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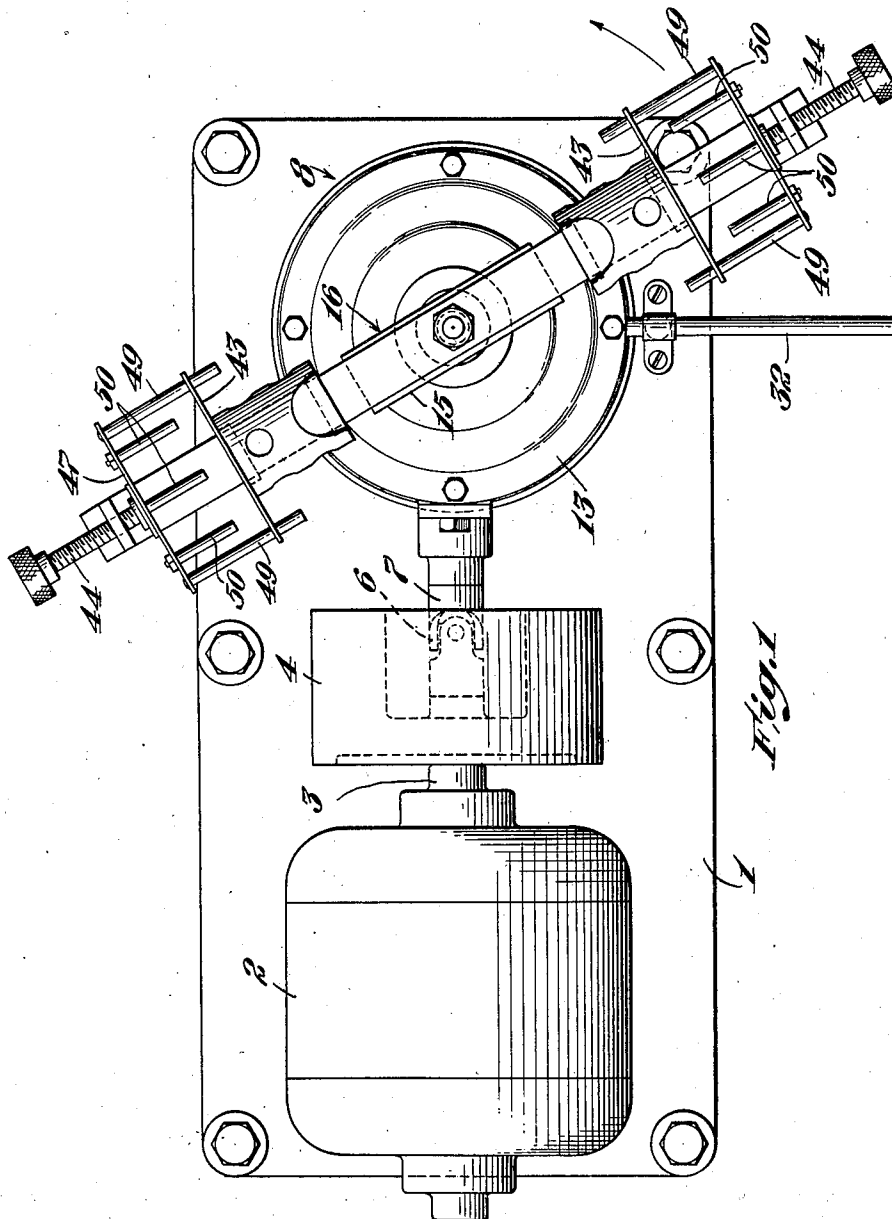
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2,140,204

CASTING APPARATUS

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2 Sheets-Sheet 1



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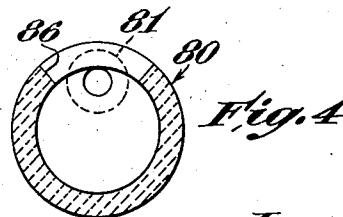
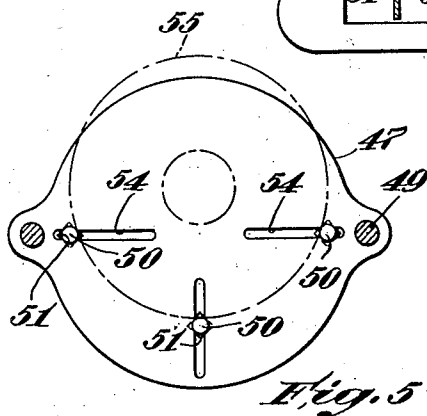
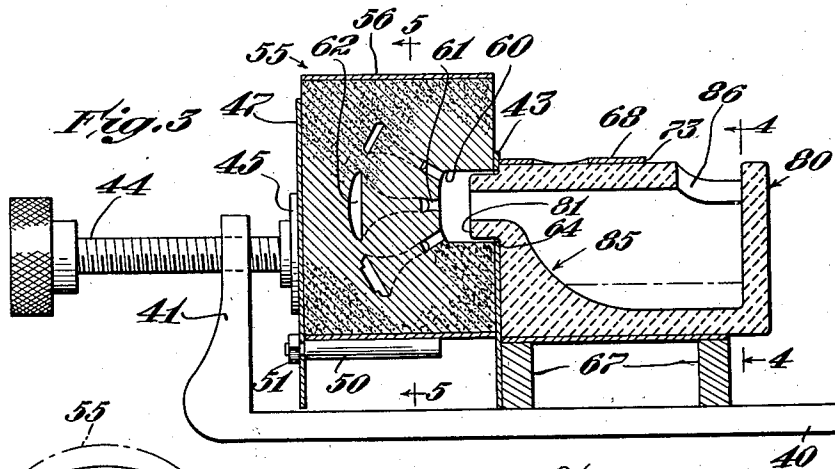
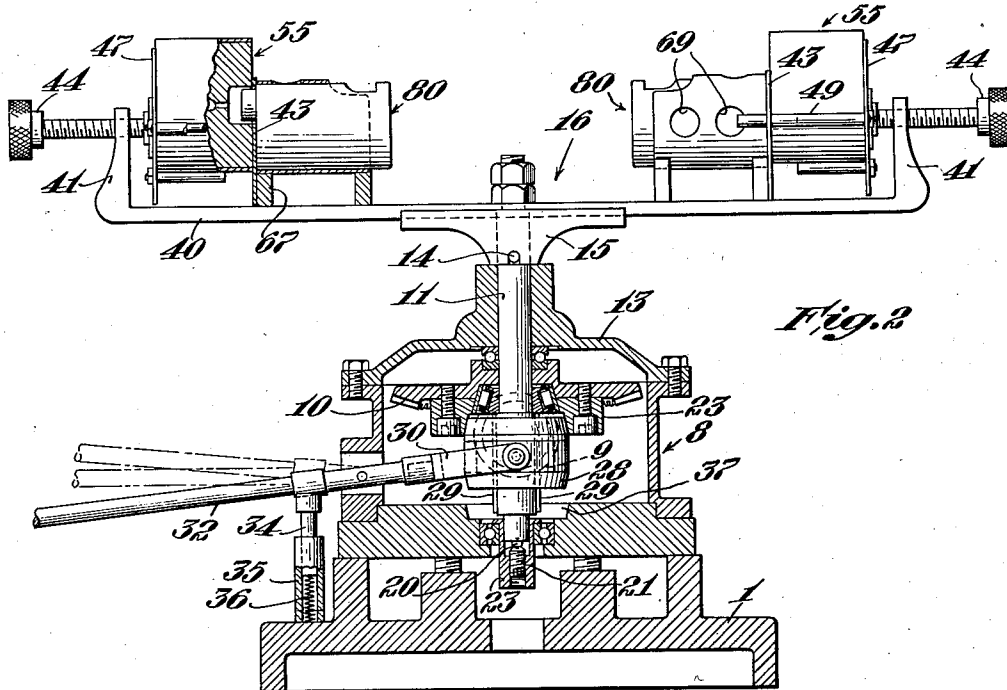
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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CASTING APPARATUS

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3 Claims. (Cl. 22—65.1)

The present invention relates to an improved centrifugal casting machine particularly for the casting of small metal articles such as articles of jewelry.

Centrifugal casting machines of the type heretofore employed for such purposes have commonly been provided with springs which were released to drive the rotors of the machines. In an attempt to provide a sufficiently high centrifugal force at the time of starting, various more or less complicated arrangements of pivoted arms have been employed. In many cases such a machine was arranged so that the metal-containing crucible may be disposed directly on the machine and then heated by a blow torch or the like.

In general, despite the complications afforded by such machines and despite the use of the flame in direct contact with portions thereof, such machines often have left much to be desired in the way of providing clean cut and sharply defined castings accurately reproducing the form of the original investments which were employed in making the moulds. The present invention affords a simple, easily operated machine capable of use by one operator with at least two moulds at the same time and provided with removable crucibles which may be conveniently heated in an auxiliary retort or electric furnace or the like and which may quickly be applied to the machine in proper relation to the moulds. To permit this desirable result, the machine is provided with crucible and mould supporting means of novel form. The moulds are arranged so that they may be conveniently supported by such means to receive the molten metal from the crucibles. One important feature of the present invention involves the construction of the moulds, the crucibles and the supporting means therefor, so that the molten metal is effectively introduced into the moulds. To permit these desirable results each supporting means may be provided with a part disposed between the mould support and the crucible support and provided with an opening which registers with a reentrant portion of the mould. The cooperating crucible is provided with a surface to engage the part and with a spout insertable through the opening and into the reentrant portion of the mould. Furthermore, the crucible is so shaped as to facilitate effective movement of the molten metal into the mould while maintaining the metal at the desired high temperature.

A further important feature of the present invention involves the arrangement of the driving means so that a very sudden torque may be

imparted to the rotor of the machine, and so that the latter may have a high rate of rotary acceleration. To permit these desirable results and also to permit the firm compacting of the metal under centrifugal force, I preferably employ an electric driving motor which also may be provided with a fly wheel. Accordingly driving means having a relatively high moment of inertia is provided. In accordance with this invention, a clutch is arranged between this driving means and the rotor, so that the clutch may be quickly engaged to cause the sudden acceleration of the rotor. To permit this desirable result I preferably may employ a suitable cone clutch. An arrangement of this type imparts an abrupt centrifugal impact to the molten metal, while permitting the employment of mechanism which is free from complications.

In the accompanying drawings:

Fig. 1 is a plan view of a centrifugal casting machine constructed in accordance with this invention;

Fig. 2 is a sectional view of the rotor, the clutch and related parts, certain parts being shown in elevation;

Fig. 3 is a sectional view of a portion of the rotor showing the supporting means for a mould and a crucible with a mould and crucible supported thereby, parts also being shown in elevation;

Figs. 4 and 5 are respectively sections on lines 4—4 and 5—5 of Fig. 3.

Referring to the accompanying drawings which illustrate a preferred exemplification of the present invention, it will be evident that my improved centrifugal casting machine is provided with a fixed frame including a relatively heavy base plate 1 supporting a driving motor 2, such as an electric motor. The latter is provided with a shaft 3 carrying a fly wheel 4, a portion of the shaft extending into a recessed part of the fly wheel, as shown in dotted lines in Fig. 1, and being connected by a universal joint 6 to a shaft 7. The latter extends into a gear housing 8 and carries a beveled pinion 9 (shown in dotted lines in Fig. 2) which meshes with a beveled gear 10, the latter preferably being disposed in a horizontal plane and being rotatable about a vertical shaft 11. The shaft extends upwardly through the cover 13 of the gear housing 8 and is provided with a diametrical pin 14 engageable in suitably recessed portions of a bracket 15 at the center of the rotor 16. The lower part of the shaft 11 rests on a ball 20 mounted on the recessed end of an adjustable set screw 21 carried by a rotatable

cup-like member 23 at the lower part of the gear housing 8.

A clutch is arranged between the beveled gear 10 and the shaft 11. This clutch comprises a driving member 23 fixed to gear 10 and having an upwardly and inwardly tapered surface and also comprises a driven member 28 slidably mounted on the splines 29 of shaft 11. An actuating fork 30 has a pivotal connection with a ring received in a grooved portion of the driven member 28. The fork is fixed to the inner end of a pivotally mounted control lever 32 which extends through an opening in the side of gear casing 8. The lever 32 is engageable with the upper end of a plunger 34 which is slidable in a cylinder 35 on the outer portion of the machine. This cylinder contains a compression spring 36 tending to swing the outer end of the lever to the intermediate position shown in dotted lines. Thus, when the handle is not being pressed downwardly, the driven part 28 of the clutch is out of engagement with the driving part 23. When, however, the handle is pressed downwardly these parts are interengaged so that the gear 10 which is being driven by the motor 2 is effective in driving the shaft 11 and the rotor 16.

The lower wall of the gear housing is preferably provided with a socket 37 affording a tapered surface to engage a corresponding surface of the driven member 28 of the clutch, thus to act as a brake when the handle 32 is pulled upwardly above its normal position.

The rotor 16 may include two oppositely disposed radial arms which are conveniently afforded by a single diametrically disposed bar 40 having upturned end portions 41. The supporting means for the crucibles and the moulds are disposed adjoining end portions or flanges 41. Since the supporting means at the opposite end of the bar are similar, but one of these supporting means will be described in detail.

An upright plate 43 is disposed on the bar in inwardly spaced relation to the flange 41 and an adjustable screw 44 has a portion freely rotatable within a hollow button 45 fixed to a movable plate 47, the screw extending through an internally threaded opening in the flange 41. The plate 47 carries two elongate studs 49 (Fig. 1) which extend through openings in the plate 43. Thus the plate 47 is guided in a straight line path as the screw 44 is screwed inwardly or outwardly. The plate 47 also carries a plurality of shorter studs 50 which may be clamped in place by nuts 51 fitting on the threaded end portions of the studs 50 (Figs. 3 and 5). The ends of the studs 50 are disposed in slots 54 so that the studs may be moved inwardly or outwardly on the plate and be adjusted to provide a cradle to receive a mould of desired size.

Such a mould 55 may be in the form of a metal cylinder or shell 56 containing material such as commonly employed for dental investments which has been previously prepared to afford a casting recess or recesses. In accordance with this invention, however, the mould is preferably provided with a reentrant portion 60 communicating through a restricted passage or passages 61 with one or more casting recesses 62. The mould is provided with opposite planar faces to engage the plates 47 and 43 respectively. When the mould is to be located on the machine, the screw 44 is actuated to space the plate 47 sufficiently from the plate 43 to permit the ready insertion of the mould. Since the latter preferably is cylindrical it is properly centered by resting on the studs 50. The set

screw 44 is then tightened to press the mould against the plate 43 with the reentrant portion 60 of the mould registering with an opening 64 in the plate.

The crucible support may comprise a pair of short bars 67 extending transversely of the main bar 40 of the rotor and supporting a cylindrical jacket 68 which may conveniently be formed of sheet metal and which may have its outer end juxtaposed to or abutting the plate 43. The wall of the jacket 68 may conveniently be provided with openings 69 and its upper portion may be cut away at its end remote from the plate 43 as designated by numeral 73. The inner end of the cylindrical jacket 68 is open to permit a crucible 80 readily to be slid into place on the support.

One important feature of the present invention involves the arrangement of the parts of the crucible, of the mould and of the cooperating supporting means, and further important features of the invention relate to the form of the crucible itself. The crucible preferably is formed of refractory material shaped to provide a chamber having an external end surface to engage the surface of the plate 43. The crucible preferably is provided with a spout 81 to project radially of the rotor 16 through the opening 64 in the plate 43 and into the reentrant part 60 of the mould. The spout may conveniently be of cylindrical form and may be provided with a bore of corresponding shape which communicates with the chamber of the crucible. The body portion of the crucible may also conveniently be of cylindrical form but the inner surface of the lower wall of the crucible is curved and inclined upwardly as designated by numeral 85 so that it has a general inclination toward the bore of the spout. This arrangement not only facilitates the flow of the molten metal through the spout but it also provides a relatively thick mass of refractory material under and adjoining the surface 85, thus affording a heat-retaining means of considerable capacity in the region of the metal as it is leaving the crucible. The top of the crucible may be closed except for an opening 86 in its upper wall at the end remote from the spout, thus the heat-retaining ability of the crucible is further enhanced. Furthermore the wall of the crucible overhangs the chamber at each side of the opening 86 thereby providing a construction to preclude spilling of the molten metal. It is evident that the radial direction of extent of the spout also facilitates the free flow of the molten metal from the crucible to the recessed portion of the mould.

When a machine of this character is about to be used the motor 2 is running but the clutch is disengaged. The moulds may have been formed in any desired manner to provide one or more casting recesses 62. In practice, if small objects such as rings are to be cast, I prefer to provide a plurality or cluster of such casting recesses which are arranged to communicate with the reentrant portion 60 through small channels 61. Each mould preferably is heated before it is placed on the corresponding support. The reentrant portion 60 of each mould is located, due to the previous proper adjustment of studs 51, so that it will register with the opening 64 of the plate 43, and the mould is then clamped in place on the mould support, being pressed against the outer surface of plate 43. The hot crucibles containing molten metal are then slid into the crucible supports, with the spouts 81 extending

into the corresponding reentrant portions 60 of the mould. As soon as this has been accomplished, the handle 32 is actuated to cause quick engagement of the clutch. Since the motor 2 is provided with a relatively heavy fly wheel and since the armature of the motor also has a substantial moment of inertia, the sudden engagement of the clutch is effective in causing the very rapid acceleration of the comparatively light rotor, it being evident that the clutch is designed so that but very slight, if any slippage between the parts thereof takes place.

Since the moment of inertia of the driving parts of the machine is comparatively great and since that of the driven parts is comparatively small, the speed of the motor is but slightly changed at the instant that the clutch is engaged. As a consequence, while the crucibles 80 are being firmly pressed against the plates 43 by centrifugal force, the molten metal is forcibly impacted into the recessed portions of the mould, so that an unusually cleanly defined casting may be obtained.

The rotation of the motor may be continued as long as necessary to assure the effective setting of the casting under centrifugal force, thus providing an arrangement which is distinctly more advantageous than can be provided by the ordinary spring actuated rotor. When the metal has had time enough initially to set, the clutch may be disengaged and if desired the handle 32 may be moved to its uppermost position to afford a braking effect, thus to permit the quick stopping of the rotor so that the moulds and crucibles may be promptly removed whereupon the operation may be repeated.

It is evident that the present invention affords a simple machine for forming small castings by the employment of centrifugal force, that the present invention permits the use of the machine with two crucibles at the same time, and that the machine may be readily used with both crucibles in this manner by a single operator.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

I claim:

1. Crucible for a centrifugal casting machine

comprising a body of refractory material affording a chamber provided with an outlet spout at one end and communicating with the upper part of the chamber, said spout being located substantially at the top of one end wall of the refractory body, said chamber being closed except for said spout and for an opening in its upper wall at the end remote from the spout, the inner surface of the lower wall of the chamber having a general inclination upwardly to said spout and extending a substantial fraction of the length of the chamber.

2. Crucible for a centrifugal casting machine comprising refractory material arranged to provide a chamber, an outlet spout communicating with the upper part of the chamber at one end thereof, the chamber having an outer planar end surface below said spout with the spout projecting outwardly beyond said surface, the chamber providing an upwardly extending lower inner surface in the region of said spout, said inner surface extending a substantial fraction of the length of the chamber, whereby a mass of refractory material of substantial thickness is provided between said surfaces in the region of the spout.

3. A crucible for a centrifugal casting machine comprising a generally cylindrical body of refractory material, said body having a planar outer surface at one end, a short spout projecting from said end of the crucible beyond said surface, said spout being located substantially above the axis of said cylindrical body, said crucible providing a chamber with an upwardly inclined and curved surface adjoining said spout whereby molten metal under the action of centrifugal force may readily move upwardly to and through said spout, said chamber being closed except for the opening provided by the spout and except for a filling opening at the upper part of the chamber at the end thereof which is remote from the spout, the crucible having overhanging walls at each side of said filling opening, said last-named opening extending only a minor fraction of the length of said chamber, said upwardly inclined and curved surface extending a greater fraction of the length of the chamber.

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