustration the hub 29 is on a reduced and threaded shaft end 31 held against the shoulder at the top of the shaft 3 by a suitable nut

32 in the top of the hub 29. A spinning shaft 33 extends from the opposite sides of the hub 29.

On one end of the spinning shaft 33 is a saddle plate 34 on which is mounted the casting mold 6 which includes the usual casing 36 containing the mold 37 with suitable cavities 42 usually filled with wax to conform to the contour of the gold or metal frame or part to be cast, for instance of a dental casting. This casing 36 is securely fixed on the saddle plate 34 and pressed against a partition disk 38 at its front. The partition disk 38 has an opening 39 near its lower portion for communication into the intake port 41 of the mold cavities 42. In front of the partition disk 38 is the crucible 7 which is suitably mounted on the spinning shaft 33 and has its outlet 44 aligned with and leading into the intake port 41 of the said mold cavities 42.

The crucible 7 includes an outside casing 46. This casing 46 is preferably a longitudinally split cylindrical casing suitably hinged on one side and clamped together around a crucible chamber 47 of suitable refractory material. A heating coil 48 is placed within the casing 46 and around the crucible chamber 47 and is suitably connected to a source of electricity as hereinafter described. The crucible chamber 47 has an intake opening 45 at its end spaced from the partition plate 38 through which the metal to be melted can be introduced. The casing 46 is lined with a heat resistant lining 49.

A characteristic of the crucible 7 herein used is that an electric conduit system is provided in said crucible and has its terminals so exposed that the circuit is bridged by the molten metal in the crucible chamber 47. This circuit system is connected by suitable wirings to be hereinafter described to the control solenoids which control the various release devices. In the present illustration a pair of terminals 49 and 51 are provided in the bottom or lowermost portion of the crucible chamber 47. At least one of these terminals is insulated except for its exposed end. The ends of the terminals 49 and 51 in the crucible chamber 47 are spaced from one another at a suitable distance so as to normally keep the circuit open. After the metal indicated by the circle 52 in the crucible chamber 47 is melted it flows toward the outlet of the crucible chamber 47 because of the inclined bottom 53 of said crucible chamber and it bridges the gap between the terminal points 49 and 51 which through suitable timing release and devices, as shown in the wiring diagram, operate and trip the release mechanism to set the device into whirling or spinning.

A gate or door 54 covers the intake opening 48 of the crucible chamber 47. This door 54 is lined with suitable heat insulating material and is supported on a cross-bar 56 on suitable spring hinges 57 for normally urging the door 54 in closed position.

On the other end of the spinning or whirling frame and on the other end of the spinning shaft 33 is supported a bracket 58 carrying a counterweight shaft 59. On the counterweight shaft 59 are the usual counterweights 8 which can be easily replaced and removed for the balancing of the whirling device. On the back of the bracket 58 are provided a plurality of contacts, for electrical circuit connections. In the present illustration there are two pairs of contacts. A pair of contacts or terminals 62 are connected by electrical lines 63, preferably concealed or attached to the adjacent whirling shaft 33, leading respectively to the terminals 49 and 51 in the crucible chamber 47. The other pair of contacts 64 are connected by comparatively heavy cables 65, which are provided with suitable loops 66 to the respective terminals 67 of the crucible heating coil 48. The cables 65 and 66 are of such dimensions as to materially reduce the voltage of the current and prevent overheating of the conduits. A suitable switch device or circuit breaker 9 heretofore mentioned is provided with matching contacts for engagement with the contacts 62 and 64 on the bracket 58 in the circuit closing position.

The base 2 has a top 69 in which the bearing 28 at the top is located and through which the shaft 3 extends. On this top 69 are a pair of parallel bars 71 forming a frame for the support of the burn-out muffle 11 at one end, and a suitable transformer 73 at the other end. These parallel frame bars 71 are fixed. On the top of the bars 71 is a plate 74 with an upright arcuate flange 76. The adjacent whirling or spinning shaft 33 above said flange 76 is hollow and it has in it a piston 77. A coil spring 78 is connected at one end to the piston 77 and at its other end to the inside of the bracket 58 to normally urge the piston 77 toward the end of the said spinning shaft 33. A roller abutment 79 extends downwardly from the piston 77 and through a slot 81 in the lower portion of the shaft 33. This abutment roller 79 rides on the arcuate flange 76 at the initial turning of the spinning mechanism 1. When the abutment roller 79 rides off the flange 76 the spring 78 snaps the piston 77 rapidly and draws a suction in a tube 82 which extends from the inner end of the cavity in the shaft 33 to the top of the casing of the casting or wax mold 37. A plug tube 83 is insertable in a hole or chamber 84 in the casing 36 which is connected by a passage 86 to the molding cavity 42. The plug tube 83 is on the top of the tube 82 so that the suction drawn by the piston 77 draws the air from the casting cavity 42 at the beginning of the whirling thereby prevents the forming of air pockets and bubbles in the casting.

When the spring 17 is wound up ready for whirling, the roller guide or roller abutment 79 is pulled inwardly of the guide flange 76 so as to cock the piston 77 and be in engagement with the arcuate flange 76. The device is held against whirling by an abutment or catchpin 87. This catchpin 87 is on one of the telescopic bars 88, on which the burn-out muffle 11 is mounted. The parallel bars 88 telescope into the tubular frame bars 71 and are urged by a spring 89, in the tubular bars 71, outwardly so as to normally urge and push the sliding bars 88 and the burn-out muffle 11 away from the casting mold. In this out of the way position the catchpin 87 is out of the way of the whirling or spinning frame allowing the rotation of the same. At the beginning of the operation, however, and after the whirling or spinning frame is cocked, the burn-out muffle 11 is pushed in so that the sliding bars 88 slide into the tubular bar 71 and the burn-out muffle 11 surrounds the casting mold 6. When the burn-out muffle 11 is pushed over the casting mold 6, a catch tooth 91 thereon engages a pawl 92 which latter is pivoted on the base wall 19 and is connected to the solenoid core 93 of the solenoid 14. A spring 94 normally urges the pawl 92 upwardly and holds the same in engagement with the tooth 91 when the burn-out muffle 11 surrounds the casting mold 6. Thus the entire device is held assembled in a heating position until the solenoid

14 is operated to draw the core 93 thereof downwardly against the action of the spring 94 and thereby to pull the pawl 92 away from the tooth 91 and allow the springs 89 to push the sliding shafts 88 and the burn-out muffle 11 outwardly and away from the casting mold 6, thereby disengaging the catchpin 37 from the whirling frame 4 and allowing the spinning of the entire spinning mechanism.

The electric connections for the operation of the devices in the whirling part of the mechanism are accomplished through the circuit breaker 9. This circuit breaker 9 includes an arm 96 pivoted on a base plate 97 so as to be swingable toward and away from the bracket 58 at the adjacent end of thes pinning shaft 33. On this pivoted arm 96 are a set of terminal contacts arranged in pairs symmetrically with the pairs of terminal contacts 62 and 64 on the bracket 58. These terminal contacts 97 and 98 respectively contact the opposite terminals or contacts 62 and 64 on the bracket 58 when the arm 96 is in circuit closing position. The terminal contacts 97 and 98 are connected into an electric circuit and release particularly shown in the wiring diagram in Fig. 7. A suitable link mechanism 99 is pivoted on an overhead bracket 98 supported on the top 69 of the central base 2, and is pivotally connected to the top of the core 109 of the solenoid 16, so as to normally hold the circuit breaker 9 in a closed position and to release it at the predetermined operation of the solenoid 16.

Thus in the general operation of the device when the spinning or whirling frame 4 is cocked and held in position by the catchpin 37, and the burn-out muffle 11 is around the casting mold 6, the suitably controlled electric circuits keep the burn-out muffle 11 at a temperature for melting out the wax in the wax mold 37. After a predetermined suitable period, after the gold 52 or other metal used melted, it flows downwardly on the crucible bottom 53 and flows over to bridge the gap between the terminals 49 and 51. By suitable delayed action relay hereinafter described, after a predetermined period subsequent to said bridging, the circuits of the solenoids 14 and 16 are closed and the pawl 92 is pulled out to release the catch tooth 91 and the link mechanism 99 is operated to move the circuit breaker 9 away from the bracket 58 thus the spinning frame 4 is freed and begins its whirling motion under the action of the flat spring 17. As soon as the roller abutment 79 clears the guide flange 76 it snaps outwardly and the piston sucks the air from the cavities of the wax mold 37 and continued whirling forces the molten gold or metal, by centrifugal force, into the mold cavities 42. When the flat spring 17 is completely unwound the frame 4 stops and the mold 6 can be removed and the casting taken out in the usual manner.

The preferable circuit for the operation and control of the various devices is shown in the wiring diagram in Fig. 7.

The link mechanismm 99 includes a link 102 pivoted on the outer end of the bracket 98 and depending from the same. An arcuate link 103 extends from the lower end of the first link 102 and has its end slidable on a pin 104 extended from the circuit breaker arm 96. A spring 106 on the pin 104 maintains the link 103 under tension. Another link is formed of two pivoted sections 107 and 108. The section 107 is pivoted to the pivote connection between the links 102 and 103 and the other section 108 is pivoted to the top of the core 109 of the solenoid 16. A setting bar

111 is fastened to the pivot of the eccentric link 102 whereby the link 102 can be turned in a clockwise direction viewing Fig. 1 for pulling the link 103 and turning the lever arm 96 to a circuit closing position. At the same time the pivoted links 107 and 108 are pulled upwardly and the solenoid core 109 is pulled up. When the solenoid 16 is energized, it pulls the core 109 downwardly which pulls down the pivoted links 107 and 108 and thereby swings the link 102 downwardly and in a contraclockwise direction, and the link 103 and lever arm 96 to the circuit opening position shown in Fig. 1.

The operation of the device is controlled by an electric circuit illustrated on the wiring diagram in Fig. 7. A timer switch 112 is interconnected between the lines 113 and 114 leading to the contact or circuit bracket terminals 97 which connect to the contacts 62 leading to the heating element 43 of the crucible 7. The timer 112 is of such construction that it can be set to any predetermined period within which to close the circuit therethrough. The line 113 is connected to a suitable supply line 115. The other line 114 is connected to an outlet terminal of muffle actuated normally resiliently open switch 116. One end of the heating coil 110 of the burn-out muffle is connected to the source of supply through said line 113, and the other end of the muffle heating coil 110 is connected to the outlet terminal of said muffle actuated switch 116. The intake terminal of the muffle actuated switch 116 is connected by a line 117 to the other line 118 of said source of electricity. The burn-out muffle has a circuit closing abutment 119 which abuts against and closes the switch 116. Said switch 119 is suitably fastened on the base so as to be abutted by said abutment 119 when the muffle is pushed over the mold.

The contact 62 leading from the spaced points 49 and 51 connect through the other contacts 97 of the circuit breaker 9 to a delayed relay 121. One of the terminals 97 is connected by a line 122 to one of the main lines 113, the other terminal 97 is connected by a wire 123 to and through the solenoid relay coil 121 and then by another solenoid line 124 to the other main line 115. Thus whenever the gap between the terminals 49 and 51 in the crucible is closed by the melted metal, the relay 121 is energized and after suitable delay, it closes a switch 126 to the circuits of the solenoids 14 and 16. Lines or wires 127 lead from the solenoids 14 and 16 to a wire 129 which latter connects to the main current supply line 118. And the intake lines 131 leading to the solenoids 14 and 16 are connected with the outlet terminal of the relay switch 126 and through that switch 126 and the line 124 to the other main line 115.

In operation the casting cavities are formed in the usual manner in the wax mold 37 and the casing 36 is mounted upon the whirling arm or shaft and against the insulating plate 38. Then the suction line 83 is connected into the casting device. The gold 54 or other suitable metal is inserted and placed upon the bottom of the crucible chamber 47. Then the whirling frame 4 is rotated to cock the flat spring 17. While the frame 4 is held manually in the cocked position the burn-out muffle 11 is pulled over the casting device 6 until the tooth 91 thereof catches on the pawl 92 and thus the burn-out muffle is held in position, and the abutment 119 closes the muffle actuated switch 116. In this manner the stop pin 37 arrests the whirling frame 4 and holds

it against rotation. The crank bar 111 is turned to close the circuit breaker 9, as heretofore described. The timer 112 is now set to the period estimated for the burning out of the wax in the mold 6 and finally a main supply switch 132 interconnected in the supply line 118, is closed. The current is immediately connected to the wires 113 and 114 and to usual heating coil of the burn-out muffle 11. After the burn-out muffle 11 operates for the predetermined period, the timer 112 closes the electric current through the lines 113 and 114 and through the closed circuit breaker 9. Thus the circuit is automatically closed after the predetermined time through the closed circuit breaker 9 and to the heating coil 48 of the crucible 7 which heats and melts the metal 52. When the metal 52 melts it flows down on the inclined bottom 53 of the crucible and bridges the gap between the terminals 49 and 51, thus closes the circuit to the delayed relay 121, which latter after a certain delay to allow all the metal 52 to melt, operates to close the switch 126 thereby to close the circuit of the solenoids 14 and 16 through the lines 131. The energized solenoids 14 and 16 respectively pull down the pawl 92 and pull down the circuit breaker link mechanism 99 to push out the circuit breaker lever 96 so as to respectively and simultaneously release the burn-out muffle 11 and disconnect the circuit breaker 9. The springs 89 push the burn-out muffle 11 into an out-of-the-way position and thus move the catch pin 87 out of the way of the spinning frame 4, and simultaneously open the muffle actuated switch 119. Thus released the whirling mechanism under the action of the flat spring 17 is whirled about at a suitable speed. At the beginning of its rotation, as soon as the roller 79 rides off and clears the arcuate flange 76, the piston 77 in the shaft 33 is snapped by its spring 78 so as to draw air out through the suction tube 83 and from the cavities of the wax mold 37. The centrifugal force of rotation expels the molten metal 52 through the crucible mouth 44 into the cavities 42 of the wax mold 37 and finally stops. It is to be noted that by the time the device stops all the electric circuits are open and disconnected.

The device, after it is set, performs all the operations automatically without any need for watching the operation of the machine at any time. The machine can be left in the laboratory by itself and performs the cycle of operations required for centrifugal casting so that any danger or damage is positively avoided. The parts of the device can be easily removed and replaced as needed.

I claim:

1. In a centrifugal casting device, the combination with a crucible, a mold adjacent the crucible, and a rotating device to rotate said crucible and said mold together as a unit for expelling molten material from said crucible into said mold, an electrical heating circuit for said crucible, said crucible having therein the terminals of a releasing electrical circuit adapted to be closed by the molten material in said crucible; of a burn-out muffle removably extending around said mold; a releasable device to arrest the rotation of said rotating device, electrically actuated means to release said releasable device, an electrical circuit for said electrically actuated means in series with said terminals, an electrical heating circuit for said muffle, and a timer switch connected in parallel with said muffle heating circuit and in series with said crucible heating circuit to regulate the closing of said crucible heating circuit relatively to the closing of said muffle heating circuit.

2. In a centrifugal casting device, the combination with a crucible, a mold adjacent the crucible, and a rotating device to rotate said crucible and said mold together as a unit for expelling molten material from said crucible into said mold, an electrical heating circuit for said crucible, said crucible having therein the terminals of a releasing electrical circuit adapted to be closed by the molten material in said crucible; of a burn-out muffle removably extending around said mold; a releasable device to arrest the rotation of said rotating device, electrically actuated means to release said releasable device, an electrical circuit for said electrically actuated means in series with said terminals, an electrical heating circuit for said muffle, and a timer switch connected in parallel with said muffle heating circuit and in series with said crucible heating circuit to regulate the closing of said crucible heating circuit relatively to the closing of said muffle heating circuit, and releasable means to simultaneously connect said muffle heating circuit and said time switch to an electric supply circuit.

3. In a centrifugal casting device, the combination with a crucible, a mold adjacent the crucible, and a rotating device to rotate said crucible and said mold together as a unit for expelling molten material from said crucible into said mold, an electrical heating circuit for said crucible, said crucible having therein the terminals of a releasing electrical circuit adapted to be closed by the molten material in said crucible; of a burn-out muffle removably extending around said mold; a releasable device to arrest the rotation of said rotating device, electrically actuated means to release said releasable device, an electrical circuit for said electrically actuated means in series with said terminals, an electrical heating circuit for said muffle, and a timer switch connected in parallel with said muffle heating circuit and in series with said crucible heating circuit to regulate the closing of said crucible heating circuit relatively to the closing of said muffle heating circuit, and releasable means to simultaneously connect said muffle heating circuit and said time switch to an electric supply circuit, and means actuated simultaneously with the operation of said releasable device to release said releasable means for disconnecting said electric supply circuit when said releasable device is released.

4. In a centrifugal casting device the combination with a whirling mechanism, a frame rotated by said whirling mechanism, a mold on the frame having a molding cavity therein, a crucible between the axis of rotation of the frame and said mold and being connected by a passage to said cavity to transfer molten material from the crucible into said cavity by centrifugal force as said crucible and mold are rotated together with said frame; of a burn-out muffle movable over said mold to burn out wax filling from said cavity, a non-rotatable support for said muffle being slidable relatively to said frame for moving said muffle over and off said mold, means to normally urge said support in a direction to remove said muffle off said mold, a releasable catch device to hold said muffle over said mold, and a device movable with said muffle to prevent rotation of said frame when said muffle is over said mold and to release said frame when said catch device

is released and said muffle is removed from said mold.

5. In a centrifugal casting device the combination with a whirling mechanism, a frame rotated by said whirling mechanism, a mold on the frame having a molding cavity therein, a crucible between the axis of rotation of the frame and said mold and being connected by a passage to said cavity to transfer molten material from the crucible into said cavity by centrifugal force as said crucible and mold are rotated together with said frame; of a burn-out muffle movable over said mold to burn out wax filling from said cavity, a catch device to hold said muffle over said mold, an element associated with said muffle to prevent the rotation of said frame while said muffle is over said mold, and means actuated by said catch device to remove said muffle from said mold when said catch device is released.

6. In a centrifugal casting device the combination with a whirling mechanism, a frame rotated by said whirling mechanism, a mold on the frame having a molding cavity therein, a crucible between the axis of rotation of the frame and said mold and being connected by a passage to said cavity to transfer molten material from the crucible into said cavity by centrifugal force as said crucible and mold are rotated together with said frame, said whirling mechanism including a stationary base, a device in the base supporting said frame and imparting rotation to said frame, of a pair of guides on said base below said frame and being generally parallel with said frame, a burn-out muffle movable over said mold to burn out wax from said cavity, supports for said burn-out muffle reciprocable in said guides alternately to carry said muffle over said mold and away from said mold, spring elements for normally urging said supports and said muffle away from said mold, an element associated with said support and engaging said frame when said muffle is carried over said mold to arrest the rotation of said frame and releasing said frame when said muffle is removed from said mold, a catch device connected to said muffle to hold said muffle on said mold, and releasing means for said catch device.

7. In a centrifugal casting device the combination with a whirling mechanism, a frame rotated by said whirling mechanism, a mold on the frame having a molding cavity therein, a crucible between the axis of rotation of the frame and said mold and being connected by a passage to said cavity to transfer molten material from the crucible into said cavity by centrifugal force as said crucible and mold are rotated together with said frame, a releasable catch device to arrest the action of said whirling mechanism on said frame, an electric releasing device to release said catch device, a normally open electrical circuit to actuate said releasing device when said circuit is closed, said circuit being open by a gap within said crucible, said material being electrically conductive and flowing over and bridging said gap when melted for closing said electrical circuit for releasing said catch and permitting the rotating of said frame by said whirling mechanism, of an electrically heated burn-out muffle movable over said mold to burn out wax

from said cavity, an electric circuit for heating said crucible, a normally open time switch interconnected in said heating circuit to close said crucible heating circuit after a predetermined period, said time switch and the electric heating circuit of said muffle being connected in parallel to a source of electricity, a normally open switch in series with said time switch and said muffle heating circuit, and means associated with said muffle to hold closed said last mentioned normally open switch when said muffle is moved over said mold.

8. In a centrifugal casting device the combination with a whirling mechanism, a frame rotated by said whirling mechanism, a mold on the frame having a molding cavity therein, a crucible between the axis of rotation of the frame and said mold and being connected by a passage to said cavity to transfer molten material from the crucible into said cavity by centrifugal force as said crucible and mold are rotated together with said frame, a releasable catch device to arrest the action of said whirling mechanism on said frame, an electric releasing device to release said catch device, a normally open electrical circuit to actuate said releasing device when said circuit is closed, said circuit being open by a gap within said crucible, said material being electrically conductive and flowing over and bridging said gap when melted for closing said electrical circuit for releasing said catch and permitting the rotating of said frame by said whirling mechanism, of an electrically heated burn-out muffle movable over said mold to burn out wax from said cavity, an electric circuit for heating said crucible, a normally open time switch interconnected in said crucible heating circuit to close said crucible heating circuit after a predetermined period, a normally open switch connected in series between said time switch and a source of electricity, means associated with said muffle to hold said last normally open switch closed when said muffle is moved over said mold to cause said time switch to determine the interval between the muffle operation over said mold and the heating of said crucible.

ADOLPH J. KEMPPE.

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