June 24, 1930. L. B. ANDRESEN ET AL 1,767,036

CENTRIFUGAL CASTING MACHINE

Filed Dec. 8, 1928 2 Sheets-Sheet 1

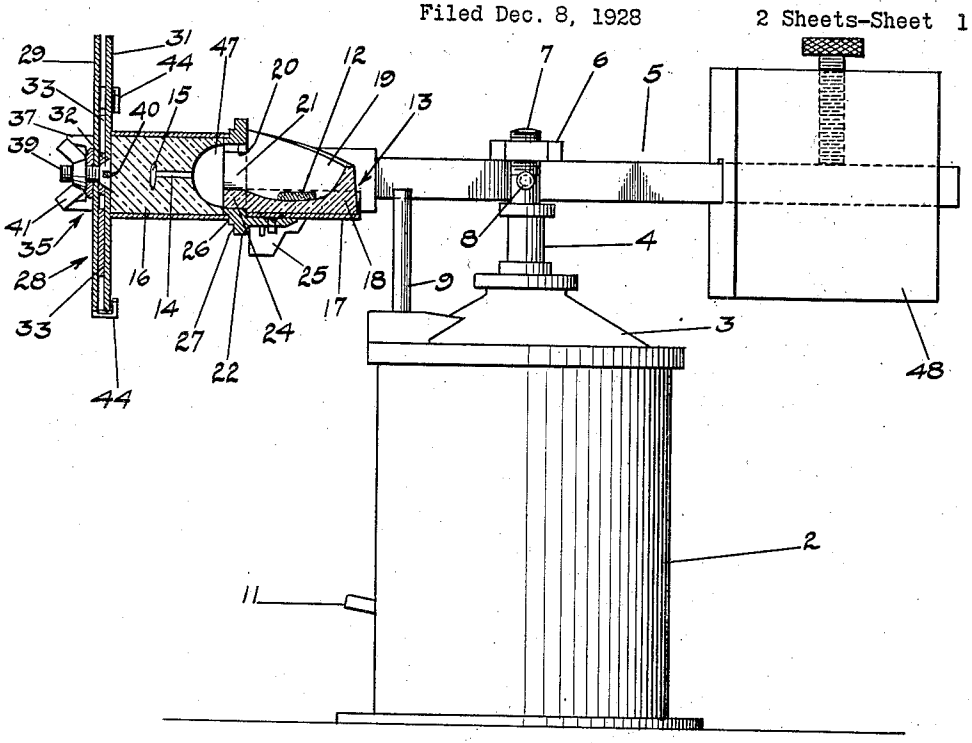


Fig. 2

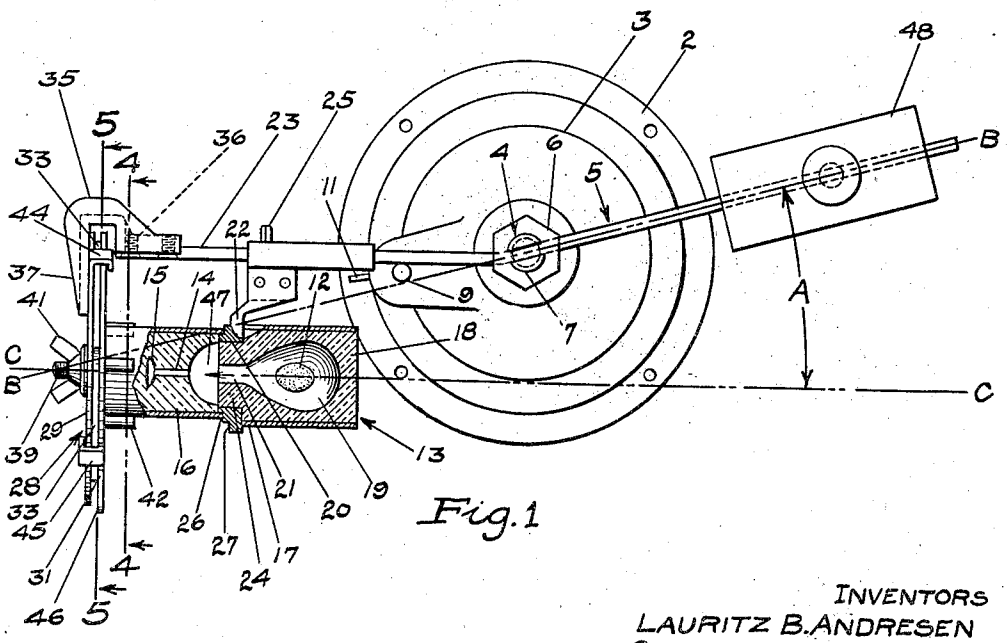


Fig. 1

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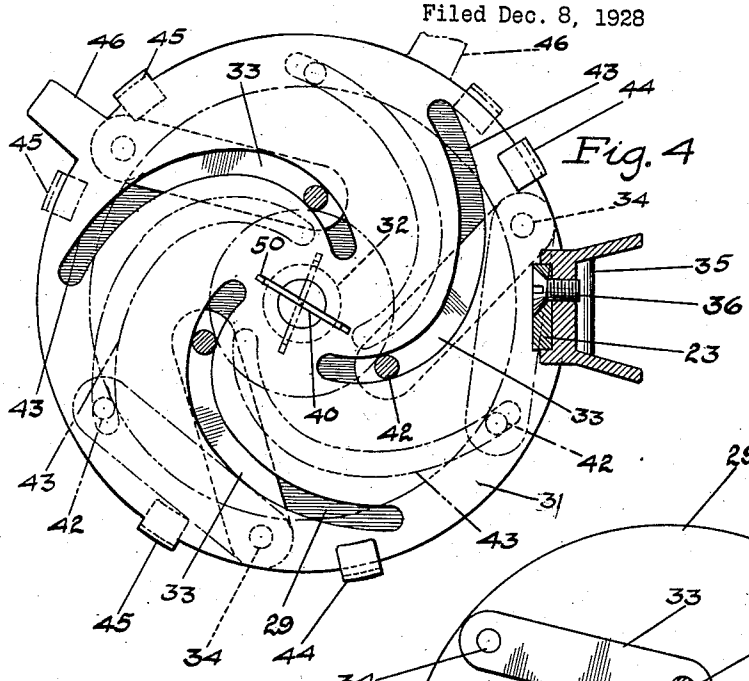


Fig. 4

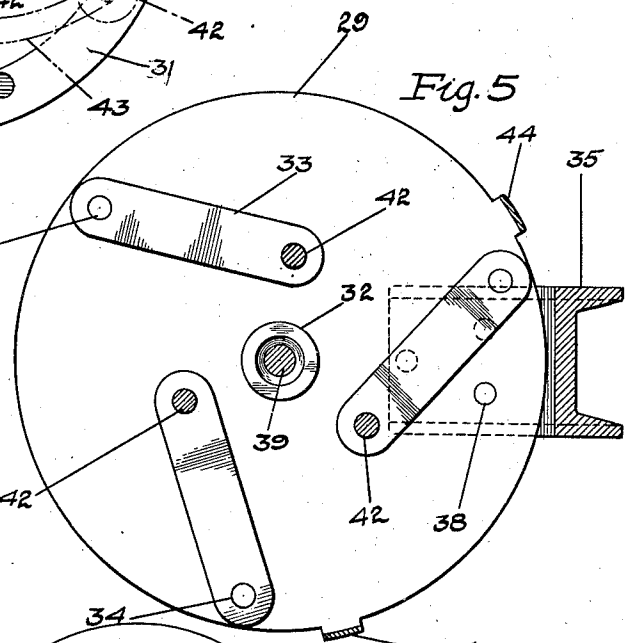


Fig. 5

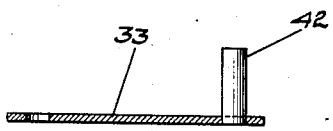


Fig. 6

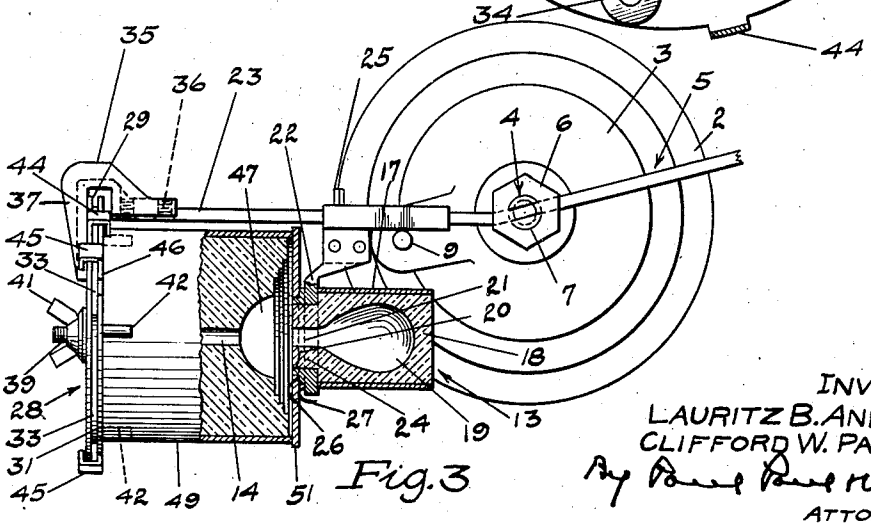


Fig. 3

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UNITED STATES PATENT OFFICE

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CENTRIFUGAL CASTING MACHINE

Application filed December 8, 1928. Serial No. 324,610.

This invention relates to new and useful improvements in centrifugal casting machines, adapted for use in dental laboratories, in the art of preparing inlays, crowns, bridges, and other similar work.

An object of the present invention is to provide a centrifugal casting machine including an arm mounted for rotary movement, and having a bracket adjustably mounted thereon and adapted to support a crucible into which the gold or metal to be cast, is placed, and a chuck also being mounted upon the arm and adapted to support a flask in alinement with the crucible, so that the cavity formed in the flask, by the usual wax pattern, will be in direct communication with the crucible whereby, when the machine is initially started, the melted gold or metal in the crucible will be thrown directly into the sprue hole in the flask and into the cavity substantially without resistance.

A further object of the invention is to provide a centrifugal casting machine comprising an upright drive shaft having an arm mounted thereon and adapted for rotation therewith, and a crucible being mounted upon the arm and laterally spaced therefrom and adapted to support the melted gold or metal to be cast, and a flask also being supported upon the arm and substantially alined with the crucible, and having the usual cavity therein adapted to receive the melted gold from the crucible, and the alined axes of the crucible and flask being off-set from the axis of the drive shaft and substantially co-incident with the natural line of travel of the melted gold from the crucible into the cavity in the flask, thereby causing the melted gold to travel from the crucible directly into the flask cavity substantially without friction losses.

A further object is to provide a centrifugal casting machine comprising a base member having a suitable motor mounted therein and provided with a drive shaft having an arm terminally secured thereto and adapted for rotation in substantially a horizontal plane, and a bracket being adjustably mounted upon the arm and adapted to support a crucible in horizontal spaced relation from the arm, and an adjustable chuck being terminally secured to the arm and also off-set therefrom and adapted to support a flask in alinement with the crucible, and a counter-weight being adjustably mounted upon the opposite end of the arm and adapted to counterbalance the combined weights of the parts supported upon the other end of the bar, the off-setting or spacing of the crucible and flask to one side of the arm causing the melted gold or metal to travel directly into the sprue hole in the flask, and thence into the cavity provided therein, substantially without engaging the side walls of the crucible or the bottom of the sprue bowl in the flask, thereby minimizing friction, with the result that the time required for the melted gold to travel from the crucible into the pattern cavity, will be shortened, resulting in the molten metal being delivered into the cavity in the flask, substantially without loss of heat, with the resultant production of a casting that will be substantially free from defects.

A further object is to provide a centrifugal casting machine comprising an arm adapted for rotation and having a crucible and a flask supported on one end thereof and spaced to one side thereof, and the bar being bent intermediate its ends and having a counterweight adjustably mounted upon the other end thereof and adapted to counterbalance the combined weights of the crucible and flask, and the parts associated therewith, and the bend in the arm being such as to cause the center of gravity of the counterweight to be substantially diametrically alined with the center of gravity of the opposite end of the arm and the parts mounted thereon, whereby the arm may be rotated at a high rate of speed substantially without vibration.

A further object is to provide a centrifugal casting machine comprising an arm adapted for rotation in substantially a horizontal plane, and having an adjustable chuck mounted at one end thereof and adapted to support flasks of different diameters or sizes, said chuck comprising a fixed

plate and a relatively movable plate, rotation of the latter plate causing the gripping element to move towards or away from the axis of the chuck, dependent upon the direction of rotation thereof.

The particular object of the invention therefore is to provide an improved centrifugal casting machine of the type commonly used in dental laboratories for casting inlays, crowns, and other dental work.

Other objects of the invention will appear from the following description and accompanying drawings and will be pointed out in the annexed claims.

In the accompanying drawings, there has been disclosed a structure designed to carry out the various objects of the invention, but it is to be understood that the invention is not confined to the exact features shown as various changes may be made within the scope of the claims which follow.

In the accompanying drawings forming part of this specification;

Figure 1 is a plan view, showing a dental casting machine with the invention applied thereto, the crucible and flask being shown in section;

Figure 2 is a side elevation of the apparatus, partially in section;

Figure 3 is a view similar to Figure 1, but showing a relatively larger flask:

Figure 4 is a detailed sectional view on the line 4—4 of Figure 1, showing in full lines, the chuck pins positioned for supporting a small flask, and showing in broken lines, the position of the pins when supporting a relatively larger flask;

Figure 5 is a detailed sectional view on the line 5—5 of Figure 1; and

Figure 6 is a detailed sectional view, showing one of the chuck pins and its supporting link removed from the chuck.

In the selected embodiment of the invention here shown, for purposes of disclosure, there is illustrated in Figures 1 and 2, a dental casting machine, of ordinary construction, comprising a base 2 having a cap 3, in which a shaft 4 is vertically mounted. The lower end of this shaft is operatively connected to a suitable motor, not shown.

The upper end of the shaft 4 is slotted as shown in Figures 1 and 3, to receive an arm 5, secured therein by means of a nut 6 received in threaded engagement with the upper reduced end portion 7 of the shaft 4. A stud or screw 8 cooperates with the nut 6 to secure the arm to the shaft.

Machines of this kind usually employ a spring-operated type of motor which tend to rotate the shaft 4 in one direction only. Before the machine can be operated, the motor is wound up, preferably by manually rotating the arm 5 in the opposite direction from that in which it rotates, when the machine is operated, thereby causing the spring in the motor to be put under tension. The bar is adapted to be locked against rotation by a stop pin 9, slidably mounted in the cap 3 and base member 2. A lever 11 is operatively connected with the stop pin 9 within the base, and provides means for releasing the pin from the bar 5, to start the motor. The mechanism above described, relating to the motor, is clearly shown in pending application, Serial No. 281,323, filed May 28, 1928, by Lauritz B. Andresen, and it is therefore thought unnecessary to show same in detail in this application.

A feature of this invention resides in the means provided for causing the melted gold or metal, shown at 12 in Figures 1 and 2, to follow substantially a straight line of travel from the crucible 13, directly into the sprue hole 14 and into the cavity 15 provided in the flask 16, when the machine is initially started. The crucible here shown, is of ordinary construction, and comprises the usual casing member 17 which supports the refractory material 18, formed with a recess 19 therein adapted to receive the gold. The recess 19 is provided with the usual discharge 21.

A bracket 22 is adjustably mounted upon the end portion 23 of the arm 5, and has a bore 20 adapted to receive the cylindrical portion or neck 24 of the crucible 13. The bracket 22 is adjustably secured to the end portion 23 of the arm 5 by means of a suitable latch 25, adapted to frictionally engage the lower edge of the arm. This latch permits movement of the bracket 22 in an outward direction, but prevents movement thereof in a direction towards the shaft 4. The bracket 22 has a plurality of annular seats 26 and 27, arranged around the bore 20, and each adapted to receive the cylindrical casing of a certain sized flask 16.

Referring to Figure 1, it will be noted that the alined axes of the flask and crucible, indicated by the broken line C—C, is offset from the axis of the drive shaft 4. It will also be noted that the line C—C is angularly disposed with respect to the line B—B, indicating the longitudinal center line of the arm 5. The angle A between the lines B—B and C—C is such as to cause the melted gold 12 in the crucible 13, to follow substantially the line C—C when traveling from the crucible 13 into the cavity 15 in the flask, thereby reducing friction and minimizing heat losses, which result when the gold is allowed to contact with the side walls of the crucible and the bottom of the sprue bowl 47, as it travels from the crucible to the cavity, which is common when using centrifugal casting machines of ordinary construction. In other words, the alined axes of the flask and crucible are so disposed with respect to the axis of the drive shaft 4 and the longitudinal center line of

the arm 5, that the melted gold, when the machine is initially started, will follow a natural course or line of travel from the crucible directly into the cavity 15, resulting in the production of a casting which will be substantially free from defects.

Another feature of this invention resides in the means provided at the outer end of the arm portion 23 for supporting the flask 16. For this purpose, a chuck 28 is provided which comprises two plates 29 and 31. preferably circular in form, as shown in Figures 4 and 5. These plates are spaced apart by a suitable washer 32, to provide clearance therebetween for a plurality of links 33, each having one end pivoted upon a pin 34, secured to the outer plate 29. The plate 29 is secured to the arm portion 23 by means of a bracket 35 having one end secured to the arm portion 23 by suitable screws 36. The plate 29 is secured to the off-set end portion 37 of the bracket 35 by such means as rivets 38.

The inner plate 31 is rotatably supported upon the plate 29 by means of a stud or screw 39, having a countersunk head received in a correspondingly shaped aperture provided in the plate 31. A wing nut 41 is received in threaded engagement with the screw 39 and cooperates therewith to secure the rotatable plate 31 in its adjusted positions.

Each link 33 has a pin 42 secured in its swinging or movable end, each of which passes through a curved slot 43, provided in the rotary plate 31, as particularly shown in Figure 4. The pins 42 project through these slots a suitable distance, as shown in Figures 1 and 3, so as to receive and grip the flask 16. Lugs 44 are provided upon the stationary plate 29 and are bent around the edge of the rotary plate 31 to provide guides therefor as shown in Figures 1 and 2. Similar lugs 45 are provided upon the plate 31 which cooperate with the lugs 44 to prevent spreading of the two plates when adjusted from one position to another. The rotary plate 31 has a finger grip 46 for the convenience of the operator in rotating or adjusting the plate 31 to grip the flask, when the latter is positioned between the pins 42, as shown in Figures 1 and 3. The wing nut 41 and screw 39 provide means for locking the plates in flask-gripping position. The screw 39 is locked against relatively rotating in the plate 31 by means of a pin 40, secured in the head of the screw and having its opposite end portions received in slots 50, provided in the plate 31, as shown in Figure 4.

The slots 43 provided in the movable plate 31 are similarly shaped and located in the plate, and are equally spaced so that the movement of the pins 42 towards and away from the axis of the chuck, will be symmetrical, thereby causing the flask supported in the chuck to be axially alined with the chuck, regardless of size. It will also be noted, by reference to Figures 1, 2, and 3, that the axis of the chuck is alined substantially with the discharge opening 21 of the crucible so that, regardless of the size of the flask supported in the chuck, the sprue hole 14 therein will always be substantially directly in alinement with the discharge of the crucible. Because of the crucible and flask being off-set to one side of the arm portion 23, the melted gold or metal will, upon initial movement of the arm 5, when released from the pin 9, cause the gold to be thrown directly through the discharge 21 of the crucible, and into the sprue hole 14. By off-setting the arm portion 23 from the longitudinal center line of the arm 5, the metal will be prevented from engaging the side walls of the discharge opening 21 of the crucible, and also from engaging the bottom of the recess or sprue bowl 47, provided in the investment material in the flask 16.

A counterweight 48 is adjustably mounted upon the opposite end of the arm 5 to counterbalance the combined weights of the parts supported upon the end portion 23 thereof. The off-set or bend in the arm 5 is such as to cause the center of gravity of the counterweight 48 to be substantially diametrically alined with the center of gravity of the parts supported by the opposite end of the arm, thereby causing the arm to rotate substantially without vibration, during operation of the casting machine.

Figure 3 illustrates the chuck 28 adjusted to receive a flask 49 of relatively larger diameter than the flask 16, shown in Figure 1. When a flask of the diameter shown in Figure 3 is supported in the chuck, a plate 51 is preferably seated upon the annular seat 26 of the bracket 22 against which the one end of the flask 49 is abutted, as shown.

In mounting the flask in the chuck 28, the thumb screw 41 is slightly unscrewed to permit rotation of the movable plate 31 to cause the pins 32 to be moved outwardly so that the flask may be received therebetween. The rotation of the plate 31 is then reversed, causing the slots 43 to move the pins 42 inwardly into engagement with the outer walls of the flask, after which the thumb screw 41 is tightened to lock the movable plate 31 in its adjusted flask-holding position. The bracket 22, supporting the crucible 13, is then moved outwardly on the arm portion 23 until the bracket engages the outer shell or casing of the flask, as shown in Figures 1 and 2, after which the gold or metal may be placed in the crucible and heated to the desired temperature, prior to starting the machine. In Figure 3, the outer casing or shell of the flask 49 is shown engaged with the plate or disk 51 seated

upon the bracket 22, as hereinbefore described.

One of the outstanding features of this invention resides in the off-setting of the alined axes of the chuck 28 and the bracket 22, from the axis of the drive shaft 4, and the longitudinal center line of the arm 5, as indicated in Figure 1 by the lines B—B and C—C. As hereinbefore stated, by thus off-setting the flask and crucible from the axis of the shaft 4, the line of travel of the melted gold or metal, when the arm is initially started, will be in substantially a straight line from the crucible through the discharge opening thereof, across the sprue bowl or recess 47, provided in the flask, and directly into the sprue hole 14, and thence into the cavity 15. By thus causing the gold to follow substantially a straight line, the melted gold will be delivered into the flask cavity without loss of speed, usually caused by the gold frictionally engaging the walls of the discharge opening 21 of the crucible, and also the walls of the recess 47, thereby minimizing heat losses with the result that the casting will be free from defects when completed.

The particular construction of the chuck 28 is also such as to permit flasks of different sizes to be supported therein, in alinement with the discharge opening of the crucible, regardless of size, thereby greatly expediting the operation of making the castings, as compared with methods and apparatus now commonly employed.

We claim as our invention:

1. A dental casting machine comprising in combination, a drive shaft, an arm mounted thereon and adapted for rotation therewith, a crucible mounted upon the arm and adapted to support the melted gold or metal to be cast, a flask also supported upon said arm and substantially alined with said crucible, said flask, having a cavity therein adapted to receive the melted gold from the crucible, and said crucible and flask being disposed at an angle to the direction of rotation whereby the melted gold in said crucible will follow a direct line of travel therefrom into the cavity in said flask, when the machine is started.

2. A centrifugal casting machine comprising in combination, an upright drive shaft, an arm mounted thereon and adapted for rotation therewith, a crucible mounted upon said arm and spaced therefrom and adapted to support the melted gold or metal to be cast, a flask also supported upon said arm and substantially axially alined with said crucible, said flask having a cavity therein communicating with the interior of the crucible, and the axes of the crucible and flask being disposed at an angle to the direction of rotation of said arm whereby the gold discharged from the crucible by centrifugal force will follow a direct line of travel into the flask cavity.

3. A centrifugal casting machine comprising in combination, an upright drive shaft, an arm mounted thereon and having a portion off-set from the longitudinal centerline thereof, a crucible mounted upon the off-set portion of said arm and adapted to support the melted gold or metal to be cast, a flask also mounted upon said off-set arm portion adjacent to the crucible and alined therewith, and the alined axes of the crucible and flask being disposed at an angle to the direction of rotation of the arm, whereby the melted gold in the crucible follow a direct line of travel from the crucible into a cavity provided in said flask, when the machine is started, thereby substantially preventing the gold from frictionally contacting with the walls of the crucible and the flask sprue hole, when delivered into the cavity.

4. A centrifugal casting machine comprising in combination, an upright drive shaft, an arm mounted thereon and having a portion angularly disposed with respect to the longitudinal centerline of the arm, a crucible mounted upon the off-set portion of said arm and adapted to support the melted gold or metal to be cast, a flask also supported upon said off-set arm portion adjacent to the crucible and substantially axially alined therewith, and the axes of said crucible and flask being disposed at an angle to the direction of rotation whereby the melted gold or metal in the crucible will travel directly into a cavity provided in the flask, upon initial rotation of said arm.

5. A centrifugal casting machine comprising in combination, a drive shaft, an arm mounted thereon and adapted for rotation therewith, a crucible adapted to support the melted gold or metal to be cast, means adjustably mounted on said arm and adapted to support said crucible in spaced relation to the arm, a flask also supported upon said arm and alined with said crucible, and the axes of said crucible and flask being disposed at an angle to the direction of rotation whereby the melted gold in said crucible will follow a direct line of travel therefrom into a cavity provided in the flask, when the machine is started.

6. A centrifugal casting machine comprising in combination, an upright drive shaft, an arm mounted thereon and adapted for rotation therewith, a crucible adapted to support the melted gold or metal to be cast, means adjustably mounted on said arm and adapted to support said crucible in spaced relation thereto, a flask, adjustable means terminally mounted upon said arm and adapted to support said flask substantially in axial alinement with said crucible, and the axes of said crucible and flask being disposed at an angle to the direction of rota-

tion whereby the melted gold in the crucible will follow a direct line of travel therefrom into a cavity provided in the flask, when the machine is started.

7. A centrifugal casting machine comprising in combination, an upright drive shaft, an arm mounted thereon and having a portion off-set from the longitudinal centerline thereof, a crucible, a bracket slidably mounted upon said off-set arm portion and adapted to support said crucible in spaced relation thereto, a flask, an adjustable chuck terminally mounted upon said off-set arm portion and adapted to support said flask in axial alinement with said crucible, and the alined axes of the crucible and flask being angularly disposed with respect to the direction of rotation of said arm whereby the melted gold in the crucible will follow a direct line of travel therefrom into a cavity provided in the flask, when the machine is started.

8. A centrifugal casting machine comprising in combination, an arm adapted for rotation, a bracket slidably mounted thereon and adapted to support a crucible in spaced relation thereto, and a chuck terminally secured to said arm and adapted to support a flask in alinement with said crucible, said chuck being adjustable for various sizes of flasks.

9. A centrifugal casting machine comprising in combination, an arm adapted for rotation in substantially a horizontal plane, a bracket slidably mounted upon said arm and provided with means for supporting a crucible, means normally locking said bracket against inward movement, a chuck terminally mounted upon said arm and adapted to support a flask in alinement with said crucible, said chuck comprising a relatively fixed member and a movable member, and means for locking said members in adjusted positions.

10. A centrifugal casting machine comprising in combination an arm adapted for rotation in substantially a horizontal plane, a crucible demountably supported thereon and laterally spaced therefrom, a chuck terminally mounted upon said arm and adapted to support a flask in alinement with said crucible, said chuck comprising a relatively fixed member having a plurality of curved slots therein, and a pin projecting through each slot and co-acting to support a flask therebetween, and means for simultaneously operating said pins to grip a flask.

11. A centrifugal casting machine comprising in combination, an upright drive shaft, an arm mounted thereon and adapted for rotation in substantially a horizontal plane, a bracket slidably mounted upon said arm and adapted to support a crucible in spaced relation thereto, a chuck terminally mounted upon said arm and adapted to support a flask substantially in axial alinement with the crucible supported in said bracket, said chuck comprising a plate secured to said arm, a second plate mounted upon and spaced from said fixed plate and adapted for relative rotation with respect thereto, a plurality of links pivotally mounted upon said movable plate and each having a pin mounted at the swinging end thereof, a plurality of curved slots in said fixed plate, each adapted to receive one of said pins, and the projecting ends of said pins cooperating to support a flask therebetween, the curvature of said slots being such as to cause said pins to move outwardly, when said movable plate is rotated in one direction, and causing said pins to move inwardly, when said movable plate is rotated in the opposite direction, whereby the chuck may support flasks of different diameters, and means for locking said movable plate member and pins in adjusted positions.

In witness whereof, I have hereunto set my hand this 13th day of November, 1928.

LAURITZ B. ANDRESEN.

In witness whereof, I have hereunto set my hand this 21st day of November, 1928.

CLIFFORD W. PAULSON.