Jan. 23, 1934. R. M. KERR ET AL 1,944,435

CASTING MACHINE

Filed Aug. 17, 1931 3 Sheets-Sheet 1

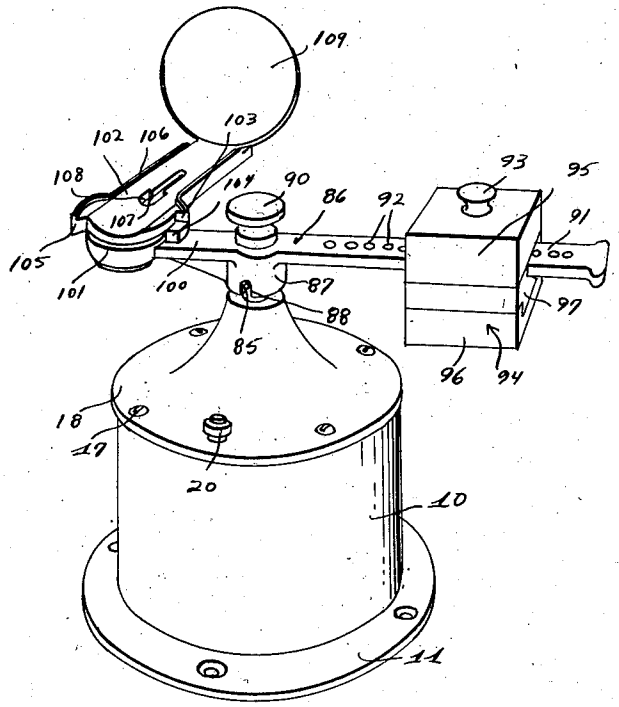


Fig. 1.

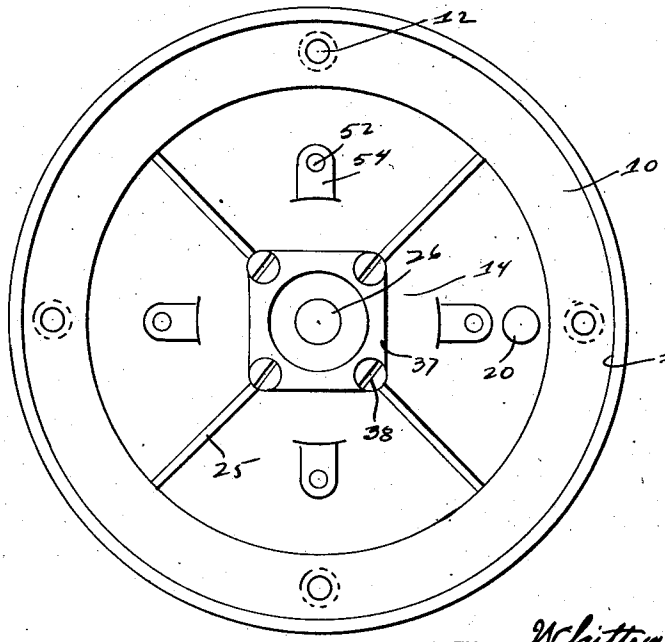


Fig. 3.

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CASTING MACHINE

Filed Aug. 17, 1931 3 Sheets-Sheet 2

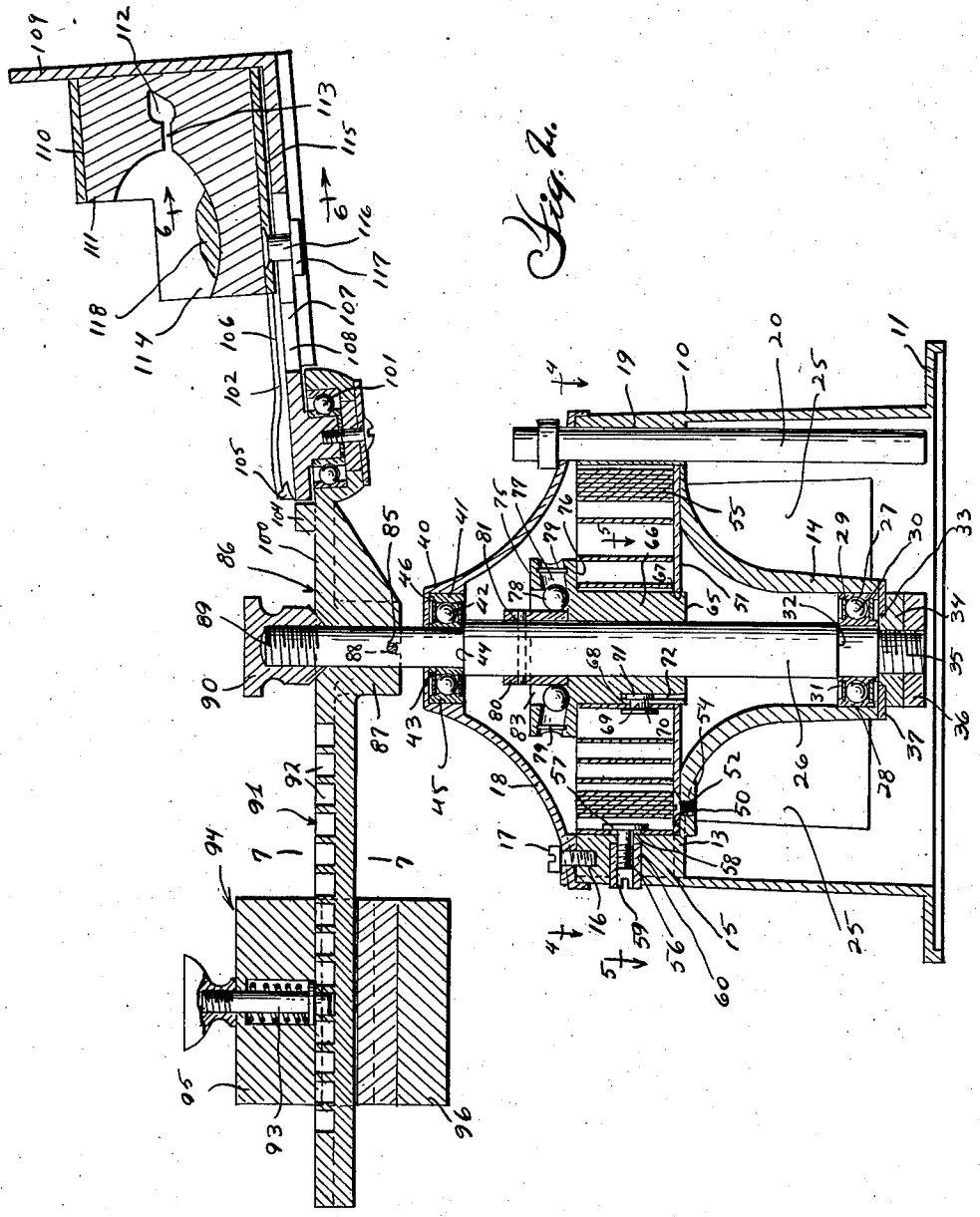


Fig. 2.

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CASTING MACHINE

Filed Aug. 17, 1931 3 Sheets-Sheet 3

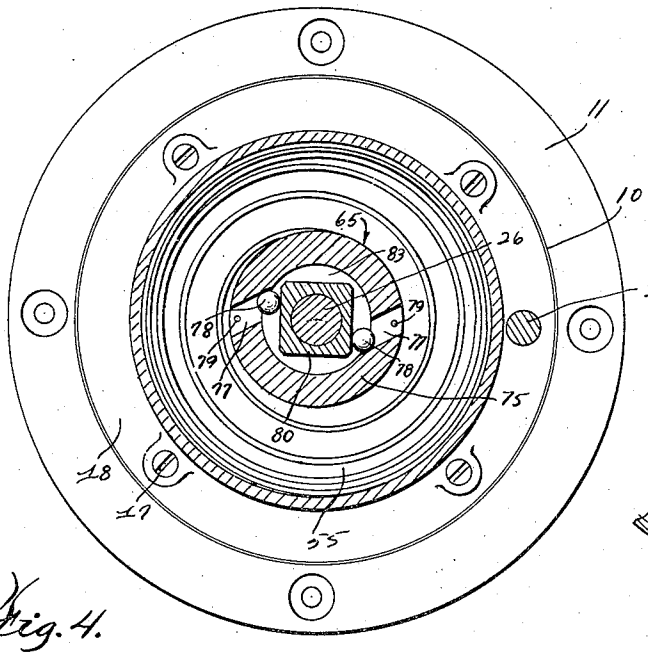


Fig. 4.

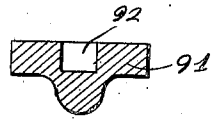
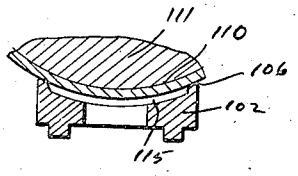


Fig. 7.

Fig. 6.



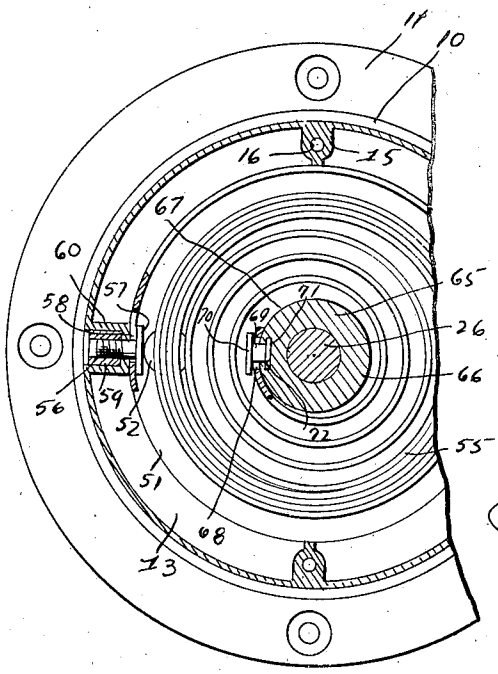


Fig. 5.

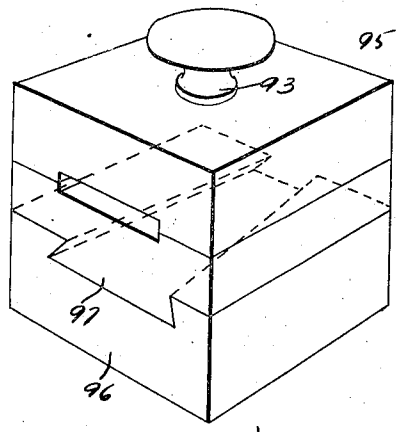


Fig. 8.

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UNITED STATES PATENT OFFICE

1,944,435

CASTING MACHINE

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Application August 17, 1931. Serial No. 557,658

5 Claims. (Cl. 22—65)

This invention relates to casting machines and has particular reference to a centrifugal casting machine of the character used in the casting of dental inlays and the like.

The invention relates more particularly to a casting machine of the above mentioned character which includes a rotatable driving shaft, and the invention has as one of its objects to provide an improved means for rotatably mounting this shaft to prevent vibration of the same during rotation thereof.

The invention has as further objects to provide an improved mounting for the spring which rotates the rotatable driving shaft and to provide an improved clutch construction forming a driving connection between this spring and the driving shaft.

Still further the invention contemplates the provision of an improved flask supporting arm on the rotatable turntable and the provision of an improved weight for counterbalancing the turntable.

Numerous other objects and advantages of this invention will become more apparent as the following description proceeds, particularly when reference is had to the accompanying drawings, wherein:

Fig. 1 is a perspective view of a casting machine constructed in accordance with the teachings of this invention;

Fig. 2 is a vertical sectional view through the machine shown in Fig. 1;

Fig. 3 is a bottom plan view of the casting machine;

Fig. 4 is a sectional view taken substantially on the line 4—4 of Fig. 2;

Fig. 5 is a sectional view taken substantially on the line 5—5 of Fig. 2;

Fig. 6 is a sectional view taken substantially on the line 6—6 of Fig. 2;

Fig. 7 is a sectional view taken substantially on the line 7—7 of Fig. 2; and

Fig. 8 is a perspective view of the counterbalancing weight forming a part of the construction.

Referring then particularly to the drawings wherein like reference characters designate corresponding parts throughout the several views, the body or base of the machine comprises a cylindrical casting 10 provided at its lower end with a laterally outwardly extending flange 11 provided with openings 12 by which the base may be secured by suitable bolts or the like (not shown) to a supporting table or platform (not shown). The base is provided on its inner periphery with the inwardly extending flange 13 which is spaced from the top of the casting in the manner clearly illustrated in Fig. 2 of the drawings. The flange 13 extends downwardly adjacent the center of the casting to form the depending housing 14 within the base.

Formed on the inner periphery of the base above the flange 13 are bosses 15 provided in their upper ends with threaded sockets 16 for threadedly receiving bolts 17 by which a cap 18 may be fixed to the top of the base. A boss 19 is also provided similar to the bosses 15, this boss being bored to loosely receive a pin 20 for a purpose which will hereinafter be more fully described.

The housing 14 is preferably reinforced by webs 25 which extend between the outer periphery of the housing and the inner periphery of the casting 10 below the flange 13 thereof. The housing 14 constitutes a support for the lower end of a vertical driving shaft 26, and for this purpose there is mounted in the lower end of this housing a bearing designated generally by the reference character 27. This bearing comprises a ring 28 which has a pressed fit within a bore 29 formed in the lower end of the housing. This ring constitutes the outer track of a ball race for the ball bearings 30, and rotatably journaled by these ball bearings is an inner ring 31 which snugly engages the lower end of the shaft 26.

The ring 31 abuts at its upper end a downwardly facing shoulder 32 formed on the shaft 26 adjacent the lower end thereof. At its lower end the ring 31 is engaged by a boss 33 formed on a nut 34 which is threaded on the reduced end portion 35 of the shaft. A lock nut 36 cooperates with the nut 34 to hold the latter in position, while a plate 37, secured as by screws 38 to the lower end of the housing 14, engages the lower edge of the ring 28 to prevent the same from moving downwardly out of the housing.

It will be apparent that the bearing 27 constitutes not only a journal bearing for the lower end of shaft 26, but also a thrust bearing for this shaft. Thus the shaft is held against vertical movement and is also so journaled as to be held against vibration or locking movement upon rotation thereof.

Adjacent its upper end the shaft 26 is journaled in a bearing designated generally by the reference character 40. This bearing is mounted in the upper portion of the cap 18 and comprises the outer ring 41 which constitutes a ball race for the ball bearings 42. Rotatably journaled by the ball bearings is an inner ring 43 which snugly engages the adjacent portion of the shaft

26. The lower edge of the ring 43 engages an upwardly facing shoulder 44 formed on the shaft 26, while the outer ring 41 has a pressed fit within a bore 45 formed in the cap. The ring 41 abuts at its free end a downwardly facing shoulder 46 formed at the upper end of the bore 45 so that the bearing 40 also constitutes not only a journal bearing for the upper end of the shaft 26, but also a thrust bearing for this shaft. To insure the accurate vertical positioning of the shaft 26 within the bearings 27 and 40, the bores 29 and 45 are preferably formed in a single operation by driving a reamer upwardly through the housing 14 and into the cap 18.

Formed in the upper face of the flange 13 is an annular shoulder 50, and engaging this shoulder and supported by the flange 13 is a plate 51. This plate is held in position by suitable screws or the like 52 which engage ribs 54 formed on the under face of the flange 13.

The plate 51 constitutes a support for a spring 55, the spring resting on this plate in the manner clearly illustrated in Fig. 2 of the drawings. At its outer end the spring 55 is anchored to one of the bosses 15 by a bolt 56, this bolt having a head 57 which engages an opening 58 formed in the end of the spring. The bolt is provided with a threaded shank which is threadedly engaged by a nut 59 which is rotatably mounted in a bore formed in an enlarged portion 60 of the boss 15. The nut 59 is thus accessible from the outer periphery of the casting 10 so that the bolt 56 will be secured firmly in position to hold the end of the spring against the inner edge of the boss 15.

The inner end of the spring is secured to a clutch member designated generally by the reference character 65. This clutch member comprises a tubular body portion 66 which is rotatably mounted on the shaft 26 and which projects downwardly through an opening 67 formed in the plate 51. The adjacent end of the spring 55 is provided with a slotted opening 68 to receive the shank 69 of a stud by which the inner end of the spring is secured to the body portion of the clutch member. The shank 69 is provided at its opposite ends with the heads 70 and 71, the head 70 being relatively large as compared to the head 71, as clearly illustrated. The arrangement is such that the head 71 may be inserted through the slot in the spring and then engaged in a T-slot 72 formed in the body portion of the clutch member.

The clutch member also comprises a head portion 75 which projects laterally outwardly beyond the body portion thereof to provide a shoulder 76 which rests upon the upper edge of the adjacent portion of the spring 55. The head 75 is provided with the inclined radial bores 77 for receiving balls 78, these balls being prevented from escaping through the outer ends of the bores by spring wires 79. It will be obvious that by inclining the bores in the manner illustrated, the balls 78 will be normally held in the position shown in Fig. 2 of the drawings.

The member 65 constitutes the driving element of a one-way clutch, the other element of which is designated by the reference character 80. The member 80 comprises a block fixed as by the pin 81 to the shaft 26 above the spring 55. The member 80 is substantially square in cross section and is received within a bore or recess 83 formed in the upper face of the head 75 of the clutch member. It will be noted that the balls 78 are movable into the bore 83 in a position to engage the member 80, as will be readily apparent.

The shaft 26 projects above the cap 18 and is provided with the transversely extending pin 85. An arm or turntable 86 is provided with a boss 87 which rests on the pin 85, the boss being provided on its lower edge with the recess 88 for receiving the pin 85 whereby the turntable 86 is rotatably secured to the shaft 26. The upper end of the shaf 26 is threaded as at 89 to receive a nut 90, this nut engaging the upper face of the boss 87 to prevent disengagement of the turntable from the shaft by upward movement.

The turntable provides on one side of the shaft 26 a counterweight supporting portion or arm 91. This arm is provided with a series of sockets 92 adapted to be engaged by a spring pressed pin 93 carried by a counterweight designated generally by the reference character 94. The arrangement is such that the counterweight may be fixed in any of a series of positions longitudinally of the arm 91 by engaging the spring-pressed pin in the proper socket, as will be readily apparent.

The counterweight is, according to the teachings of this invention, formed of the sections 95 and 96, the section 95 carrying the spring-pressed pin above referred to. The section 96 is arranged to be detachably connected to the section 95 by any suitable means such, for example, as the dovetailed connection illustrated in Fig. 8 of the drawings. By reference to this figure it will be noted that the section 95 is provided on its bottom face with a dovetailed rib or tongue 97, and this tongue is engageable in a dovetailed groove formed in the section 96.

It will be noted that the rib and groove are tapered and are so arranged that their wider ends are directed toward the outer end of the arm 91. Thus, when the turntable is rotated, the sections of the counterweight will not be disconnected from each other by centrifugal force acting on the lower section 96.

By providing a sectional weight such as above described, the arm 91 may be made relatively short while still providing for the use of a wide range of weights of flasks. Thus the section 95 may be used by itself if a relatively light flask is to be used in the casting operation, while if a heavy flask is to be used, both sections 95 and 96 of the counterweight may be utilized.

Opposite the arm 91 the turntable 86 is provided with the portion 100 which is relatively short as compared to the portion 91. The portion 100 of the turntable is provided at its free end with a bearing 101 which pivotally mounts a supporting arm 102. It will be noted that the upper face of the end of the portion 100 of the turntable 86 is inclined to the horizontal so that the support 102 will normally swing about its pivot to the position shown in Fig. 1 of the drawings, being held in this position by engagement of the stop 103 on the support with a stop 104 formed on the turntable. A second stop 105 on the support 102 limits movement of the support in the opposite direction about its point of pivotal or rotatable connection with the end of the turntable.

The support 102 comprises an elongated arm provided at its edges with the upstanding marginal flanges 106. Centrally, the support 102 is provided with the longitudinally extending slot 107 which terminates at its inner end in an enlarged portion 108. At its outer end the support 102 terminates in an upstanding disk-like member 109 which constitutes an abutment for the end of a molding flask 110.

The molding flask forms no part of this inven-

tion, but, as illustrated, comprises a substantially cylindrical member which is filled with investment compound, as designated by the reference character 111. A cavity 112 is formed in this investment compound and constitutes the mold, this cavity communicating by way of a passage 113 with a ladle chamber 114 formed in the investment compound.

It will be noted that the flask 110 is substantially cylindrical in cross section and, when positioned on the support 102, rests upon the marginal flanges 106 so as to be supported in spaced relation to the body or central portion of the support. The flask thus has only line contact with the support and is spaced from the base thereof to provide an air chamber 115. The flask is held to the support by a stud 116 which engages in the slot 107, the stud being held in this slot by a head 117 which may be inserted through the enlarged portion 108 of the slot.

In operation, when it is desired to make a casting, the spring 55 is first wound by manually rotating the turntable or arm 86 in the proper direction. It will be understood that the arm is connected to the shaft 26 by the pin 85 and that the shaft is connected to the spring by way of the clutch members 65 and 80. When the spring has been wound the proper amount, the turntable may be held against rotation by raising the pin 20 to a position where it is in the path of rotation of the turntable 86, as clearly illustrated in Fig. 1 of the drawings.

The flask 110 with the mold cavity 112 formed therein may then be positioned on the support 102, the outer end of the flask engaging the face of the disk 109, as illustrated. A quantity of molding material such as gold may be placed in the ladle 114, as designated by the reference character 118, and this molding material may then be heated in any desired manner, as by directing a jet of flame against the same. When the molding material has been melted, the turntable may be slightly moved to disengage the same from the pin 20, after which the pin 20 may be dropped to the position shown in Fig. 2 of the drawings and the turntable then released. The spring in unwinding will rotatably drive the shaft 26 and the turntable 86, it being understood that centrifugal force will swing the support 98 to the position shown in Fig. 2 of the drawings where it is in substantial alignment with the longitudinal axis of the turntable 86. The initial jerk imparted to the support 108 incident to its movement from a position at right angles to the turntable, as illustrated in Fig. 1 of the drawings, to a position substantially in alignment with the longitudinal axis of the turntable, as illustrated in Fig. 2 of the drawings, causes the molding material to flow toward the passage 113.

The initial turning movement of the turntable 86 will be caused by the spring 55, as above brought out, but the turntable may and will continue to rotate after the spring has become unwound, by virtue of the one-way clutch between the shaft 26 and the spring. The rotation of the turntable will centrifugally cause the melted molding material from the ladle 114 to flow through the passage 113 to the mold cavity 112, as will be readily apparent. When the rotation of the turntable stops, the support 102 will return to a position at right angles to the longitudinal axis of the turntable by virtue of the inclined upper surface of the end of the portion 100 of the turntable.

From the above it will be apparent that the invention provides a casting machine in which the rotatable driving shaft is supported at its upper and lower ends by combination journal and thrust bearings. The shaft will thus be prevented from vertical movement and also from rocking movement or vibration within the body of the casting machine.

The invention further provides a simple and improved means for supporting the spring which drives the turntable, this means including a plate which is removably supported within the body of the machine. The one-way clutch construction provides for rotation of the turntable after the spring has become unwound, and it will be found that the ball clutch disclosed will be substantially noiseless in operation.

Still further, the flask will be supported only by the flanges 106 and will thus have only line contact with the support 102. Thus the heat of the flask will not be conducted to the support, and the support may be made relatively light without danger of bending or breaking in operation. The air space 114 between the body of the flask and the body of the support provides an insulation between the support and the flask to prevent the transmission of heat by radiation from the one to the other.

The invention provides for the use of a relatively short counterweight supporting arm by forming the counterweight in sections which are arranged to be detachably connected to each other. Thus, for relatively light flasks, the section 95 of the counterweight may be used by itself, while for relatively heavy flasks, both sections 95 and 96 may be utilized. Obviously, the counterweight may be adjusted longitudinally of its supporting arm to vary the effective force of the weight of the counterweight, as will be readily apparent.

While the invention has been described with some detail, it is to be understood that the description is for the purposes of illustration only and is not definitive of the limits of the inventive idea. The right is reserved to make such changes in the details of construction and arrangement of parts as will fall within the purview of the attached claims.

What we claim as our invention is:

1. In a casting machine of the class described, a substantially cylindrical casting having an inwardly extending flange adjacent the upper end thereof, a plate removably supported on said flange within said casting, a spring supported on said plate and having its one end anchored to said casting, a vertically positioned shaft having its lower end extending through said plate and within said casting, and means forming a driving connection between the other end of said spring and said shaft.

2. In a casting machine of the class described, a base comprising a substantially cylindrical casting having an annular inwardly extending flange spaced from its upper edge, a plate supported on said flange within said casting, means detachably securing said plate to said flange, a spring supported on said plate, and a vertically positioned shaft supported within said base and arranged to be rotatably driven by said spring.

3. In a casting machine of the class described, a turntable, a flask-supporting arm pivotally mounted on one end of said turntable, and cooperating surfaces on said flask-supporting arm and said turntable inclined to the horizontal and arranged to normally maintain said flask-sup-

porting arm at substantially right angles to the longitudinal axis of said turntable.

4. In a casting machine of the class described, a rotatable turntable, a counterweight adjustable longitudinally of said turntable, said counterweight including an upper section having a dovetailed rib on its under face, said rib being of tapered cross sectional area with its wider end adjacent the free end of the turntable, and a lower section having a dovetailed groove for receiving the rib on the said upper section whereby the said sections may be detachably connected to each other, the tapered rib preventing disengagement of the sections by centrifugal force during rotation of the turntable.

5. In a casting machine of the class described, a hollow base having an inwardly extending flange adjacent its upper end, said flange being shaped to provide a substantially inverted cone-shaped housing within said base, webs connecting said housing to the inner surface of the wall of said base, a cover for said base, a vertical shaft extending from within said housing upwardly through said cover, bearings for said shaft in the lower end of said housing and in the said cover, a plate supported on said flange within said base, a clutch member rotatably journaled on said shaft above said plate, a spring on said plate secured to said clutch member for rotating the same, a second clutch member fixed to said shaft, and means providing a one-way driving connection between said first mentioned clutch member and said second mentioned clutch member, said clutch members being disposed within said base and being enclosed by said base and cover.

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