J. R. CRUICKSHANK.

PROCESS OF CASTING DENTAL PLATES.

APPLICATION FILED SEPT. 10, 1912. RENEWED FEB. 11, 1915.

1,150,102.

Patented Aug. 17, 1915.

2 SHEETS—SHEET 1.

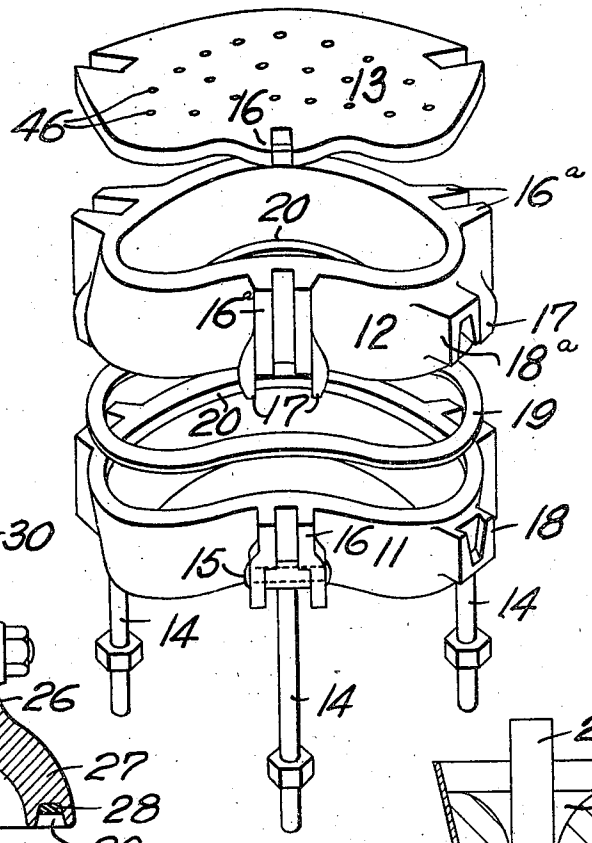

FIG. 1.

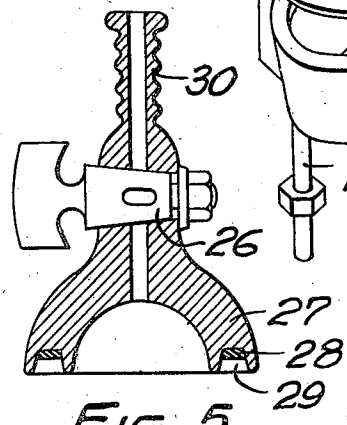

FIG. 5.

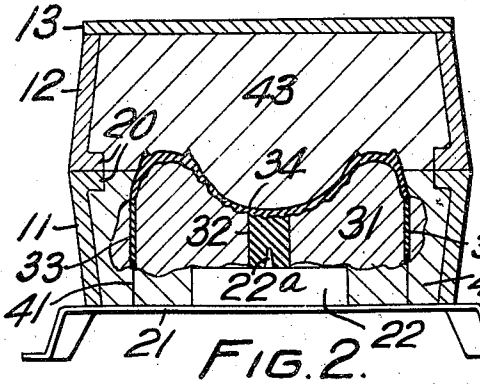

FIG. 2.

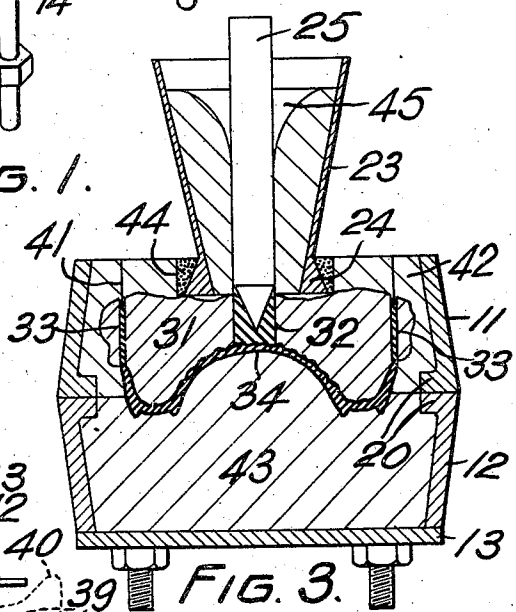

FIG. 3.

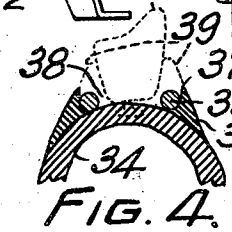

FIG. 4.

Witnesses

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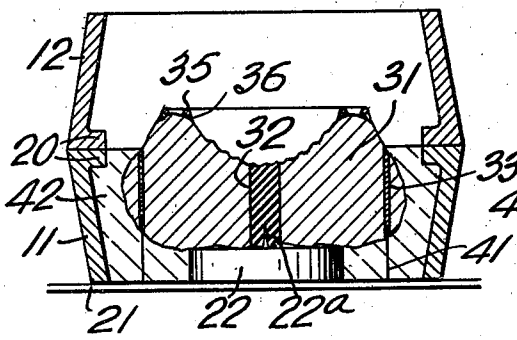

FIG. 6.

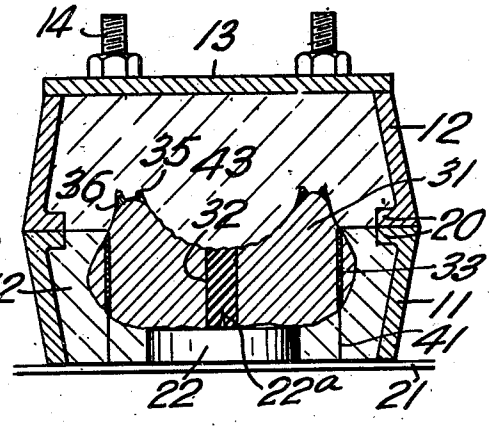

FIG. 7.

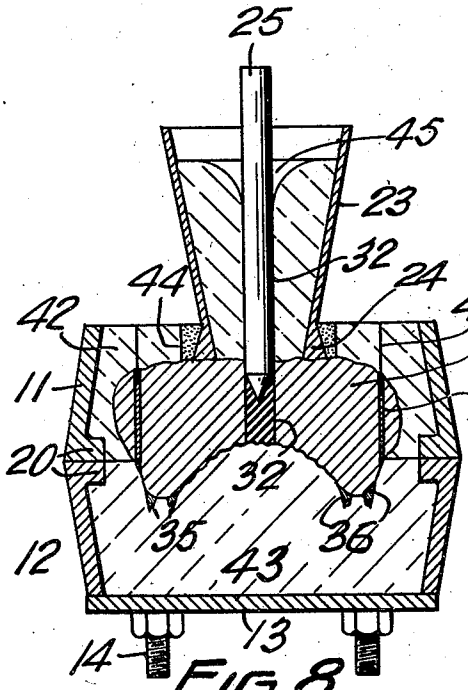

FIG. 8.

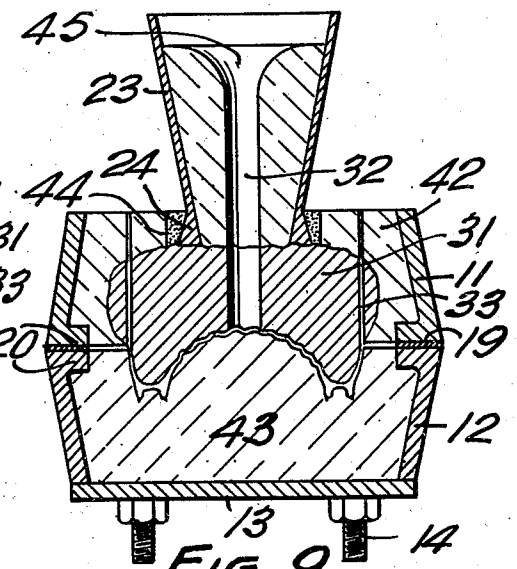

FIG. 9.

Witnesses

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UNITED STATES PATENT OFFICE.

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PROCESS OF CASTING DENTAL PLATES.

1,150,102. Specification of Letters Patent. Patented Aug. 17, 1915.

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To all whom it may concern:

Be it known that I, JAMES R. CRUICKSHANK, of the city of Calgary, in the Province of Alberta and Dominion of Canada, have invented new and useful Improvements in Processes of Casting Dental Plates, of which the following is a full, clear, and exact description.

This invention relates to improvements in the process of casting dental plates, bridges and other articles, and the main object is to provide a simple and easy method of molding and of casting plates by fluid pressure.

A further object is to provide means of casting plates whereby the rugæ or natural corrugations in the mouth are exactly duplicated on the concave surface of the plate.

A still further object is to provide a process of casting dental plates whereby the thickness of the plate may be made absolutely uniform and gaged with great exactness.

In the drawings which illustrate the application of this process:—Figure 1 is a perspective view showing the several parts of the flask in which the plates are cast. Fig. 2 is a sectional view illustrating certain preliminary steps of the molding operation. Fig. 3 is a similar view indicating the final steps of the molding operation. Fig. 4 is an enlarged fragmentary sectional view showing a detail of the molding operation. Fig. 5 is a sectional view of the fluid nozzle. Fig. 6 is a sectional view showing the first step of making a mold for the washer process of casting. Fig. 7 is a similar view showing the mold proper completed, but not dried out. Fig. 8 is a similar view showing the pouring spout attached to the mold. Fig. 9 is a further similar view showing the mold baked with the wax and wire 35 removed, and the two halves spaced apart ready for pouring.

Referring more particularly to the drawings, 11 designates the cope, 12 the drag, and 13 the cover of a flask of substantially the same shape as is usually employed for casting or for vulcanizing dental plates. The drag 12, contrary to the usual dental practice, is open bottomed, the cover 13 forming the bottom when in place. The cope 11 is preferably not provided with any cover plate, although one may be used if desired. The cope is provided with a plurality of bolts 14 hinged thereto by pins 15 passing through the bolt heads. These bolts are adapted to be swung upwardly between the lugs 16 and 16ª on the cope and drag respectively to clamp the same together. The drag may be provided with pins 17 arranged in pairs and positioned to embrace the outer sides of the lugs 16 of the cope in order to hold the parts in proper alinement. The cope and drag are provided with a recess 18 and 18ª respectively for the insertion of a handle similar to a stove lid lifter, so that the flask may be conveniently lifted when hot. The flask is also provided with a washer 19 adapted to be inserted between the cope and drag in order to space the same apart. The cope and drag are both tapered slightly away from their abutting faces, as shown in Figs. 2 and 3, for the purpose of holding the molding material in place, in order to prevent escape of the mold when the flask is opened. The abutting faces of the two parts are each provided with an internal flange 20.

The remaining apparatus comprises a tray 21, a small disk 22 of suitable size to make a print in the mold for the insertion of the spout 23, which is provided at its lower end with an external flange 24 arranged to be inserted in the print formed by the disk 22. A rod 25 is provided for molding the runner. A fluid pressure valve 26 having a flaring nozzle 27 adapted to be applied to the upper end of the spout 23 is provided with a suitable gasket 28, located in the groove 29 on the lower edge of the nozzle. The valve is pressed down over the spout and the gasket forms a fluid tight joint. Fluid pressure is transmitted from a suitable source of generation or storage through a flexible pipe, which may be forced over the corrugated shank 30 of the valve.

In the process of casting the plates, a plaster impression of the mouth is first taken in the usual manner and painted with suitable parting material. This impression is then run or filled with investment material, and when the material is hardened the impression is cut out, thus leaving an exact reproduction of the roof of the mouth, which reproduction forms the mold 31 from which the plate is to be cast. A runner 32 is formed through the center of this mold to allow the introduction of molten metal, and air vents 33 are formed at the highest points around the periphery of the mold, the runner and vents being then filled with wax.

In the ordinary method of casting plates, a sheet of wax, designated 34, is now adapted to the surface of the mold, the thickness of the wax representing the thickness of the plate to be cast. A copper wire designated 35 is now applied to the wax sheet 34 and run all around where the bases of the teeth will come. The cracks between the wire and wax sheet 34 are filled up with wax, designated 36, and ridges 37 built up to form a groove 38 for the reception of the teeth bases. The ridges 37 serve the very important purpose of preventing the vulcanite or other material used to reproduce the gums from coming to a knife edge, which edge would be very difficult to finish and which would be constantly breaking away and irritating the mouth. This gum material is designated in dotted lines at 39, Fig. 4, and a tooth in place is shown at 40. If the teeth are to be cast directly into the plate, they are mounted in the wax and the filling 39 inserted with wax. The disk 22 is now applied to the back of the mass of investment material forming the mold, and is held in place by its center pin 22^a being pressed into the wax in the runner 32. Small wires 41 are embedded in the wax in the vents 33, the free ends of the wires being made flush with the outer surface of the disk 22. The cope is inverted on the tray 21, and the mold placed in inverted position within the cope, the disk 22 resting on the tray. The cope is now run until level full with investment material, designated 42, and is allowed to harden. The tray 21 allows the apparatus to be picked up and gently shaken or knocked on some stationary object, in order to work out any air bubbles which may be imprisoned in the investment material. When hard, the surface of the mold is painted with parting material, and the drag placed in inverted position and filled with investment material, designated 43, and covered, the shaking being repeated as previously described. The steps thus far described are illustrated in Fig. 2.

When the completed mold thus made has hardened, it is turned upside down into its normal position, as shown in Fig. 3, and the disk 22 and wires 41 removed. The removal of the disk leaves a recess 44 in the upper surface of the mold in which the flange 24 of the spout 23 may be inserted. This recess is now filled with investment material so that the spout is firmly held in place. A rod 25 is next passed through the center of the spout, and its lower end which is preferably pointed embedded in the wax in the runner 32. The spout is poured nearly full of investment material, and when hard the rod 25 is removed, thus forming a continuation of the runner 32. The mouth of this runner is enlarged as shown at 45 by scraping, and the clamp bolts 14 tightened up to finally close the mold. The mold thus completed is placed on the tray 21 or other suitable tray above which it is supported by the projecting ends of the bolts, and is covered with a crucible or other suitable apparatus and placed over a frame to dry out. It will of course be understood that the tray may be dispensed with, and the mold placed in a suitable baking oven. This baking not only dries and hardens the mold, but raises it to practically the same temperature as the molten metal, so that the metal will not chill on entering the mold and produce a rough casting. This baking process further melts fragments of the wax, which could not be otherwise removed, and the same is allowed to burn away, so that the interior of the mold is emptied for the reception of the metal.

When thoroughly dry and hot, the mold is removed and the metal poured into the runner 32. The nozzle 27 of the fluid pressure valve is then pressed firmly over the mouth of the spout, the gasket 28 making a gas tight joint. The valve 26 is opened to admit fluid pressure above the metal, which forces the metal completely through the mold until the metal shows at the top of the vents, when the valve is closed and the cast allowed to cool. When cold, the mold is opened and the metal in the runner and vents cut off. The application of air pressure to the metal forces the same into the minutest crevices of the mold, so that a very clear, sharp casting is obtained.

When it is desired to cast a plate having on its concave surface a duplication of all the rugæ or natural corrugations of the roof of the mouth, the mold 31 is not covered with the wax sheet 34. The copper wire 35 may, however, be applied directly to the mold and the crevices filled with wax, as previously described. The drag is placed on the cope and poured with investment material, so that one half of the mold is made directly from the other half, there being no space between the two halves. It will thus be seen that the mold in the drag, in which the concave side of the plate is molded is an exact duplicate of the plaster impression as taken from the mouth, and bears all the rugæ. The two halves of the flask are separated and the washer 19 inserted between them. The wire and wax may now be removed so that the completed plate will not contain useless grooves where it contacts with the gums, and will also be strengthened by the additional thickness of metal at this part. This washer may be of any suitable thickness, preferably as thin as possible, since the thickness of the washer determines the thickness of the plate which will be cast, for the reason that it blocks the two halves of the mold its own thickness apart. Washers of various thicknesses will

be supplied with each flask in order that plates of different thicknesses may be made to meet different requirements. The mold is closed, dried and poured with metal as already described, and when opened the cast will be found corrugated on its concave surface to reproduce the natural lines in the roof of the mouth. This latter feature of the invention is of great importance, and is a great advantage in the art of casting dental plates. Heretofore, users of these plates experienced great difficulty in properly masticating their food, for the reason that the tongue could not properly guide the food between the teeth without the cooperation of the rugæ, which were not reproduced on the plate, so that the food slipped around the smooth surface and was only managed with great difficulty. Furthermore the smooth surface of the plate produced a strange and unnatural feeling in the mouth, which was decidedly disagreeable, and to which persons became accustomed only after considerable periods of time. In the present process the lines of the mouth are accurately duplicated, and by the use of metal, a plate may be cast so thin that its presence in the mouth will not be noticed after an hour or so. It will be further noted that this process is no more complicated than the ordinary processes, and is in fact considerably simplified by the elimination of the wax plate 34, which required considerable skill to adapt it to the mold. It will be seen that the process of making the mold and using the flask, as previously described, is applicable to both the wax plate and the washer system of determining the thickness of the casting, the wax plate method being the present recognized method while the use of the washer is the novel means of determining the thickness.

In order to facilitate the drying out operation, the cover 13 may be perforate, so that the moisture will be readily given off. This result may be obtained by providing the plate with a plurality of apertures 46.

While I have described this process as applied only to the casting of dental plates, I do not wish to limit the invention to this class of work, as it may at times be applied with advantage to the general art of casting in metal, and particularly to the casting of thin metal plates for ornamental work and the like where uniform thickness is desired.

Having thus described my invention, what I claim is:—

1. A process of casting dental plates, which consists in making a model of the mouth, forming a pouring runner and air vents through the model, investing the model in the inverted cope of a flask, casting a mold from said model in the inverted drag of the flask, tightening the flask, investing a pouring spout containing a continuation of the pouring runner in the investment in the cope and spacing the mold from the model to form a matrix.

2. A process of casting dental plates, which consists in making a model of the mouth, applying a band of ductile metal around the base of the teeth seat, building up a tooth retaining ridge of wax around said metal band, casting a mold above the model and spacing said mold from said model to form a matrix.

3. A process of casting dental plates, which consists in making a model of the mouth, forming a runner and air vents through said model, investing the model in the inverted cope of a flask, forming a recess and continuation of the air vents in the investment, embedding a pouring spout in said recess, and forming a continuation of the runner through said pouring spout.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

JAMES ROBERT CRUICKSHANK.

Witnesses:
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G. M. MORELAND.