No. 633,222. Patented Sept. 19, 1899.

W. STREETMAN.

METHOD OF AND APPARATUS FOR CASTING DENTAL ALUMINIUM PLATES.

(Application filed Dec. 22, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

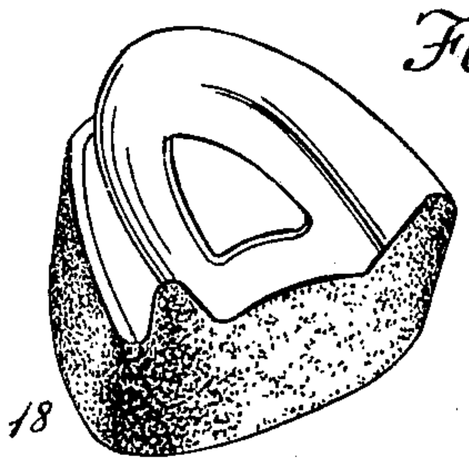


Fig. 2.

Fig. 3.

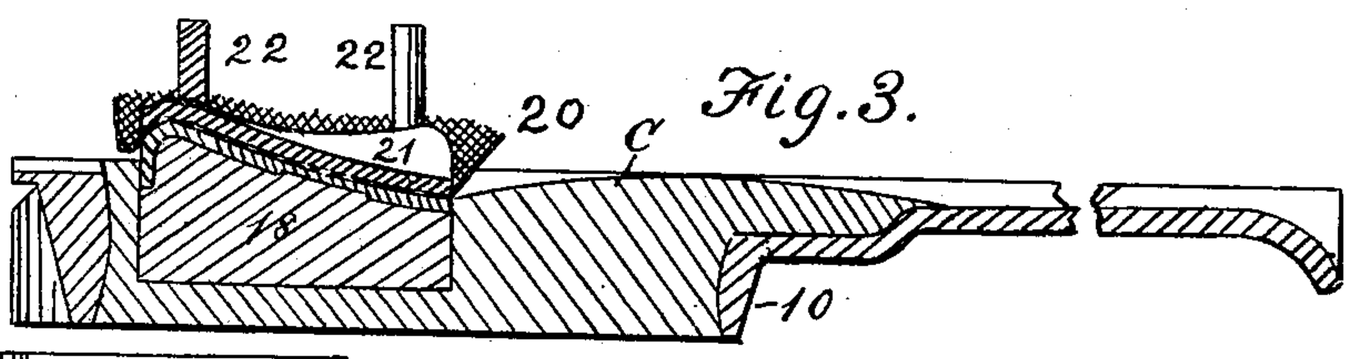


Fig. 4.

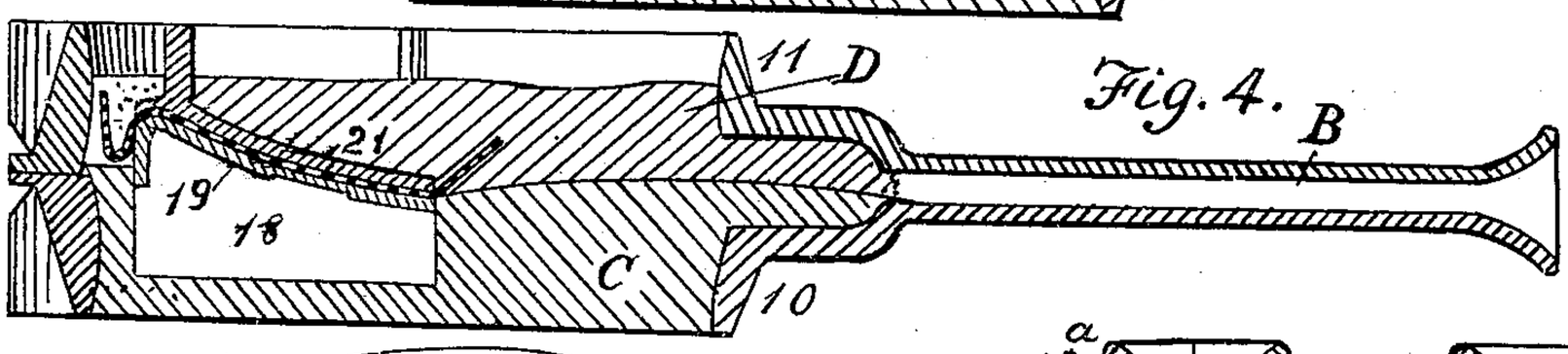


Fig. 5.

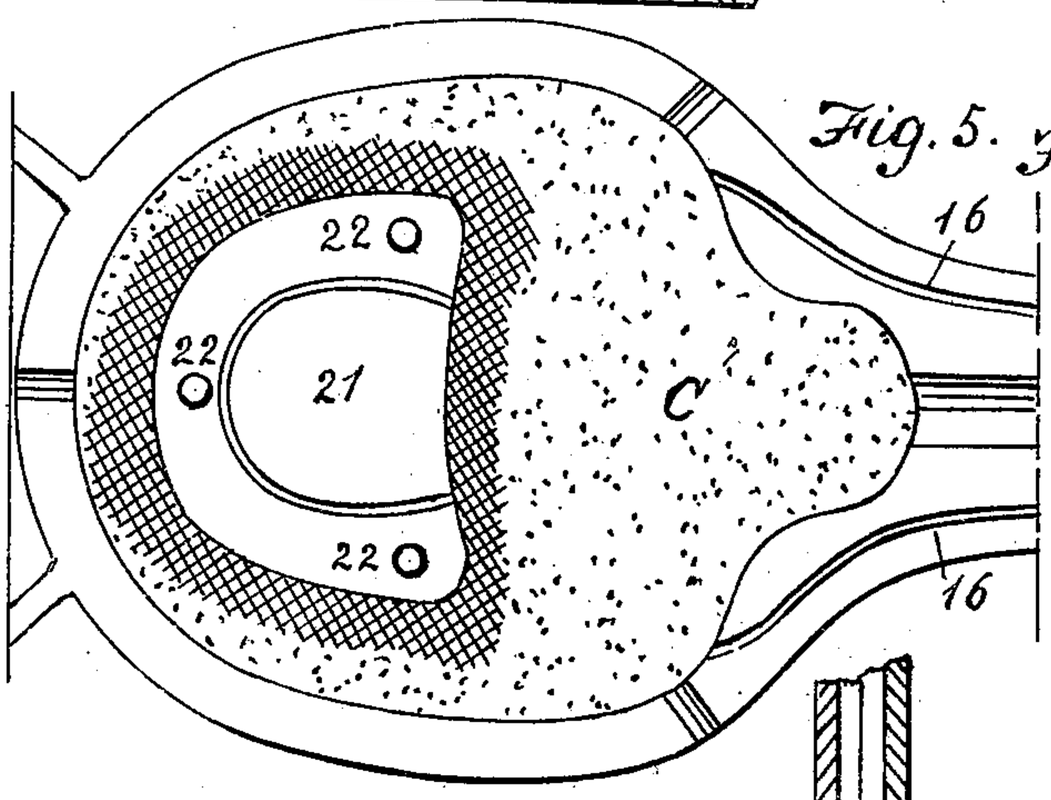


Fig. 6.

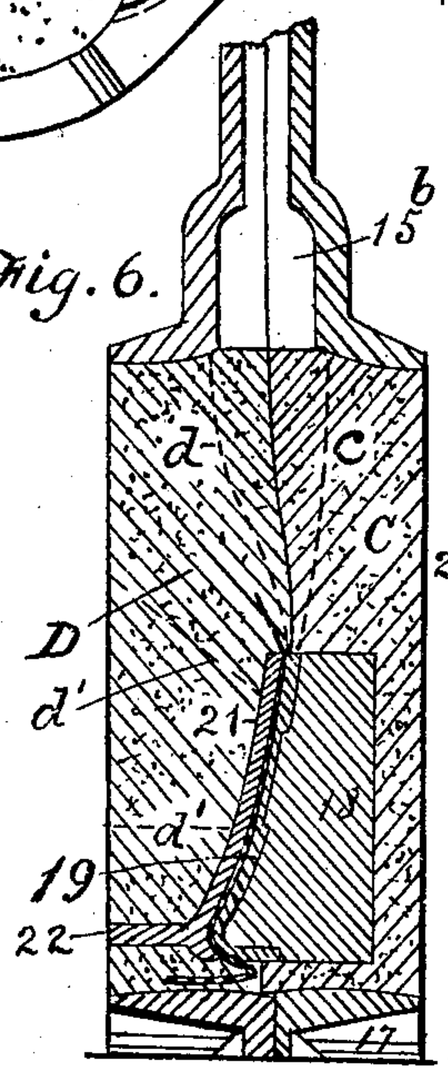


Fig. 7.

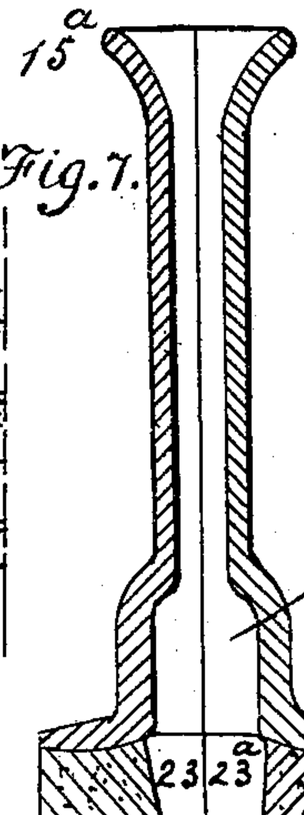
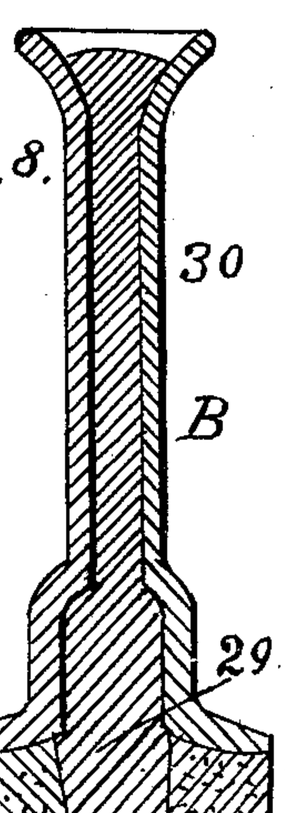


Fig. 8.



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METHOD OF AND APPARATUS FOR CASTING DENTAL ALUMINIUM PLATES.

(Application filed Dec. 22, 1898.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 9.

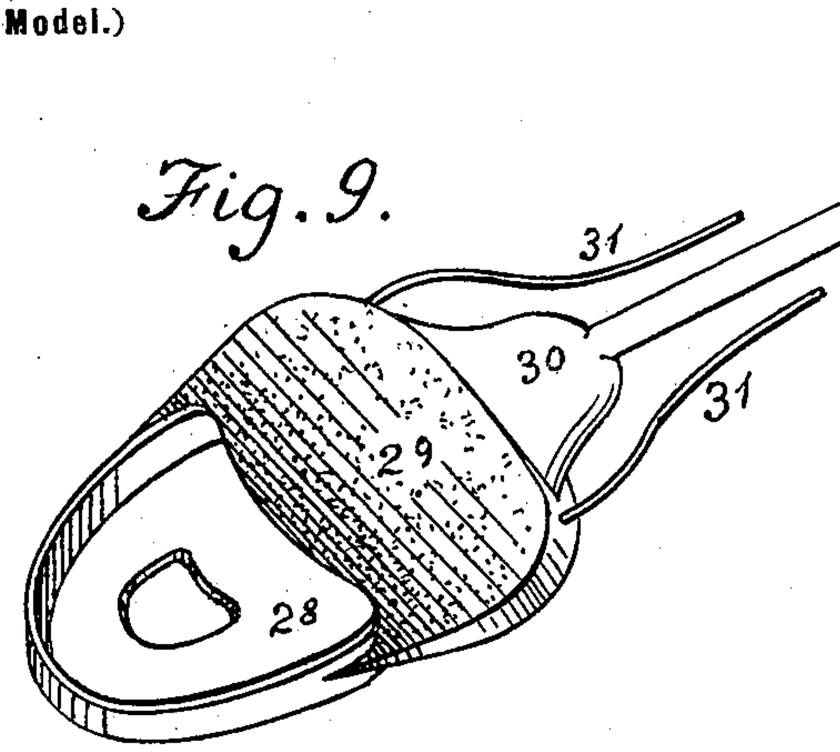


Fig. 12.

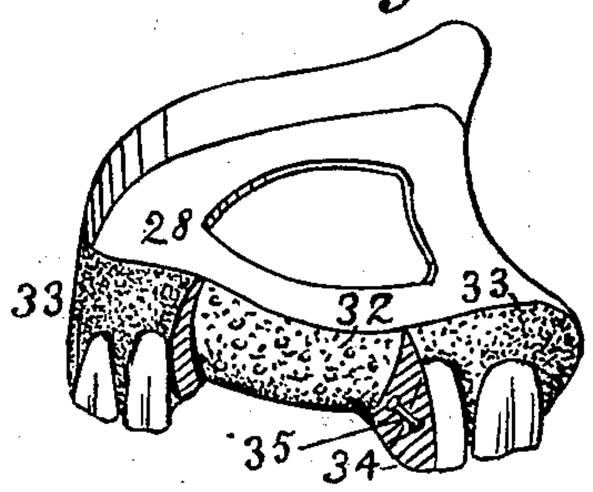


Fig. 10.

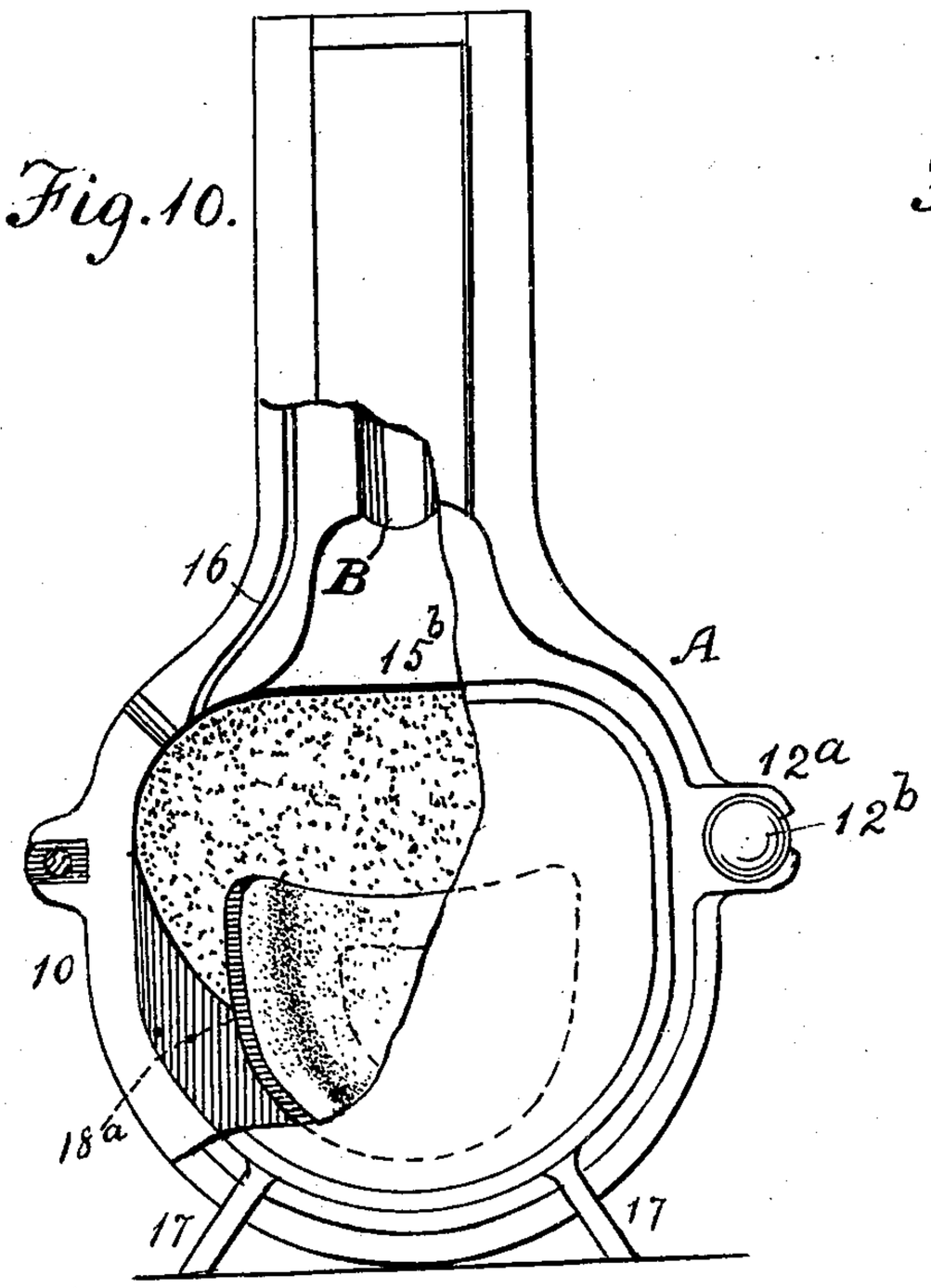
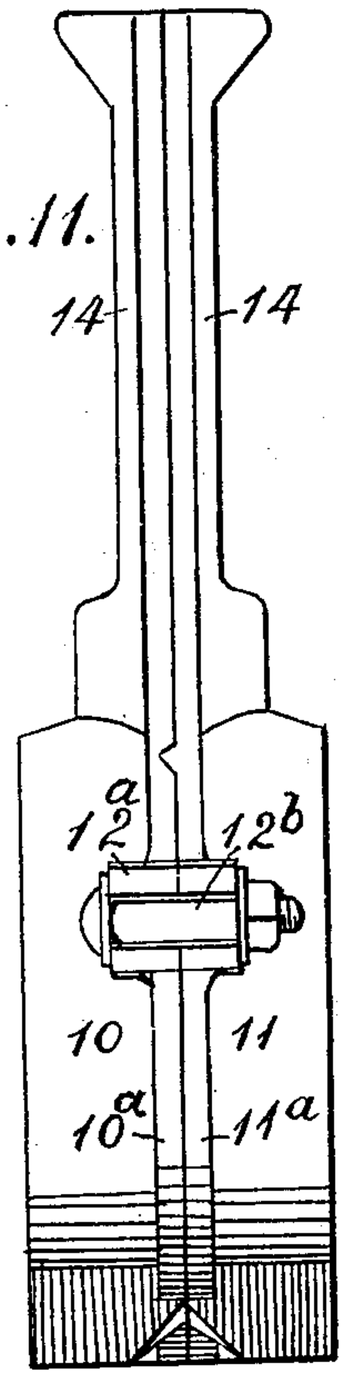


Fig. 11.



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UNITED STATES PATENT OFFICE.

WILLARD STREETMAN, OF CLEBURNE, TEXAS.

METHOD OF AND APPARATUS FOR CASTING DENTAL ALUMINIUM PLATES.

SPECIFICATION forming part of Letters Patent No. 633,222, dated September 19, 1899.

Application filed December 22, 1898. Serial No. 699,979. (No model.)

To all whom it may concern:

Be it known that I, WILLARD STREETMAN, of Cleburne, in the county of Johnson and State of Texas, have invented a new and Improved Method of and Apparatus for Casting Dental Aluminium Plates, of which the following is a full, clear, and exact description.

The object of my invention is to provide a method of casting aluminium dental plates that will provide a perfect product and a plate of superior quality with an expenditure of less time and labor than is possible under the usual methods, at the same time securing a better fit in the mouth.

Another object of the improved method is to provide a means for overcoming all difficulties now present in the casting of plates of aluminium or its alloy and to so simplify such method or process that it can be generally employed.

A further object of the invention is to provide an apparatus that will be simple, durable, and economic and that will insure the casting of a perfect plate of pure aluminium—namely, a plate without alloy—and wherein the method and apparatus will embody all the advantages of previous methods and devices without their defects.

The invention consists in the novel construction and combination of the several parts, as will be hereinafter fully set forth, and pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a perspective view of a model to be employed. Fig. 2 is a longitudinal section through one member of a flask, showing a model held in the investment thereof and the upper face of the model provided with a wax covering. Fig. 3 is a view similar to Fig. 2, in which a second wax covering is located above that which is on the model, the two wax coverings being provided with an intervening gauze and the upper wax covering with a stem extending upwardly therefrom. Fig. 4 is a longitudinal vertical section through the complete flask, showing the investments in both. Fig. 5 is a plan view of the member of the flask shown in Fig. 3. Fig. 6 is a longitudinal vertical section of the flask completed, as shown in Fig. 4, and set up prior to pouring, illustrating in dotted lines the margins of the body-gates to be provided for the flasks and formed in the investments thereof. Fig. 7 is a view similar to Fig. 6, showing the body-gates in the investment of one of the members of the flask, the wax material employed in the formation of the mold having been melted out. Fig. 8 is a view similar to Fig. 7, illustrating the metal as having been poured into the mold and the plate as formed. Fig. 9 is a perspective view of the cast plate and the attached metal removed from the flask after pouring. Fig. 10 is a side elevation of the complete flask set up for pouring, a portion of one of the members being broken away to show the inner face of the member in which the model is set. Fig. 11 is an edge view of the flask set up; and Fig. 12 is a perspective view of the finished cast plate, parts being in section, illustrating the application of the teeth to the plate.

The difficulties to be overcome in casting aluminium and that prevent it being cast in the ordinary way are, first, it is so light that it will not force the gas and air out of the mold, and consequently the cast pieces are rendered more or less porous; second, the metal when melted lacks fluidity and will not run sharp; third, shrinkage is extreme and destroys the integrity of the plate, and, fourth, contraction is also extreme and destroys the fit of the plate. I seek by my methods to overcome all these difficulties without alloying the metal, although alloys may be cast, as by previous methods.

In carrying out the process an impression is taken in the usual way, and a plaster model is taken therefrom. From the model a matrix is formed in sections, if there are undercuts. A second model, of any material that will endure heat, is formed in the matrix. A base-plate of required thickness is made upon this model, and teeth are set up or are omitted if other attachments are to be used. Invest in the usual way in the same material as the model or any other material, if desired. The model is then placed in a flask, the heel of the model being as far as possible from the neck of the flask. The flask is so constructed as to provide considerable space between the

heel of the model and the neck of the flask in order that the metal, being light, shall spread and shall distribute itself almost simultaneously and evenly to the entire mold. The gate admitting of such distribution of metal is formed in the body of the flask by scraping out or otherwise removing portions of the investment to form a space of such shape that when the molten metal is poured into the flask the metal molded will be thinnest at the heel of the plate and will gradually thicken toward the neck of the flask. The investment is further scraped out or removed at the sides of the heel of the model in order to admit a more ready ingress of metal and egress of air and gases contained in the mold. Means are provided for obtaining an excess of hydrostatic pressure and also a perfect escape for gases and air. The matrix having been formed, the investment is dried out by heat, and the metal to be poured is preferably refined as follows: A quantity of rock-salt (natural sodium chlorid) is placed in a crucible and covered with the aluminium to be refined. Heat is then applied until all the material in the crucible is melted, whereupon saltpeter (potassium nitrate) is added in suitable quantity, piece by piece, the mass being stirred and skimmed until all dross and impurities are removed. The metal is now either poured into other crucibles or molds to form ingots for future pouring or is removed from the furnace to be cooled until it begins to granulate. The metal is then replaced in the furnace, and when the granulations again disappear (determined by stirring with a wire) the metal is at the proper heat for pouring and should be removed from the fire. At this time a small piece of saltpeter is added, and when it is melted the skin is broken by a wire and the metal is poured in a continuous stream into the mold until it is full. Previous to pouring the flask is heated, so that the neck will be the hottest portion and the base the coolest portion to promote the proper cooling of the cast material. After pouring the flask is permitted to thoroughly cool, whereupon the cast plate is removed, all excess and gates are sawed off, and the cast plate is reduced to proper form by filing or grinding and finished on leather buffs and rouge. When the plates are tried in the mouth and are found not to fit properly, they can be swaged on the first model or upon a model poured into the plate as it comes from the flask and shaped, being properly scraped upon the exterior border to correct any defect of contraction which may occur at said point. The swaging or shaping, however, is preferably performed by the process in which the model, with the plate on it, is placed in a cylinder, the cylinder being filled with shot or sand, and a plunger is driven down upon it.

It will be understood that wherever wax is employed to form the mold or to form air or gas vents the wax is melted by placing the flask (the mold having been completed) in a furnace or otherwise subjecting the flask to such a degree of heat as will cause the wax employed to entirely disappear from within the flask.

The preferred form of apparatus employed for carrying out the method above stated is constructed as follows:

The flask A usually consists of two members 10 and 11, and the inner surface of each member of the flask is more or less inclined in order that the investment employed shall be firmly held in position. The member 10 of the flask is provided with a flange 10^a and the member 11 with a corresponding flange 11^a, the two flanges being adapted to engage with each other and have interlocking connection, if desired. These wide flanges serve to render the flask tight when the members are brought together. Any form of locking device may be employed for locking the flask. In the drawings the locking device consists of ears 12^a, formed integrally with the flanges of the members, the ears of the members being arranged to register, and bolts 12^b, provided with suitable nuts, which are passed through the said ears 12^a, as shown particularly in Figs. 10 and 11. Each member of the flask is provided with a neck 14, the necks being likewise flanged and the necks of the two members when the flask is set up being adapted to be brought together. The neck of each member of the flask is provided with an inner longitudinal groove 15, and when the necks of the two members are brought together these grooves form a gate B. The upper end of the neck, and consequently the upper end of the gate B in the neck, is made flaring, and the lower portion 15^b of the said gate B is made quite large and somewhat bell-shaped.

At each side of the gate B of the flask-neck vents 16 are formed, adapted for the outward passage of air and gas, and these vents 16 lead directly to the interior of the flask, as shown particularly in Figs. 5 and 10. Each member of the flask is preferably provided with legs 17 at the bottom portion of its body, so that the flask may be maintained in the upright position during the process of pouring. The mold 18 for the plate to be cast is embedded in the investment C, which is placed, for example, in the member 10 of the flask, as shown in Figs. 2, 3, 4, and 5. The mold is placed as near as possible to the bottom portion of the flask or so that the heel of the cast plate will be as far as possible from the neck of the flask. The object of the additional room at the heel of the model and also of the bell-shaped space 15^b in the neck of the flask and the wide mouth 15^a for said neck is to admit of the proper formation of pouring-gates and the admission of a body of metal sufficient to control the shrinkage in the plate.

The investment employed may be of any desired material that will stand heat and drying. An economic material that has given

satisfaction is an equal mixture of sand and coarse builders' plaster. The investment C is normally made to extend within the lower enlargement 15^b of the gate of the member 10 and is made to fit around the model 18 in such manner that it will not interfere with the upper surface of said model. A covering 19, of wax, is placed over the upper face of the model 18, and ordinarily, but not necessarily, a strip of reticulated material is placed upon the wax covering or leaf of the model, extending beyond the edge of the said covering 19. A second leaf or sheet 21, of wax, is placed over the reticulated material 20, both of the wax sheets 19 and 21 and the reticulated sheet 20 being made to conform to the upper side and front edge surfaces of the model 18. Wax pegs 22 are secured upon the upper wax leaf 21, and these pegs 22 are preferably circular in cross-section, as shown in Fig. 5, although it may be given other desired shape. After the upper wax leaf 21 is placed in position and pegs have been attached thereto the mating section 11 of the flask is properly placed and secured upon the member 10, and the upper member 11 of the flask is then provided with an investment D, corresponding to the investment in the member 10 of flask, as shown in Fig. 4. The flask is permitted to remain untouched until the investment is properly set, whereupon the investment is treated to form a gate leading from the enlargement 15^b in the main gate or gate in the neck to a point just above the face of the model on which the cast is to be made or at the heel portion of the wax sheet 19, placed directly upon the model. The gate in the body of the flask is formed upon the lines *c* and *d*, (shown broken in Fig. 6,) and a large air-vent is made in the investment D on the broken lines indicated by the reference-letters *d'* in Fig. 6. The gate in the body of the flask (indicated by the lines *c* and *d*) is made partially in the investments C and D. After the investment has been properly set and dried the members of the mold are separated and the investment from a point at each side of the heel portion of the mold 18 to the side of the body of the mold adjacent to the neck, is scraped or otherwise removed to form cavities, designated as 23 and 23^a and shown best in Fig. 7, which cavities are quite shallow where they connect at the heel portion of the model or at the mold, being gradually deepened as they approach the neck until the upper portions of the cavities forming the gate in the body are combinedly as wide as the enlargement 15^b at the bottom portion of the neck of the flask. That portion of the investment D located between the lines *d'* is removed, forming a large vent 24, which will expose a portion of the wax leaf 21 before said leaf is removed. After the gate in the body of the flask has been made the wax is washed out with hot water and the flask is submitted to heat until it is practically red-hot, thus melting any remaining wax contained within the flask, providing a mold-cavity 25, which was formerly occupied by the wax sheet 19, and a space 26 at the opposite side of the reticulated sheet 20, together with air and gas vents 27, which lead out through the investment D, as shown in Fig. 7. The mold is now in a position to cast from, and it is placed upright, as shown in Figs. 6, 7, and 8, particularly Fig. 8, and the molten metal is poured into the flask at the top of the gate B of the neck, whereupon the metal will flow quickly downward and enter the mold-cavity 25, flooding the same with metal almost simultaneously at each and every point, and the heavy column of metal above the mold will serve to almost instantly force all the air and gases from the mold out through the vents 24 and 27, while the gases and air in the path of the poured metal above the mold will be forced out through the vents 16. Under such a construction it will be evident that the cast will be thinnest at the heel of the plate and will gradually thicken toward the neck of the flask, as shown in Fig. 9, in which the plate 28 is shown just as it is removed from the flask, 29 representing the thin web of metal which connects with the heel portion of the plate, 30 the heavy bulk of metal which was contained in the neck of the flask, and 31 the metal that found its way up into the vents 16.

In addition to scraping the investment to form the tapering gates in the body of the flask the investment is likewise scraped away from around the mold, as shown at 18^a in Fig. 10, in order to permit a ready ingress of metal to the mold and the egress of air and gases contained in the mold and to insure a casting that will be non-porous and perfect in its character.

In Fig. 12 I have illustrated a plate 28 as having its outer sides roughened, as shown at 32, in order that the representation of a gum may be firmly held to the plate and wherein the teeth 34 are attached to the representation of the gum by means of pins 35; but I desire it to be understood that teeth may be formed directly upon and attached directly to the cast plate, if desired.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The herein-described method of casting aluminium plates, which consists in building up the members of a flask with investments, embedding a model in the investment of one member of the flask, covering the face of the model with a material liquefied by heat, forming air-vents in the investment of the other member of the flask, and providing in the inner face of the investment of each flask member tapering opposing cavities, which cavities form a gate, the delivery portion of the gate extending to the heel portion of the impression-surface of the model as set forth.

2. The herein-described method of constructing aluminium plates, which consists in providing a flask with a long neck, and a gate

within said neck, whose upper and lower ends are enlarged, locating investments in each member of the flask, locating a wax covering on the impression-face of the model, providing a reticulated plate for the said wax covering and a wax plate for the reticulated plate, the reticulated plate and its adjoining wax plate being located in the investment opposed to that in which the model is located, forming vents in the investment carrying the reticulated plate, the said vents being adapted to communicate with plates, producing a tapering gate in the opposing faces of the investments, which gate communicates with the gate in the neck, the narrow end of the gate in the investment communicating with the impression-surface of the model, and also forming vents in the neck of the flask communicating with the gate in the investments, as described.

3. In a device for casting aluminium plates, a flask constructed with removable members, the inner faces of the body portion of the members of the flask being inclined, each member being provided also with a flange where said members engage with each other, a neck formed upon each member of the flask, each neck being provided with a longitudinal groove, forming a gate adapted to receive the metal to be poured, the said gate being enlarged at the top and at the bottom, each section of the neck being also provided at each side of the gate with opposing channels, which extend from top to bottom of the neck, the inner portions of the channels communicating with the interior of the body of the flask, said channels being adapted as vents for the escape of air and gas, as specified.

4. In a device for casting aluminium plates, the combination, with a flask, provided with a neck, which neck is provided with a longitudinal gate enlarged at the top and at the bottom, and vents at each side of the gate, of an investment located in each section of the flask, the inner faces of the investment being channeled to form a gate communicating with the gate in the neck of the flask, the gate in the investment being thickest at the top and thinnest at the bottom, the gate also extending at its upper portion from side to side of the flask, a model secured in the investment of one member of the flask at the point farthest removed from the neck, the thinner end of the gate in the investment leading to the impression-face of the model, the investment in the opposite member of the flask being provided with vents leading to a point near the impression-face of the model, for the purpose set forth.

5. In a device for casting aluminium plates, the combination, with a flask provided with a neck, which neck is provided with a longitudinal gate enlarged at the top and at the bottom, and vents at each side of the gate, of an investment located in each section of the flask, the inner faces of the investment being channeled to form a gate communicating with the gate in the neck of the flask, the gate in the investment being thickest at the top and thinnest at the bottom, the gate also extending at its upper portion from side to side of the flask, a model secured in the investment of one member of the flask at a point farthest removed from the neck, the thinnest end of the gate in the investment leading to the impression-face of the model, the investment in the opposite member of the flask being provided with a reticulated plate which is spaced from and extends over the impression-surface of the model, the investment to which the reticulated plate is attached being provided with vents leading to said reticulated plate, substantially as set forth.

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