Aug. 23, 1949. J. FREI, JR 2,479,610

CENTRIFUGAL CASTING MACHINE

Filed Jan. 20, 1945 4 Sheets-Sheet 1

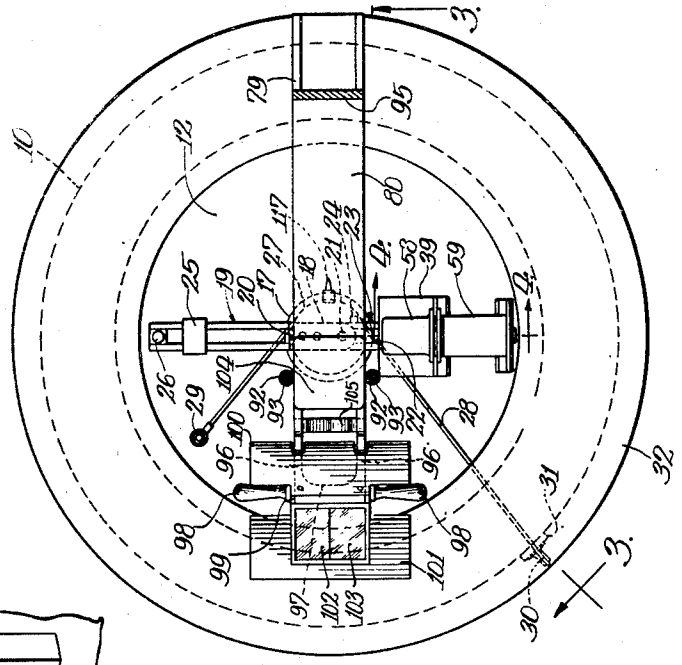


Fig. 2.

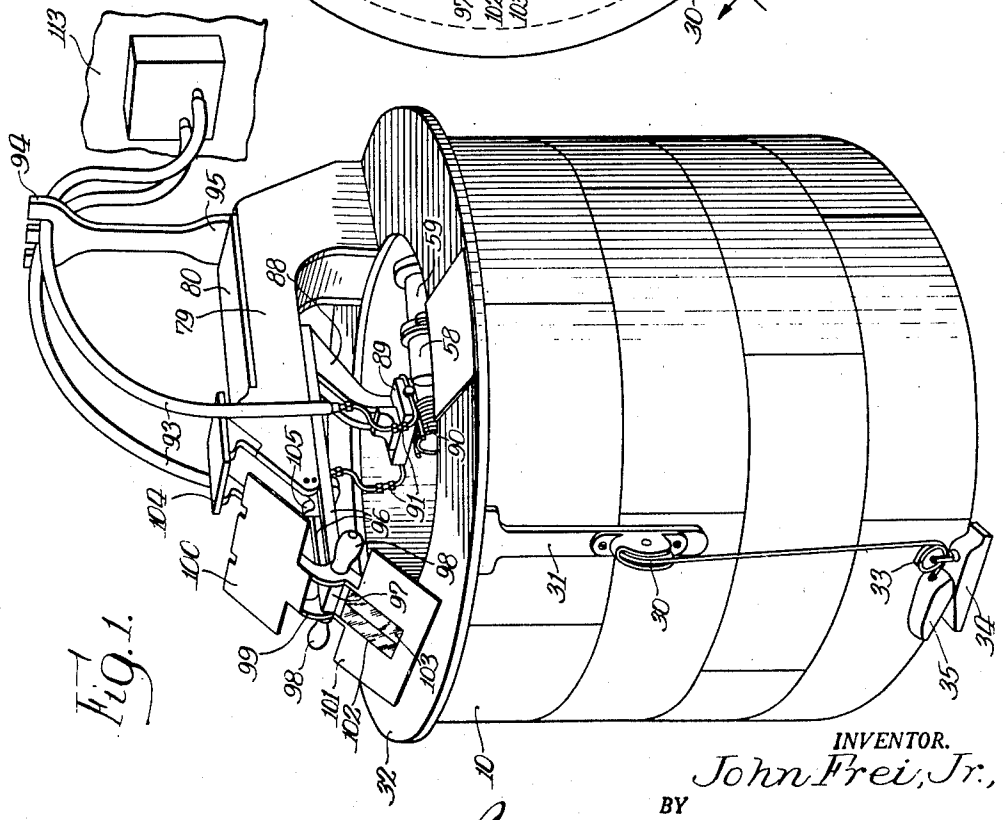


Fig. 1.

INVENTOR.
John Frei, Jr.,
BY
Brown Jackson Boettcher Dennis
Attys.

Aug. 23, 1949. J. FREI, JR 2,479,610

CENTRIFUGAL CASTING MACHINE

Filed Jan. 20, 1945 4 Sheets-Sheet 2

Fig. 3.

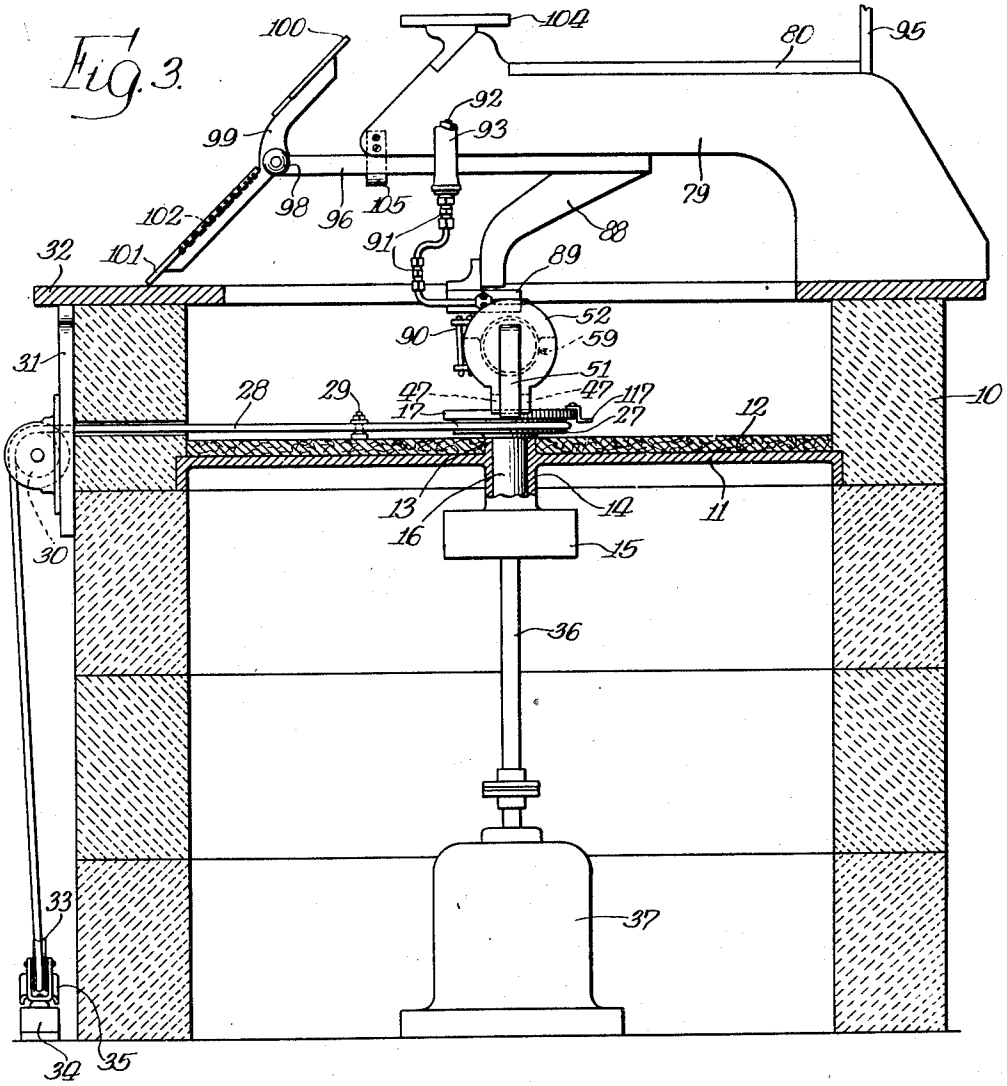
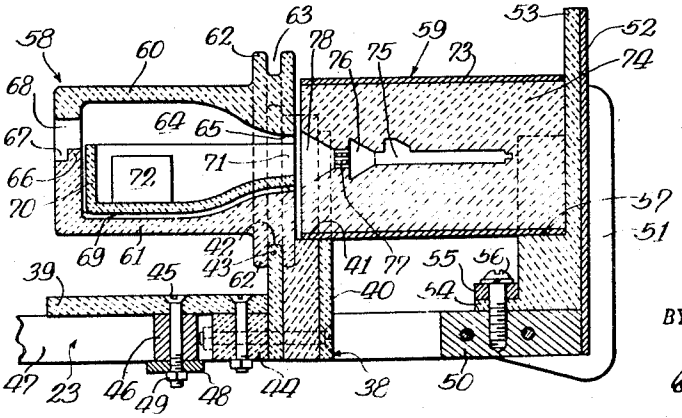


Fig. 4.



INVENTOR.
John Frei, Jr.,
BY Mason Fenwick,
Bowles & Brenner Attys

Aug. 23, 1949. J. FREI, JR 2,479,610

CENTRIFUGAL CASTING MACHINE

Filed Jan. 20, 1945 4 Sheets-Sheet 3

Fig. 5.

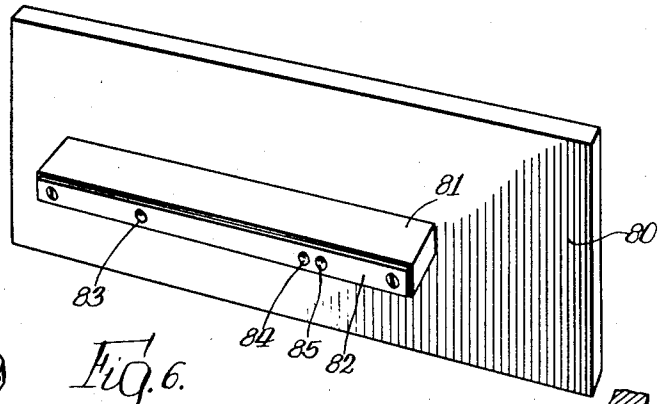


Fig. 6.

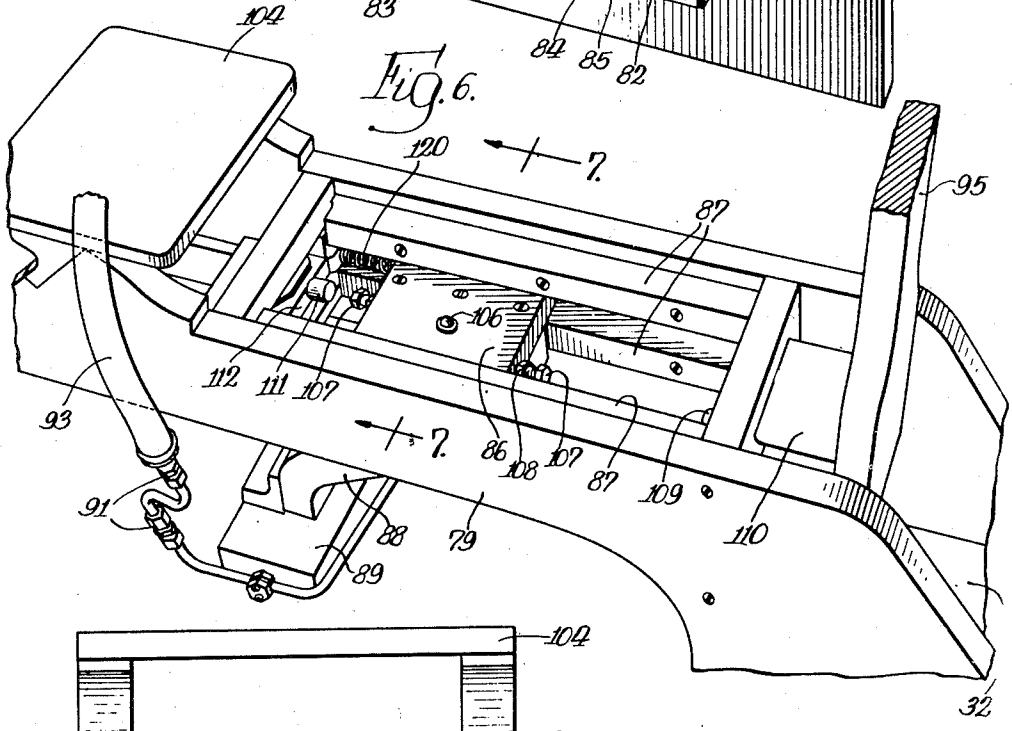
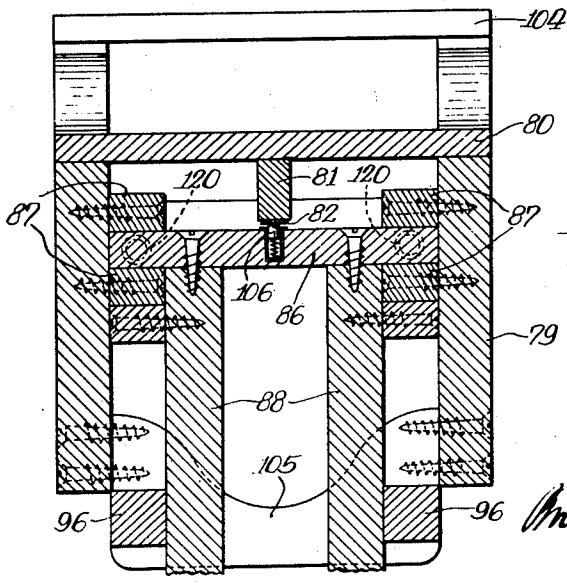


Fig. 7.



INVENTOR.
John Frei, Jr.
BY
Dowerfaeson & Boettcher Dean
Atty.

Aug. 23, 1949. J. FREI, JR 2,479,610

CENTRIFUGAL CASTING MACHINE

Filed Jan. 20, 1945 4 Sheets-Sheet 4

Fig. 8.

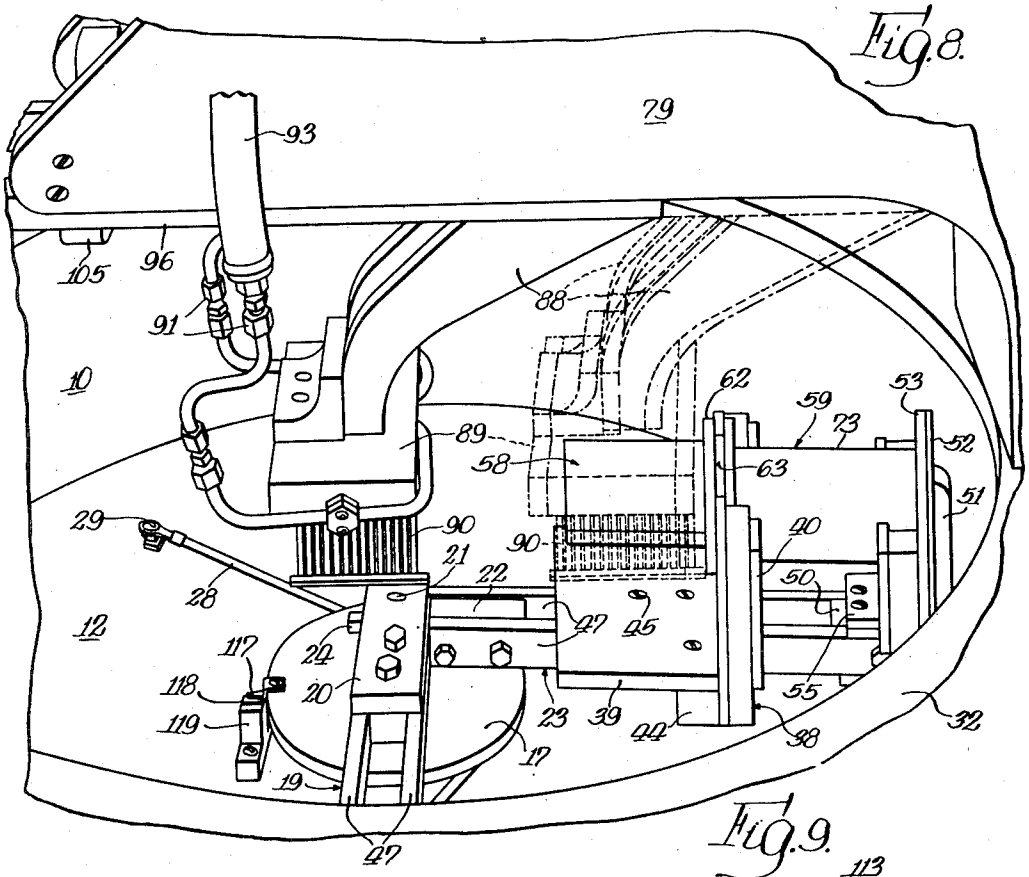
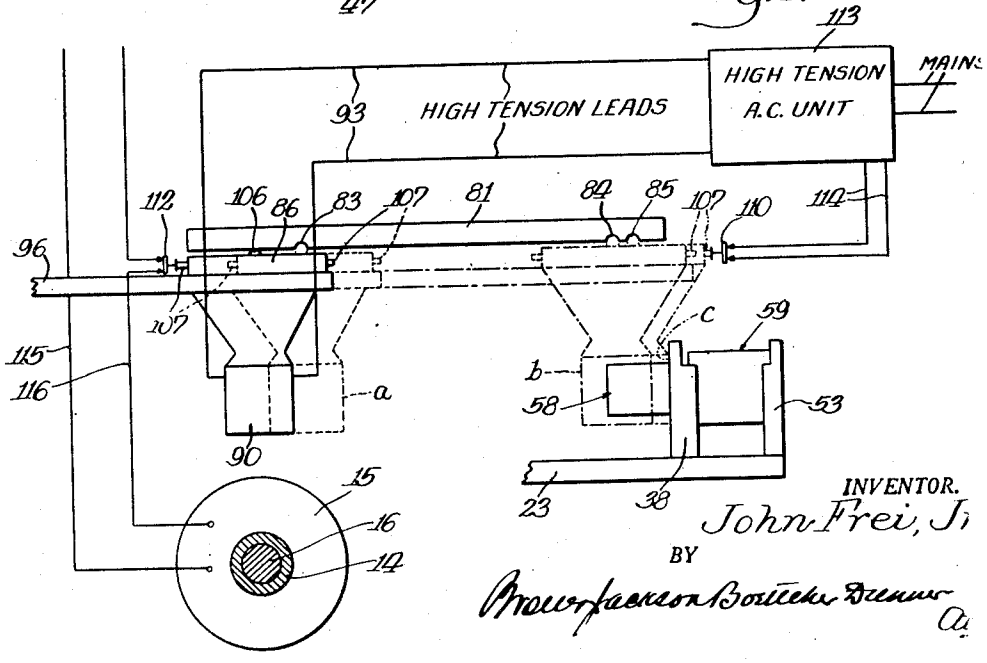


Fig. 9.



INVENTOR.
John Frei, Jr
BY
Brown Jackson Boettcher Dienner
Attorneys

Patented Aug. 23, 1949

2,479,610

UNITED STATES PATENT OFFICE

2,479,610

CENTRIFUGAL CASTING MACHINE

John Frei, Jr., Chicago, Ill.

Application January 20, 1945, Serial No. 573,745

5 Claims. (Cl. 22—65)

1

This invention relates to machines for use in casting articles and has to do more particularly with centrifugal casting machines.

Centrifugal casting is used in the dental profession for casting inlays and other small parts, and in the jewelry art for casting rings and like small articles. While present day centrifugal casting machines are well suited for casting small articles of precious metals, which bring correspondingly high prices, they are not well suited for commercial production of articles cast of non-precious metals or alloys, or of appreciably greater size than finger rings. Further, in present day centrifugal casting machines of the character referred to, difficulty frequently is encountered in maintaining the casting metal in proper molten condition until it is projected into the mold, and the use of rubbing contacts for conducting electric current to the heating element of the crucible, where used, gives rise to complications and frequently unsatisfactory results caused by inefficient contact or failure of parts.

My invention is directed to a centrifugal casting machine of simple construction and operation, which avoids the difficulties of the present machines above referred to and is particularly suitable for the centrifugal casting of articles on a production basis. More particularly, I provide a rotating bar carrying a crucible and a cooperating mold, and a heating element movable into position effective for heating and thereby melting the metal or casting material in the crucible, the heating element being also movable into a position clear of the crucible and of the bar and the parts carried thereby, during rotation of the bar. I also provide means whereby the heating element, preferably an induction coil, is energized and deenergized responsive to movement thereof to and from heating position, which is conducive to increased speed of operation, an important consideration in commercial production. I provide power means for rotating the bar and control means therefor whereby the power means is effective only when the heating element or coil is in position clear of the crucible, the control means being of such character that it has to be held in predetermined position to enable operation of the power means, the latter being disabled upon release of the control means. That provides a safeguard against injury or damage in the event anything goes wrong during the casting operation. In that connection, I also provide braking means for quickly stopping rotation of the arm, in the event of a mischance during casting, or stopping it more slowly at the

2

end of the casting operation. As a further safeguard, I provide means whereby the heating element or coil is automatically and releasably locked in its several positions of adjustment, except its drive position in which the power drive means is enabled. Further objects and advantages of my invention will appear from the detail description.

In the drawings:

Figure 1 is an isometric side view of a centrifugal casting machine embodying my invention;

Figure 2 is a plan view of the machine of Figure 1;

Figure 3 is a sectional view taken substantially on line 3—3 of Figure 2, certain parts, including the mold and associated parts and the supporting arm, being shown in elevation;

Figure 4 is a sectional view, on an enlarged scale, taken substantially on line 4—4 of Figure 2;

Figure 5 is an isometric underneath view of the cover of the main supporting arm, on an enlarged scale;

Figure 6 is an isometric top view of the main supporting arm and associated parts, with the cover removed and certain parts broken away, on the same scale as Figure 5;

Figure 7 is a sectional view taken substantially on line 7—7 of Figure 6, on an enlarged scale, with certain parts shown in elevation;

Figure 8 is a fragmentary isometric side view of the upper portion of the machine of Figure 1, showing the crucible disposed for positioning thereabout of the induction coil; and

Figure 9 is a circuit diagram indicating the controls and associated elements.

I have illustrated my invention, by way of example, as embodied in a centrifugal casting machine comprising a base 10, in the form of a hollow cylindrical casing of refractory masonry construction. A spider 11 is supported by base 10 interiorly and a short distance from the top thereof, this spider carrying on its upper surface a refractory deck 12 in the form of a disc of asbestos. Spider 11 is provided with a central collar 13 (Figure 3) from which depends a coaxial bearing sleeve 14 carrying at its lower end a cylindrical housing 15. A stub shaft 16 is rotatably mounted through sleeve 14 and extends upward beyond collar 13, having a disc 17 secured on its upper head. A bar 18 is carried by disc 17 and constitutes therewith the head of the machine. Bar 18 is formed in two sections, one of which 19 is fixed to disc 17, conveniently by bolting, for rotation therewith. A plate 20 is bolted or otherwise suitably fixed to the inner

end portion of bar section 19 and projects inwardly therebeyond, this plate receiving a pivot pin 21 passing therethrough and through a block 22 fixed in the inner end of bar section 23, pin 21 seating at its lower end in an opening in disc 17 and, in cooperation with block 22, pivoting bar section 23 thereto. The latter bar section is movable in one direction about the axis of pin 21 into position in alignment with bar section 19, movement of section 23 beyond that position being restrained by a stop 24 fixed to disc 17, movement of bar section 23 in the opposite direction about the axis of pin 21 being limited, by the inner end of section 19, to a position extending at right angles to the latter section. The bar section 19 carries a counterweight 25 adjustable lengthwise thereof and is provided at its outer end with a suitable handle 26 extending upward therefrom. The machine head so far described is of known construction and operation and need not be described in greater detail. A circumferentially grooved pulley 27 is fixed to the under face of disc 17 and receives a belt 28, which may be a round leather belt, anchored to spider 11 and deck 12 at one end, at 29. This belt 28 passes from its point of anchorage 29 about the pulley 27 thence outward through the wall of base 10, over a guide pulley 30 mounted on an arm 31 secured to and depending from an annular top plate 32 of nonmetallic material, conveniently wood, mounted on the upper end of base 10. From the pulley 30 belt 28 passes downward to and about a pulley 33 mounted on a block 34 fixed to the floor or foundation supporting base structure 10. The other end of the belt is anchored to a treadle 35 pivoted on block 34. It will be seen that the pulley 27 and belt 28 provide means for braking the stub shaft 16 and slowing down or stopping rotation of the machine head, as conditions may require.

A drive shaft 36, disposed in underlying coaxial relation to stub shaft 16, is suitably coupled at its lower end to the shaft of an electric motor 37 mounted in appropriate manner at the lower portion or bottom of base structure 10. The motor 37 is connected to a suitable source of electrical energy, preferably under control of a switch, in a known manner, and normally is continuously driven in the use of the machine. The housing 15 encloses an electromagnetic clutch of any suitable known type, which when energized is effective for clutching drive shaft 36 to stub shaft 16, thereby establishing driving connection between these two shafts. Any suitable means other than the magnetic clutch may be provided for establishing and disestablishing driving connection between the drive shaft 36 and the stub shaft 16, though I prefer to use the magnetic clutch because the magnetic coupling between these two shafts is conducive to soft or gentle starting of rotation of the head of the machine, avoiding objectionable jerks or jars such as might interfere with the accuracy of the casting operation.

The pivoted section 23 of bar 18 carries a crucible and a cooperating mold, as will be understood. To that end a crucible supporting bracket 38 is suitably mounted on bar section 23. This bracket 38 comprises a base plate 39 seating flatwise on the upper face of bar section 23, and a vertical plate 40 extending upward from the outer edge of plate 39, plate 40 having therein an opening or slot 41 the inner portion of which is slightly restricted at 42 to provide an inwardly extending flange 43. The lower portion of slot 40 is of semicircular shape, the sides of this slot, including the flange element 43, being tangent to the lower portion thereof. The plates 39 and 40 are formed of a refractory nonmetallic material, preferably compressed asbestos, and are secured together in a suitable manner. As shown, the lower base portion of plate 40 straddles bar section 23 and is bolted or otherwise suitably secured to blocks 44 disposed between and also at opposite sides of members 47 of bar section 23, which blocks 44 are formed of a suitable heat resistant nonmetallic material. The plate 39 is also secured to the blocks 44, conveniently by means of screws, and is further secured, by screws 45, to a block 46 fitting snugly but not tightly between the two parallel side members 47 of bar section 23. The screws 45 also pass through a clamping plate 48 bearing against the under sides of members 47, each of the screws having a nut 49 threaded on its lower end. That provides simple and efficient means for securing the bracket 38 in adjustment lengthwise of the bar section 23.

The bar section is further provided, adjacent its outer end, with means for holding the outer end portion of a mold supported at its inner end by bracket 38. A block 50, which may be a steel block, is suitably secured, as by bolting, between adjacent side members 47 of bar sections 23, as shown more clearly in Figure 4. This block 50 has suitably secured thereto, conveniently by welding, an upwardly projecting arm 51 carrying a backing plate 52, conveniently in the form of a disc, or substantially so. A mold supporting bracket 53 seats upon the upper face of block 50, from which it extends upward with its outer face seating against the inner face of plate 52. Bracket 53 is provided with an inwardly extending base flange 54 clamped between an overlying plate 55 and the underlying block 50, to which plate 55 is secured in a suitable manner, conveniently by means of screws 56. The bracket 53 is provided, in the inner portion of the vertical arm thereof, with a vertical slot 57 open at its upper end and of substantially semi-circular shape at its lower end. This slot 57 is adapted for reception of the outer end portion of a cylindrical mold, as will be explained more fully later.

The bracket 38 is adapted for reception of a crucible 58 disposed in cooperating relation to the mold 59 supported at its inner end by bracket 38 and at its outer end by the bracket 53. The crucible and the mold are disclosed in detail in my copending application for Casting mold and method, Serial No. 562,708, filed November 9, 1944, now abandoned and my copending application for Crucible holder and crucible, Serial No. 573,746, filed January 20, 1945, now matured into Patent No. 2,462,259 and a brief description thereof will suffice here. The crucible 58 is formed of a suitable refractory material and comprises upper and lower sections 60 and 61, respectively, each of semi-cylindrical cross-section and each provided at its inner end with a peripheral flange 62 having therein an outwardly opening groove 63. Interiorly the crucible 58 defines a suitable recess or heating chamber 64 the outer portion of which converges outward to an opening 65 through the outer end of the mold centrally thereof. The lower section 61 preferably is provided with an upwardly extending flange 66 about the recess therein, the upper section having a downwardly extending flange 67 fitting about flange 66. The upper section 60 is further provided with an observation opening 68 through its inner end wall. Preferably lower mold section 61

is provided, in the recess thereof, with lengthwise spaced ribs 69 upon which seats an inner crucible or liner 70, also of suitable refractory material, the outer end portion of which tapers outward and opens through a restricted neck 71 extending through opening 65. The inner crucible 70 is adapted for reception of the metal, alloy or other material from which the articles are to be cast, conveniently in the form of a block or cube 72 of suitable mass or volume for the article to be cast. If the inner crucible 70 is not used, the ribs 69 of the lower crucible section 61 may be omitted, the crucible 58 being then the primary crucible. The crucible 58 is mounted in the vertical flange or arm 40 of bracket 38, with flange 43 thereof engaging snugly into the grooves 63 of the flanges 62 so as to hold the crucible sections 60 and 61 in proper register and support the crucible as a whole in horizontal position extending from the mounting means or bracket 38 inward of bar section 23 spaced thereabove.

The mold 59 comprises a cylindrical flask 73 formed of a suitable heat resistant alloy, such as stainless steel. This flask 73 contains a body of refractory 74 having formed therein a casting cavity 75 corresponding to the article to be cast, this cavity opening at its inner end into an inner gate 76 of substantially conical shape flaring inward of the mold. The gate 76 opens, at its outer end, through a strainer element 77, into an inwardly flaring outer gate 78, also of substantially conical shape, which opens through the inner end of the mold. The mold seats at its outer end in the bracket 53 and at its inner end in the bracket 38, the latter bracket preferably being so adjusted that the inner end of the mold is spaced a short distance from the outer end of the crucible, to permit of removal and replacement of the mold with expedition and facility. The outer gate 78 of the mold is disposed in substantially concentrical relation to the opening 65 through the outer end of crucible 58 so that, upon rotation of the bar 18, molten material is projected from the crucible into outer gate 78 of mold 59 and thence into the mold cavity 75, as will be understood.

A supporting arm 79, of hollow construction and formed of wood or other suitable insulating material, is secured to top plate 32 and extends inward of base 10 substantially diametrically thereof in overlying spaced relation to the head of the machine. Arm 79 is provided with a removable cover 80 carrying on its under face a wooden bar 81 extending lengthwise thereof, this bar having a strip 82 of steel secured to its under face, this strip being provided with spaced recesses 83, 84 and 85, shown more clearly in Figure 5. The horizontal portion of arm 79 is of box formation and receives a block 86, also formed of wood or other suitable electrical insulating material, slidably mounted between guide strips 87 secured to the inner faces of the side walls of the arm. A coil carrying arm 88 is secured to block 86 and extends downward and inward therefrom. A block 89, of a suitable known electrical insulating and heat resistant material, is secured to the lower end of arm 88 and carries a depending induction coil 90 of known type suitably mounted on block 89. The coil 90 is formed of copper tubing and has its terminals connected, by suitable couplings 91, of known type, to tubular conductors 92 enclosed within insulation for the major portion of their length and constituting high frequency leads 93. The leads 93 extend upward above arm 79 and then outward through head 94 of upright 95 secured to the outer portion of arm 79. The upright 95 supports the leads 93 and the latter possess sufficient flexibilty to permit of adjustment of the coil 90 lengthwise of arm 79 without subjecting the parts to objectionable stresses or offering objectionable resistance to such adjustment. The leads 93 are connected to a suitable source of high tension alternating current, as will be explained more fully later.

Side bars 96 of suitable insulating material, conveniently wood, are secured to the sides of arm 88 and extend therefrom beyond the inner end of arm 79, the inner ends of bars 96 being spaced apart by a wood block 97 suitably secured therebetween. Handles 98 are secured to bars 96 at the ends thereof remote from arm 88, there also being brackets 99 secured to the latter ends of side bars 96, each providing an arm extending upward toward the arm 79 and an arm extending downward away from arm 79. A shield 100, of asbestos or other suitable material, is mounted upon the upwardly extending arms of the brackets 99 and a second shield 101, which may also be formed of asbestos, is supported on the lower arms of the brackets 99. The lower shield 101 is cut away at its central portion to accommodate two glass panels 102 and 103 mounted in a suitable frame, of which panel 102 is of clear glass and panel 103 is of colored or dark glass. A platform 104 is supported at the inner end of arm 79 and spaced thereabove, and a block 105 is secured in the end of arm 79 at the lower portion thereof, and extends therebelow, the sides of this block being suitably notched to receive the bars 96 so as to guide and support them. The bars 96, together with the block 97 and the block 86 constitute a slide which, by means of the arm 88 and associated parts, supports the coil 90 for rectilineal movement substantially radially of the axis about which the head of the machine rotates.

Block 86 carries an upwardly urged spring pressed detent 106 of known type disposed for engagement into the recesses 83, 84 and 85, selectively, of strip 82, for automatically and releasably locking the slide in adjusted position, thereby locking the induction coil 90 in position. The block 86 is further provided, at each end thereof, with an adjustable abutment in the form of a threaded stud 107 screwing into the block and secured in adjustment by a jam nut 108. The stud 107 at one end (the outer end) of block 86 is disposed to contact the normally projected button 109 of a push button switch 110 of known type, mounted in arm 79 adjacent the outer end thereof, in the outer position of block 86. The other stud 107, that is, the stud at the inner end of block 86, is disposed to contact the normally projected button 111 of a push button switch 112 mounted in arm 79 adjacent the inner end thereof.

Referring to Figure 9, the high tension leads 93 are connected to a high tension alternating current unit 113 of known type the operation of which is controlled by switch 110 through the leads 114. The electromagnetic clutch enclosed within the housing 15 is connected to a suitable source of electrical energy by leads 115 and 116, in the latter of which is interposed the switch 112, which controls the clutch. This switch 112 includes a compression spring (not shown) which urges the button 111 thereof toward projected position with sufficient force to move the slide 86 inward of arm 79 a proper distance to permit of opening of switch 112, unless the slide is held by hand in its switch closing position, as will be explained more fully presently. In preparing

for casting, the crucible 58 and the mold 59 having been properly mounted in the brackets 38 and 53, bar section 23 is swung about pivot pin 21 in position at right angles to bar section 19, and the head of the machine is turned into position to bring pointer 117, fixed to disc 17, into register with a mark 118 on a block 119 fixed to deck 12 adjacent disc 17. With the parts disposed as stated, the crucible 58 is disposed coaxially with coil 90. The upper section 60 of crucible 58 is then removed and the metal or other material of which the article is to be cast is placed within the crucible, after which the upper section 60 is replaced. During this operation, the coil 90 is held in its neutral position shown in Figure 8, which corresponds to its dotted line position *a* of Figure 9, the slide also being in its neutral position, in which it is releasably locked by the detent 106 engaging into the recess 83 of bar 81. After the material has been placed in the crucible and the upper section thereof has been replaced, as above, the slide is moved outward so as to bring the coil 90 into its dot and dash line position *b* of Figure 9, enclosing the crucible 58 for the major portion of its length. The slide is releasably locked in its latter position by engagement of detent 106 in the recess 84, and a final check is made to assure that everything is in proper condition for casting. The slide is then moved a further distance outward so as to bring the coil 90 into its effective heating position *c*, indicated by double dot and dash lines, as distinguished from its ineffective position *b*. In position *c* of coil 90 the stud 107 at the outer end of block 86 has moved the button 109 of switch 110 into circuit closing position, thus setting the unit 113 into operation and energizing the coil 90. Also, in position *c* of coil 90, detent 106 enters recess 85, releasably locking the slide and the coil in position. It will be understood, of course, that the desired adjustments of the slide are effected by an operator grasping the handles 98. With the coil 90 in its effective position *c*, the operator standing at the front of the machine observes the interior of crucible 58 through the opening 68 in the inner end thereof. The induction coil 90, when energized, acts in a known manner to quickly melt the material within the crucible. When the material has been melted to the proper extent, which can readily be determined by observation, the operator grasps handles 98 and moves the slide along the supporting arm 79 away from the crucible until the block 86 is at the inner or forward end of arm 79, in such a position that the stud 107 at the inner end of this block closes the switch 112, thus coupling the stub shaft 16 to the drive shaft 36 so as to be rotated thereby. That enables the power source or electric motor 37 with respect to the head of the machine for rotating the bar and the parts carried thereby, it being noted that at such time the coil 90 is disposed above and spaced from the bar substantially in overlying relation to disc 17 so as to be clear of the bar and of the crucible 58 and other parts carried by the bar. In order to maintain the driving connection between the motor and the head of the machine, the slide has to be held manually in its switch closing position indicated in full lines in Figure 9, in opposition to the spring 120 of switch 112. Preferably, I provide two compression springs between the pairs of guide strips 87, adjacent the forward ends thereof, in position to be placed under compression by the block 86 when the latter is in its forward position. In the event of any mischance during the casting operation, the operator instantly releases the handles 98, and the block 86 is moved rearward by the spring of switch 112, supplemented by the compression springs 120 if used, so that switch 112 is opened and stub shaft 16 is declutched from drive shaft 36 and may quickly be stopped by drawing the belt 28 tightly about pulley 27. That provides a safe guard, as does the means for automatically locking the slide in its various positions of adjustment, except its position in which the switch 112 is closed.

When the stub shaft 16 is clutched to drive shaft 36, as above, the rotation of the machine head first causes bar section 23 to swing about pivot pin 21 into alignment with bar section 19, and thereafter continued rotation of the bar 19 as a whole causes the molten material to be projected by centrifugal force from the crucible 58 into the mold 59. After the bar has rotated sufficiently to project the molten metal into the mold and permit initial setting thereof sufficient to retain its cast shape, which requires but a short time, the slide is returned to its neutral position, returning induction coil 90 to its neutral position and opening switch 112, after which the stub shaft may be braked so as to be quickly brought to a stand still. The mold 59, with the cast article therein, may then be removed and replaced by a new mold, and a new charge of metal may be placed in the crucible in the manner above described, after which the operation may be repeated. In that manner, the machine may be operated at comparatively high speed sufficient to render it practicable for industrial casting of articles on a commercial production basis. It will be understood, of course, that the surrounding wall of the pit, provided at the upper portion of the base structure, serves as an additional safeguard against injury to the operator in the event of breakage of the crucible or of the mold, or of leakage of molten metal.

As above indicated, and as will be understood by those skilled in this art, changes in construction and arrangement of parts of my invention may be resorted to without departing from the field and scope thereof, and I intend to include all such variations, as fall within the scope of the appended claims, in this application in which the preferred form only of my invention has been disclosed.

I claim:

1. In a centrifugal casting machine, a base, a substantially horizontal bar mounted on said base for rotation about a vertical axis intermediate its ends, means for mounting a crucible and a cooperating mold on said bar spaced outward thereof from said axis with the crucible extending inward toward said axis and spaced for the major portion of its length from said bar, a supporting arm on said base spaced above said bar, a slide adjustable on said arm movable substantially radially of said axis in one direction into a heating position and in the opposite direction to a neutral position and a drive position, an induction coil carried by said slide disposed to clear said bar and to be positioned about the crucible in the heating position of said slide and clear of the crucible in the neutral and drive positions of said slide, a motor for rotating said bar, means actuated by said slide for energizing and deenergizing said coil responsive to movement of said slide from neutral position to heating position and vice versa, means for releasably securing said slide in its heating and neutral

positions, and means actuated by said slide for establishing and disestablishing driving connection between said motor and said bar responsive to movement of said slide from neutral to drive position and vice versa, said last means comprising means whereby said slide is urged from its drive position toward its neutral position.

2. In a centrifugal casting machine, a bar mounted for rotation about an axis intermediate its ends, power means for rotating said bar, a crucible and a cooperating mold mounted on said bar spaced outward thereof from said axis with said crucible extending from said mold along said bar toward said axis and spaced for the major portion of its length from said bar, an induction coil movable toward said crucible into heating position extending thereabout and away from said crucible into a neutral position and a drive position clear of said crucible and said bar and parts carried thereby, in the rotation of said bar, automatic means for locking said coil in its heating and neutral positions, means for energizing and deenergizing said coil responsive to movement thereof from neutral to heating position and vice versa, and means for establishing and disestablishing driving connection between said power means and said bar responsive to movement of said coil from neutral to drive position and vice versa and for urging said coil from drive position toward neutral position.

3. In a centrifugal casting machine, a bar mounted for rotation about an axis substantially perpendicular to said bar, a crucible and a cooperating mold mounted on said bar spaced outward thereof from said axis, said crucible being substantially parallel with and spaced for the major portion of its length away from said bar, an induction coil aligned with said crucible, means for moving said coil in one direction to a heating position extending about said crucible and in the opposite direction to a neutral position and thence to a drive position, said coil when in said neutral position being spaced a substantial distance from said crucible giving access to the latter and when in drive position being spaced a further distance from said crucible and clear thereof and of other parts carried by said bar, in the rotation of the latter, power means for rotating said bar, means for energizing and de-energizing said coil responsive to movement thereof from neutral position to heating position and vice versa, and means for establishing and disestablishing driving connection between said bar and said power means responsive to movement of said coil to and from drive position.

4. In a centrifugal casting machine, a bar mounted for rotation about an axis substantially perpendicular to said bar, a crucible and a cooperating mold mounted on said bar spaced outward thereof from said axis, said crucible being substantially parallel with and spaced for the major portion of its length away from said bar, an induction coil aligned with said crucible, means for moving said coil in one direction to a heating position extending about said crucible and in the opposite direction to a neutral position and thence to a drive position, said coil when in said neutral position being spaced a substantial distance from said crucible giving access to the latter and when in drive position being spaced a further distance from said crucible and clear thereof and of other parts carried by said bar, in the rotation of the latter, power means for rotating said bar, means for energizing and deenergizing said coil responsive to movement thereof from neutral position to heating position and vice versa, means for establishing and disestablishing driving connection between said bar and said power means responsive to movement of said coil to and from drive position, and means effective in the drive position of said coil for yieldingly urging it from that position.

5. In a centrifugal casting machine, a base, a substantially horizontal bar mounted on said base for rotation about a vertical axis, means for mounting a crucible and a cooperating mold on said bar spaced outward thereof from said axis with the crucible extending inward toward said axis and spaced for the major portion of its length from said bar, a slide mounted on said base overlying said bar and adjustable substantially radially of said axis, an induction coil carried by said slide adjustable therewith in one direction to a heating position extending about said crucible and in the opposite direction to a neutral position and thence to a drive position, said coil when in said neutral position being spaced a substantial distance from said crucible giving access to the latter and when in drive position being spaced a further distance from said crucible and clear thereof and of other parts carried by said arm, in the rotation of the latter, power means for rotating said bar, means actuated by said slide for energizing and deenergizing said coil responsive to movement thereof from neutral position to heating position and vice versa, means actuated by said slide for establishing and disestablishing driving connection between said bar and said power means responsive to movement of said coil to and from drive position, and means effective in the drive position of said coil for yieldingly urging said slide from the position it occupies when said coil is in drive position and thereby disconnecting said power means from said bar.

JOHN FREI, JR.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,735,648	Moore et al.	Nov. 12, 1929
1,751,766	Smith	Mar. 25, 1930
1,767,035	Andresen	June 24, 1930
1,767,036	Andresen et al.	June 24, 1930
1,805,168	Frist	May 12, 1931
1,904,214	Fagan	Apr. 18, 1933
2,086,483	Touceda et al.	July 6, 1937
2,140,204	Griffin	Dec. 13, 1938
2,209,331	Berger	July 30, 1940
2,223,002	Somes	Dec. 3, 1940