June 22 , 1926. 1,589,967

I. B. HOROWITZ

DENTAL CASTING DEVICE

Original Filed April 24, 1920 2 Sheets-Sheet 1

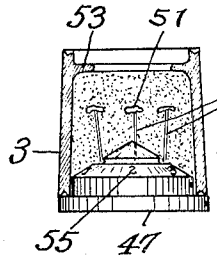


Fig.2.

Fig.3.

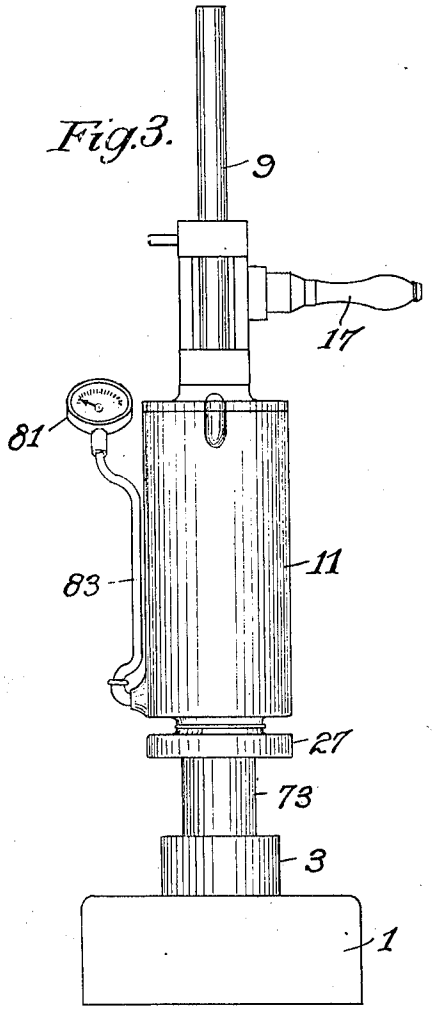
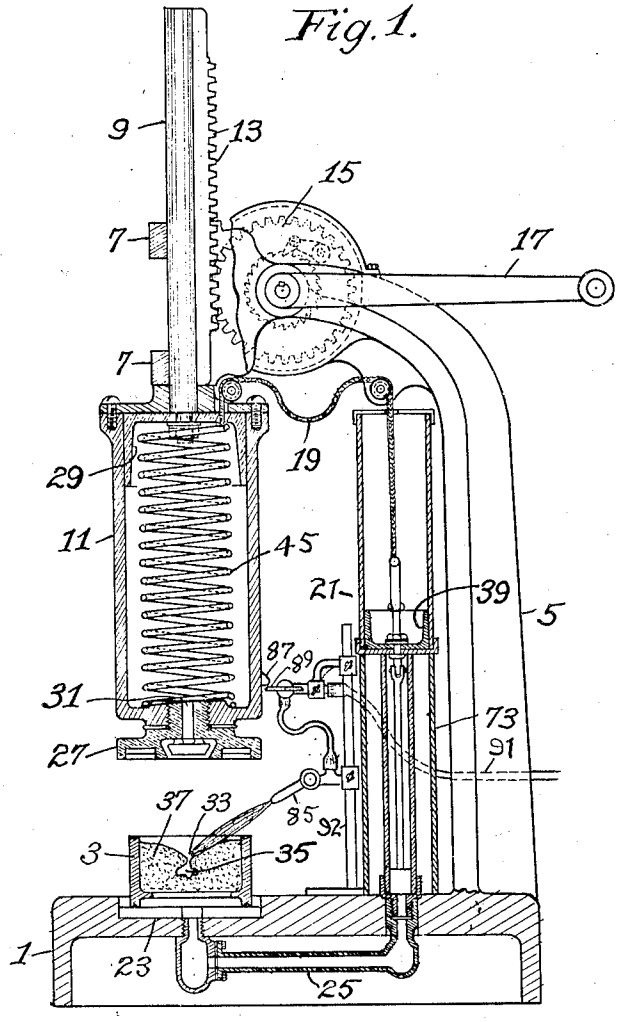


Fig.1.



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Fig. 4.

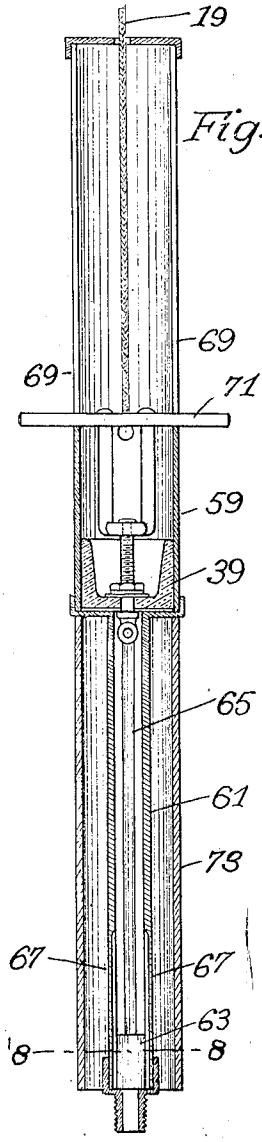


Fig. 5.

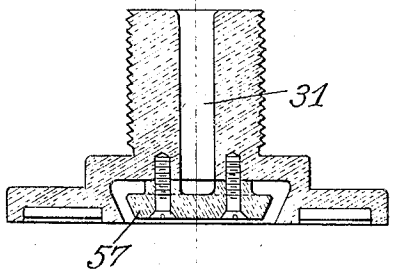


Fig. 6.

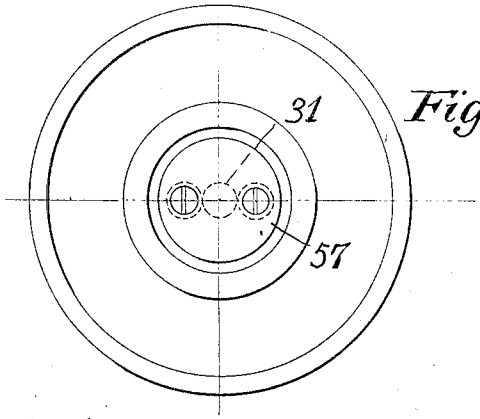


Fig. 7.

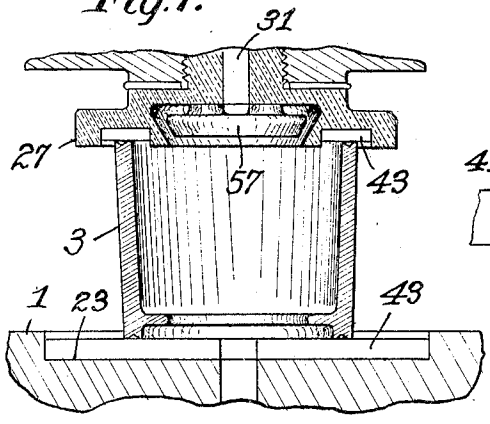


Fig. 11.

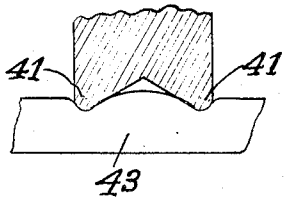


Fig. 8.

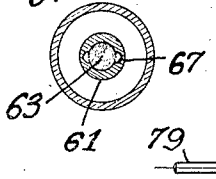


Fig. 10.

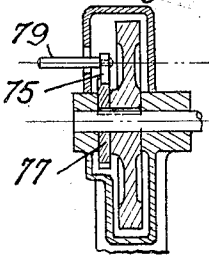
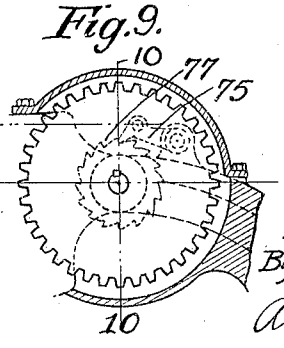


Fig. 9.



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UNITED STATES PATENT OFFICE.

ISAAC B. HOROWITZ, OF NEW YORK, N. Y.

DENTAL CASTING DEVICE.

Application filed April 24, 1920, Serial No. 376,201. Renewed September 24, 1925.

This invention relates to dental casting devices of the type in which molten metal is forced into the mold through a small sprue opening.

A well recognized method of producing inlay and other castings for use more particularly in dental and jewelers' work is by forming a mold cavity in a suitable cementitious plastic or investment material from a pattern formed of wax which is volatilized and driven off by heat when it has served its purpose. It is the practice to form the mold cavity in a completely enclosed relation as possible within the investment material, leaving only a very small opening or passage leading to the mold cavity. Ordinarily, the outer end of the passage terminates in a depression in the surface of the mold material, which is made to serve as a crucible in which the gold or other metal is melted preliminary to the casting operation.

In order to force the melted gold through the restricted passage leading from the crucible-forming depression to the mold cavity, pneumatic pressure is applied to the adjacent open end of the container or flask for the mold material, either by applying to the open end of the mold container a previously compressed gas, such as air or nitrous oxide, from a tank, or by connecting the open end of the mold container to an air compressor and operating the compressor to gradually force the gold into the mold cavity.

The first of these methods referred to is open to the objection that the sudden access of relatively high pressure from the gas storage vessel tends to drive the molten gold into the mold cavity so rapidly that the air in the cavity does not have time to wholly escape but frequently portions of the volume of air remain and cause annoyance by producing porous and imperfect castings. The second method produces a gradual accumulation of pressure which is quickly distributed through the porous investment material, forming a cushioning mass of air pressing on the molten metal from beneath and every side and resisting the filling of the cavity so that, again, perfect results have been difficult to secure.

The object of the present invention is to provide a casting device of the general nature indicated in which the objections referred to are overcome.

I have discovered that I can attain the desired results by the use of a combined pressure applying and pressure exhausting means so arranged that when pneumatic pressure is applied above the molten gold in the crucible, an exhausting or sucking action is applied at the lower end of the mold container, so that the formation of an air cushion in the container that will interfere with the filling of the mold cavity with metal is not possible.

Other features of the invention will be hereafter referred to.

In the drawing, in which a preferred embodiment of the invention is selected for illustration—

Fig. 1 is a vertical section of a casting device embodying the invention.

Fig. 2 is a detail view showing in section a mold used in the device and the manner in which the patterns are used.

Fig. 3 is a front elevation of the device shown in Fig. 1.

Fig. 4 is an enlarged detail view of an exhaust pump forming part of the device.

Fig. 5 is an enlarged detail view in section of a sealing member carried by the air pressure pump, shown in Fig. 1.

Fig. 6 is a view of the device shown in Fig. 5 from beneath.

Fig. 7 is an enlarged detail view in section of the flask and adjacent parts.

Fig. 8 is a horizontal section taken on the line 8—8 of Fig. 4.

Fig. 9 is a view, partly broken away, of a driving gear and holding pawl therefor.

Fig. 10 is a vertical section of the device shown in Fig. 9 taken on the line 10—10.

Fig. 11 is an enlarged detail view showing the sealing connection between the flask and contiguous parts.

Referring to the drawings, there is shown in Fig. 1 of the drawing a casting device embodying the invention in which a base member 1 is arranged to support a mold container or flask 3. A supporting bracket or frame member 5 rising from the base member 1 is provided with a pair of guide members 7 through which the stem 9 of a pressure pump cylinder 11 is arranged to reciprocate with relation to the flask 3 beneath. The stem 9 is provided with rack teeth 13 which mesh with the teeth of an operating gear 15 journaled in the frame piece 5, the gear being rotated by means of the hand crank 17 to raise or lower the pump cylinder 11 and operate the same. An operating connection taking the form of a flexible chain

19 or equivalent member connects a moving part of the pump 11 with a corresponding part of an air exhausting pump 21 mounted on the base 1 and connected with a port in the seat 23 for the flask 3 by means of the conduit 25.

In operation, the pump cylinder 11 is lowered to bring the member 27 into sealing engagement with the upper open end of the flask 3 by operation of the handle 17. Continued rotation of the handle 17 after contact of the member 27 is made with the flask 3 causes the piston 29 to move downwardly within the cylinder 11 and thereby compress and force air through the passage 31 into the upper part of the flask to thereby force the molten gold in the flask through the sprue opening 33 into the mold cavity 35 formed in the investment material 37 contained in the flask. Simultaneously with the downward movement of the air compressing piston 29, the piston 39 of the exhaust pump 21 is raised through the operating connection 19, so that, at the same time that pressure is applied to the upper part of the flask 3, an exhausting effect is produced in the lower end of the flask to thereby insure the complete filling of the mold cavity 35 with metal free from air bubbles.

In addition to the combined pressure applying and pressure exhasting means referred to and which form the most important feature of the invention, I have also succeeded in producing an exceedingly effective sealing means whereby the pneumatic devices are operated at their full efficiency and without leakage of air either into or out of the flask during operation. Referring to Figs. 7 and 11 of the drawing, it will be noted that the upper and lower edges of the flask 3 are formed with double flanges 41 which indent the surface of a heat-proof composition 43, as indicated in Fig. 11, and thus form a double seal which is exceedingly effective for the purpose. The heat-proof composition or packing 43 is formed in annular areas on the seat 23 and the sealing member 27, as will be clear, and is preferably formed of asbestos fabric rendered non-porous by filling with a non-combustible medium. Included in the sealing means is a compression spring 45 mounted between the piston 29 and the lower end of the cylinder 11. It will be seen that with the continued movement downward of the piston 29 after contact of the sealing member 27 with the flask 3 has been made, will make an increasingly effective sealing connection as the spring is progressively compressed.

Another feature of the invention resides in providing means for forming a plurality of mold cavities in the mold material and for identifying the castings when formed. In Fig. 2 of the drawing is shown the flask 3 mounted in inverted position on a sprue-former holding member 47. The member 47 is provided with a plurality of seat openings or a circular groove filled with wax in which the sprue formers 49 carrying the wax patterns 51 may be mounted. The plaster forming the investment material 37 is then poured in place to surround the patterns 51 and sprue-formers 49, an inwardly directed flange 53 formed in the flask serving to hold the investment material in place when the flask is mounted on the seat 23 of the machine. When the investment material has been allowed to dry and harden to a suitable extent, the member 47 and the sprue-forming members are withdrawn from the material, leaving the sprue openings or channels 33 leading from the patterns 51 to the outer surface of the investment material. The mass is then subjected to the action of heat to volatilize the wax comprising the patterns and drive it off through the sprue openings, thus making ready for the next step in the operation, which consists in melting a mass of material in the crucible or depression formed by the member 47. In order to identify the castings eventually formed, the member 47 is provided with numbers or other characters 55 stamped in the member adjacent the sprue-former seats. These characters, as will be clear, are reproduced on the button or disk of metal continuous with the small necks of metal filling the sprue openings. It will be seen that the numbers are thus connected with the respective castings when the investment material is broken away and the castings removed.

Another feature of the invention resides in the provision of a baffle plate 57 mounted in the sealing member 27 and having a bevel extending inwardly and downwardly to cause the air delivered into the flask 3 from the passage to be applied to the molten gold in the form of an annular converging stream or current which effectively acts to drive the metal through the sprue openings 33 into the cavity 35.

Attention is directed to the details of the exhausting pump illustrated in Figs. 4 and 8. It will be seen that the piston 39 already referred to reciprocates in the cylinder 59 and draws air through a passage formed by the tube 61 from the conduit 25. In order to cut off the exhaustion of air at a desired point in the operation the valve member 63 is provided, which is connected to the piston 39 by means of the rod 65 and which rises above the grooves 67 through which air is driven around the valve, in the uppermost position of the piston 39, thus shutting off access of air to the cylinder 59 from the conduit 25. In order to allow air to enter beneath the piston 39 and per-

mit its further upward movement slots 69 are provided in the upper part of the cylinder 59, through which air may enter. The slots 69 also provide guideways for a handle member 71 which may be manually operated to return the piston 39 to its lower position, following an operation of the machine. The cylinder 59 is preferably supported on a cylindrical frame member 73 mounted on the base member 1.

In order to hold the pressure piston 29 in its lowered operative position, a locking pawl 75 is provided which is arranged to cooperate with the teeth of a ratchet 77 to hold the parts locked in operative position. A handle member 79 carried by the pawl 75 provides for releasing the pawl when desired.

In Fig. 3 of the drawing is shown a pressure gauge 81 which may have a connection through the pipe 83 with the interior of the lower part of the cylinder 11 to indicate the pressure therein and guide the operator in his work.

In Fig. 1 there is also shown means for automatically rendering the blow pipe device 85 inoperative when the apparatus is operated to force the casting metal into the mold cavity 35. This means takes the form of a lug 87 formed on the cylinder 11 for operative engagement with a valve operating member 89, which is engaged by the lug in the downward movement of the cylinder. The resulting closing of a valve in the gas supply pipe 91 of the blow pipe device automatically stops the operation of the blow pipe as the cylinder 11 descends to operative position. It will be seen that the blow pipe device is adjustably mounted on the standard 92 so that it can be swung or moved to any desired position to accommodate mold flasks of different sizes.

What I claim is:—

1. In a casting apparatus, a mold member having a mold cavity therein opening to a surface of said member, and manually operable pump mechanism arranged to be moved into engagement with the mold member for applying pressure to the outer open end of said cavity and manually operable pump mechanism for exhausting pressure from the inner end of said cavity to thereby force material into said cavity.

2. In a casting apparatus, a porous mold member having a mold cavity therein opening to one surface of said member, a manually operable pump arranged to be moved into engagement with the mold member for gradually applying pressure to the surface of said member containing said opening and a manually operable pump for exhausting pressure from an opposite surface to thereby force material into said mold cavity

3. In a casting apparatus, a porous mold member having a mold cavity therein opening to a surface of said member, a pump arranged to be moved into engagement with the mold member for applying pneumatic pressure to the surface of said member containing said opening, and a pump having an operative connection with said pressure applying pump for exhausting pressure from an opposite surface of said member.

4. In a casting apparatus, a base member, a standard mounted on said base, a flask member arranged to rest on said base and having an open upper end, an air pump reciprocably mounted on said standard for movement toward and from the open end of said flask member, and means including a rack and pinion for operating said pump to produce pressure and to move said pump into engagement with the flask member.

5. In a casting apparatus, a base member, a standard mounted on said base, a flask arranged to rest on said base and having an open upper end, a pump piston reciprocably mounted on said standard for movement toward and from said flask member, means including a rack and pinion for operating said piston, a cylinder carried by said piston, a sealing member carried by the lower end of said cylinder for engagement with the open end of said flask, and a compression spring in said cylinder between said piston and the lower end of said cylinder, whereby when the piston is moved downwardly in said cylinder following the engagement of said sealing member with the flask the spring will be gradually compressed to gradually increase the effectiveness of the sealing connection.

6. In a casting apparatus, a base member, a standard mounted on said base, a flask arranged to rest on said base and open at its upper and its lower end, a pressure pump piston reciprocably mounted on said standard for movement toward and from said flask member, means including a rack and pinion actuated by a hand crank for operating said piston, a cylinder carried by said piston. a compression spring in said cylinder between said piston and the lower end of said cylinder, an exhaust pump mounted on said base and connected with the lower open end of said flask, an operative connection between the exhaust pump and the pressure pump, and means for automatically holding the apparatus in operative condition.

7. In a casting apparatus, a base member, a standard mounted on said base, a flask member arranged to rest on said base and having an open upper end, a pneumatic pressure producing device reciprocably mounted on said standard for movement toward and from the open end of said flask member, said pressure producing means being operable to gradually increase the pressure at the open end of the flask.

8. In a casting apparatus, a base member,

a standard mounted on said base, a flask member arranged to rest on said base and having open upper and lower ends, said flask having an inwardly directed mold material support spaced from the lower end, a manually operable pneumatic pressure producing device reciprocably mounted on said standard for movement toward and from the open end of said flask member, and heat-resistant relatively yieldable sealing material carried by said pressure producing device and said base member for engagement by said flask member, said flask member having grooved upper and lower edges for sealing engagement yith said sealing material.

9. In a casting apparatus, a sprue former support having an identifying character formed adjacent each sprue former, whereby each character will be reproduced in casting material connected with each casting to thereby facilitate identification of the castings.

Signed at New York, in the county of and State of New York, this 9th day of April, 1920.

ISAAC B. HOROWITZ.