W. H. TAGGART.

METHOD FOR MAKING DENTAL INLAY FILLINGS AND THE LIKE.

APPLICATION FILED JAN. 12, 1907.

983,579.

Patented Feb. 7, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

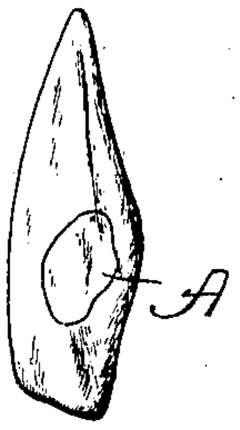


Fig. 2.

Fig. 3.

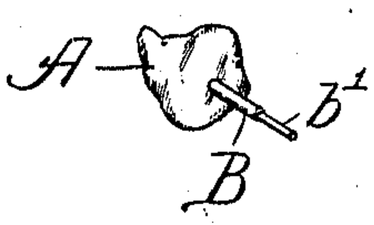


Fig. 4.

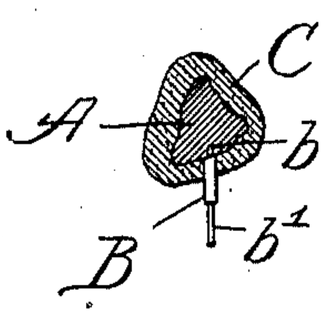


Fig. 5.

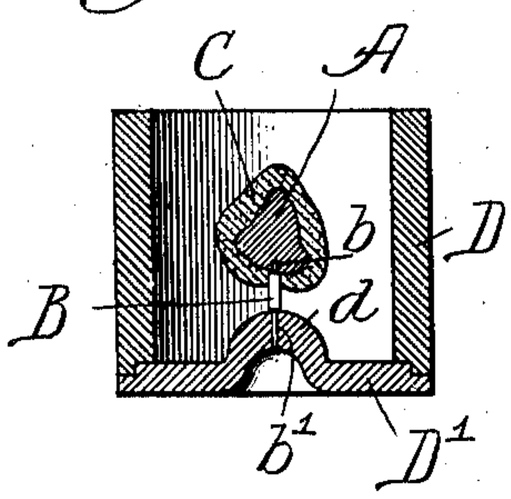


Fig. 6.

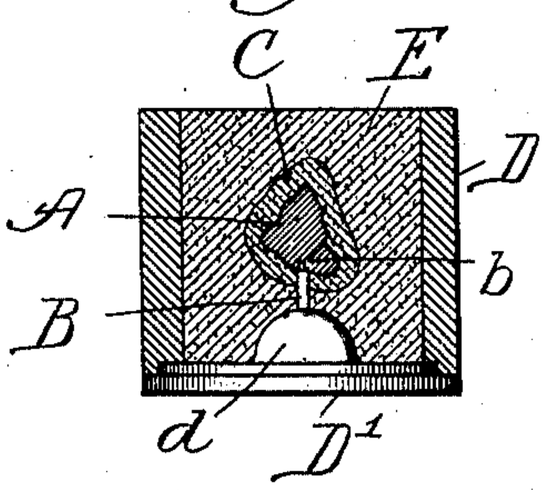


Fig. 7.

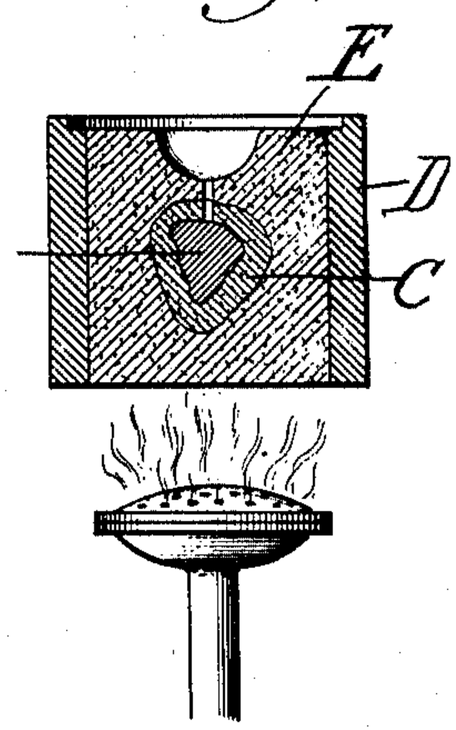


Fig. 8.

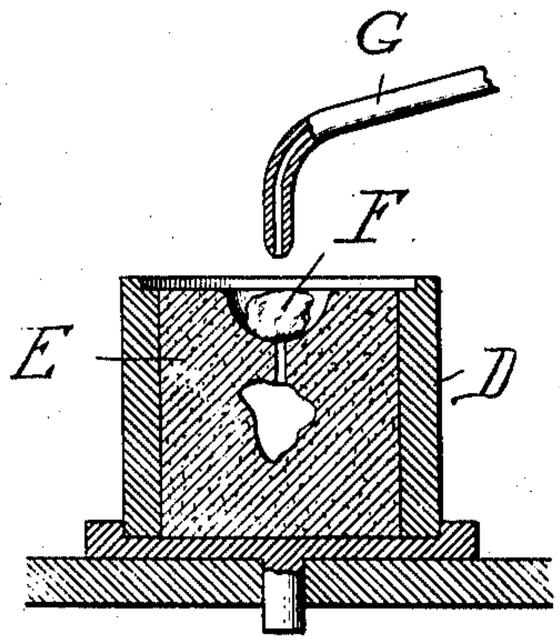


Fig. 9.

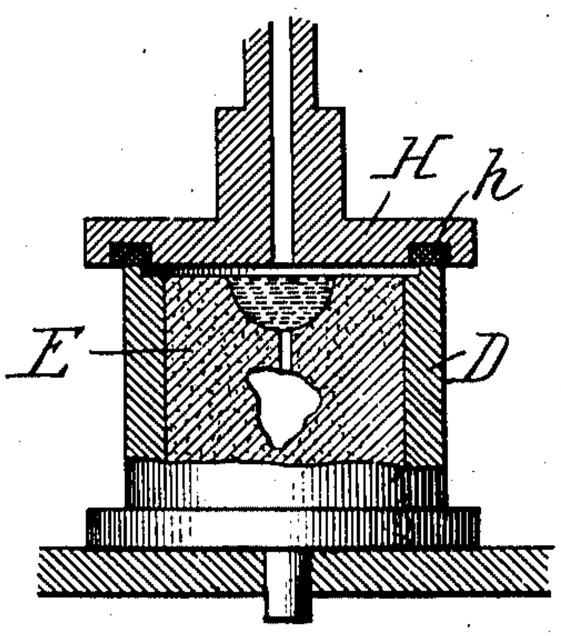
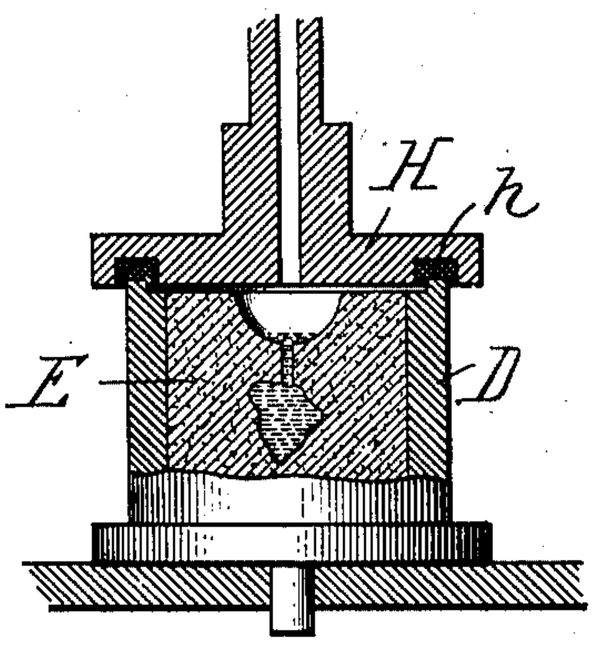


Fig. 10.



Witnesses:
Chas. E. Taylord.
John Enders.

Inventor:
William H. Taggart,
By Dyrenforth, Dyrenforth, Lee & Wills,
Attys.

W. H. TAGGART.

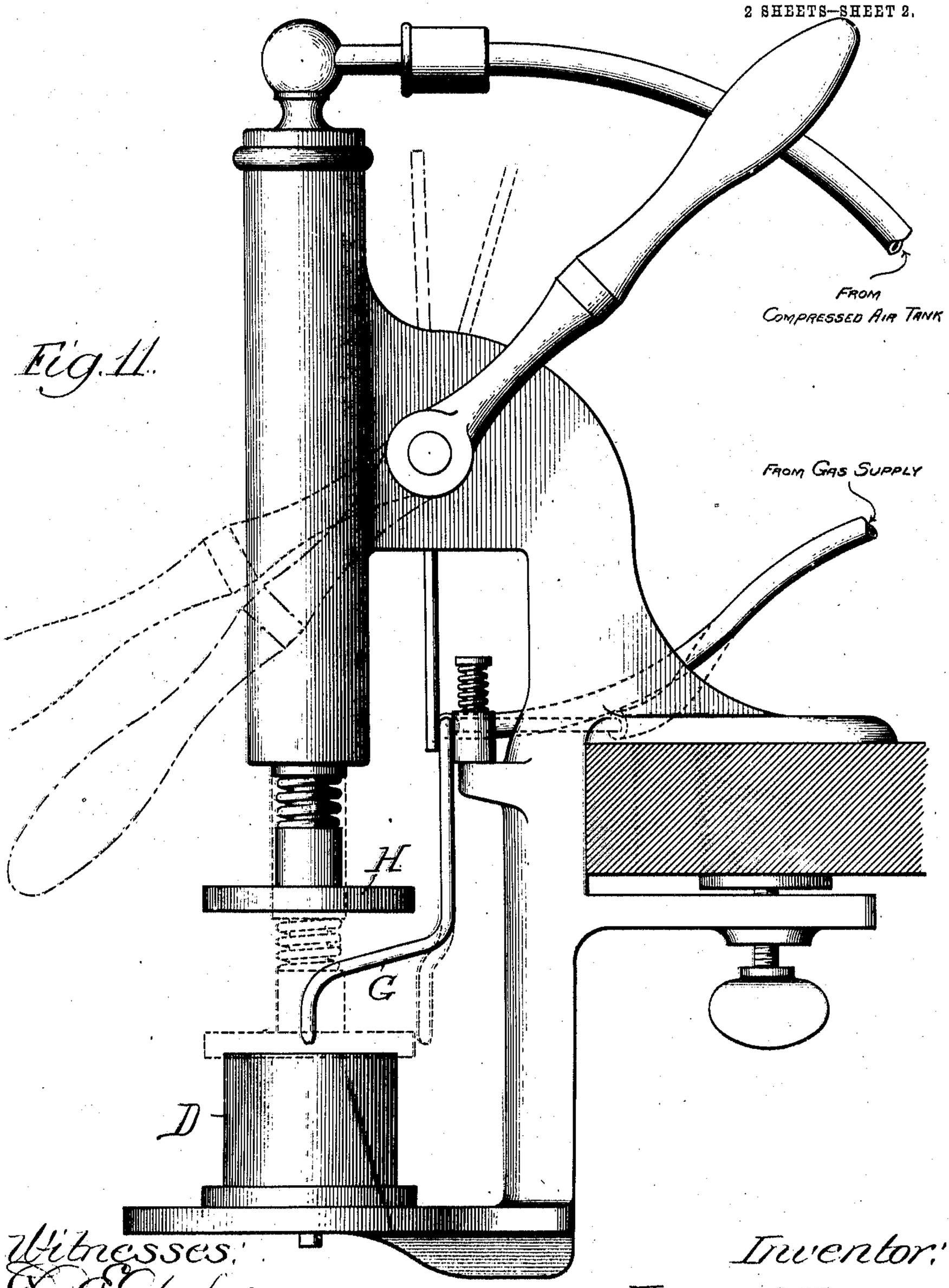
METHOD FOR MAKING DENTAL INLAY FILLINGS AND THE LIKE.

APPLICATION FILED JAN. 12, 1907.

983,579. Patented Feb. 7, 1911.

2 SHEETS—SHEET 2.

Fig. 11.



Witnesses:
Chas. E. Gaylord.
John Enders.

Inventor:
William H. Taggart,
By Dyrenforth, Dyrenforth, Lee & Wells,
Attys.

UNITED STATES PATENT OFFICE.

WILLIAM H. TAGGART, OF CHICAGO, ILLINOIS.

METHOD FOR MAKING DENTAL INLAY-FILLINGS AND THE LIKE.

983,579. Specification of Letters Patent. Patented Feb. 7, 1911.

Application filed January 12, 1907. Serial No. 351,917.

To all whom it may concern:

Be it known that I, WILLIAM H. TAGGART, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Method for Making Dental Inlay-Fillings and the Like, of which the following is a specification.

My invention relates to a certain new and improved method for making dental inlay fillings and the like, and its object is to provide by certain novel steps of procedure, more fully set forth herein, a method by which such filling can be made with great accuracy and ease.

In the accompanying drawings are shown the various steps of my method as practiced in making a single metal inlay filling, Figure 1 being a perspective view showing a tooth and the manner in which the pattern is made therein; Fig. 2 a perspective view of the pattern removed from place; Fig. 3 a similar view of the pattern with the sprue former attached thereto; Fig. 4 a section through the pattern and the first or primary coating of mold material; Fig. 5 a section through the flask and cover showing the pattern and primary coating of the mold material in position; Fig. 6 a similar section showing the secondary body of the mold in position; Fig. 7 a similar section showing the flask in its upright position with the cover removed, the mold being in process of heating for the purpose of dissipating the pattern; Fig. 8 a section through a flask and mold after the pattern has been dissipated, said view showing the burner in position to melt the metal which is to form the casting; Fig. 9 a similar view after the metal has been melted, the burner removed and the sealing head brought into position; Fig. 10 a similar view showing the parts after pressure has been applied and the molten metal has been forced into the mold; and Fig. 11 a side elevation of the device by which the metal is melted and pressure applied to drive it into the mold.

As the first step in my process I form a pattern, as illustrated in Fig. 1. The pattern is of wax, of a grade which is plastic at the temperature of the body and which is essentially pure so that it can be evaporated and leave behind no solid residue. It is formed in immediate contact with the surface which the filling is to fit, being molded directly in the cavity, the upper or outer surface of the pattern being obtained by having the patient bring the teeth together so that proper articulation is secured. Any excess of material can be trimmed off in the ordinary way and the pattern is removed from the cavity, being first chilled by the application of cold water. It will be understood that the cavity is of the form commonly used for inlay fillings either of metal or porcelain, that is, a cavity without overhangs, so that the pattern can be readily removed without distortion.

It will be understood from the further description of my invention that, as far as certain steps of the process are concerned, the manner of forming and the material of the pattern are not of immediate importance, and, while I prefer to use this process and this material for forming the pattern in all cases, still I do not intend to limit myself thereto as far as certain other steps of the process are concerned.

After the completion of the pattern, as seen in Fig. 1, the pattern is removed from place, the same being shown in its complete shape in Fig. 2. I then insert into one of the faces of the pattern, preferably one of the surfaces where no particularly accurate fit is required, as one of the outer surfaces rather than one of the surfaces which will lie within the cavity, a sprue former B of metal, having a small point *b* at one end for ready insertion in the material of the pattern, and having at the other end a reduced portion the purpose of which will presently appear. I then grasp the sprue former B and, using it as a handle to support the pattern, spread over the pattern a primary coating C of dental investing material such as is in use in the art. I then insert the reduced end b^1 of the sprue former in a central perforation provided in a cover D^1 of a flask D. The center of the cover has a rounded projection *d* which, when the cover is in place upon the flask, extends toward the center of the flask, and the perfo-

ration in which the reduced end b^1 of the sprue former is placed is centrally located with respect to this projection upon the cover, so that the parts take the position shown in Fig. 5 of the drawing. I then pour into the flask D a secondary body E also of investing material. I find that in pouring in the mold material air-bubbles are likely to be formed between the mold material and the surfaces with which it contacts and, if the primary coating of mold material C is omitted, these air-bubbles will be in immediate contact with the pattern and will interfere with the accuracy of the casting. Therefore, I spread very carefully over the pattern the first coat of mold material, so as to avoid any possibility of such air-bubbles lying in contact with the pattern, and when the mold material is poured into the flask any air-bubbles which may be formed will lie outside the primary coating of mold material where they can do no possible harm. After pouring in the secondary mold body, I set the flask away until the investing material has set, when I remove the cover D^1 and the sprue former B from position leaving the parts in the position shown in Fig. 6. The mold thus has formed in one surface a crucible-shaped depression caused by the projection upon the cover of the flask, the center of this crucible-shaped depression being connected by the sprue with the space occupied by the pattern. During all this operation the flask is preferably in an inverted position.

After removal of the cover I turn the flask into its upright position and place it over a suitable burner, as shown in Fig. 7, so as to heat the mold to a considerable extent. This heating melts the wax pattern and a portion of the melted wax soaks into the pores of the mold while the remainder, by continued heating, is volatilized and passes out through the sprue. A mold is thus obtained which is extremely accurate and which has no parting line whatever.

In fine dental work the presence of a parting line in the mold would be extremely disadvantageous, as it would introduce imperfections into the pattern which might seriously interfere with the fit of the filling in the cavity, and furthermore it is often necessary to make fillings of such form as to make it absolutely impossible to draw the pattern from a mold which has not a great number of parting lines, and the filling is often so small as to make it practically impossible to construct a mold having many parting lines.

The method of making the mold herein set forth is that set forth, described and claimed in my Patent No. 872,978, granted December 3d, 1907, on an application divided out of this application, and the apparatus used in making the mold is that set forth, described and claimed in my patent granted September 10th, 1907, No. 865,823, divided out of application No. 351,918, hereinafter referred to.

After the complete dissipation of the pattern, I place the completed mold, together with the containing flask, upon a suitable base-plate, supported upon a bracket of a casting device. This casting device is particularly described and claimed in an application filed by me on even date herewith and allotted Serial No. 351,918, and it is also illustrated in a general way in Fig. 11 of the drawings herein. I place in the crucible-shaped depression of the mold a lump or ingot F which is to form the casting, and swing over it a burner G which directs downward against said metal and into the crucible-shaped depression of the mold a very intense flame, preferably a flame formed by the combustion of a mixture of ordinary city gas and laughing gas.

After the ingot F has been completely melted, and takes the form shown in Fig. 9, I swing forward the operating lever of the casting device from the position shown in solid lines in Fig. 11, thus bringing down upon the flask a sealing head H having an annular packing ring h which contacts with the upper edge of the flask and makes a tight joint. The means by which the sealing head is brought down is completely explained in the apparatus application above referred to. During this operation the flow of the metal into the cavity of the mold is ordinarily prevented by the surface tension of the molten liquid and the presence of air in the mold hollow. It will be understood that just as the sealing head H begins its descent suitable means provided in the casting device swing the burner G out of the path of the sealing head so that the flame is removed from the molten metal.

Immediately after the tight seal is accomplished between the sealing head and the upper edge of the flask a supply of compressed air, normally at a pressure of from 25 to 30 or 40 pounds, indicated pressure, is automatically turned on to the central perforation of the sealing head, so that said pressure is transmitted to the molten metal in the crucible-shaped depression of the mold, thus forcing the metal downward from the position shown in Fig. 9 to the position shown in Fig. 10 where it occupies the hollow or cavity in the mold. The operation of this compressed air is to force the metal into every portion of the mold so that a much more accurate casting is produced than can possibly be produced by pouring in the ordinary way. Furthermore, the use

of the compressed air causes the metal to travel very rapidly so that it reaches its place in the mold before it has been chilled, and it also holds the metal in close contact with the surface of the mold, while the metal is in a more or less plastic condition during its cooling, and prevents the metal from being pushed away from the mold by any pressure which may be generated by the vaporization of fluid contained within the pores of the mold under the influence of heat from the molten metal. It will be understood that these advantages are particularly important when making a very small casting, because the small body of metal used has no great amount of contained heat and chills very rapidly in running into the mold. Furthermore, when the body of metal is small, a slight pressure between the surface of the mold and the molten metal will force the metal away, so as to interfere with the perfection of the casting.

By practicing my improved method, I find it possible to make castings of the most intricate form without the slightest difficulty and such castings have all the accuracy that could possibly be desired. In making fillings for teeth I procure inlays which slip into the cavity and fit with absolute accuracy, far more accurately than the ordinary filling produced by swaging or burnishing.

A cast filling produced by this process is readily distinguishable from fillings made by other processes, for the reason that the specific gravity of the cast filling is higher than the specific gravity of a gold-welded or pounded filling. Furthermore, the lower surface of a gold-welded filling has a polished lower surface, *i. e.*, the surface in contact with the walls of the cavity, whereas the lower surface of the cast filling is not polished but conforms to even the finest tool marks appearing on the walls of the cavity for which it was prepared. This filling is readily distinguishable from a burnished filling, for the reason that the matrix of the burnished filling must have a higher melting point than the body of said filling, so that if the body is of pure gold the matrix must be of platinum, and, similarly, if the matrix be of pure gold the body of the filling must be of 22 carat gold, or less.

It is to be observed that the matter here in claimed forms only a part of the general system disclosed herein. There are patentable features in the apparatus for making molds and in the method for making molds both of which have already been patented and are not here claimed. The apparatus for performing the actual work of casting is fully claimed in the application referred to, and the present application is therefore limited to the method for making the filling and such article claims as, under the law, are considered the same invention.

I realize that considerable variation is possible in the steps herein set forth, and, by particularly describing the preferred method of operation, I do not thereby intend to limit myself to the specific steps described except as pointed out in the following claims.

I claim as new and desire to secure by Letters Patent—

1. The method of making a dental inlay filling which consists in melting the metal in a crucible-shaped depression in a mold which is provided with a hollow of the size and shape of the desired filling, and with a sprue-hole connecting the hollow with the depression, and forcing the molten metal by gas-pressure into the hollow.

2. The method of making dental inlay fillings which consists in melting the metal in a crucible-shaped depression in the upper surface of the mold, the bottom of which depression is connected directly by a sprue-hole with a hollow of the size and shape of the desired inlay filling, establishing a greater gas-pressure upon the molten metal than exists within the hollow, whereby the molten metal will enter the hollow, and maintaining such difference in pressure until the metal sets.

3. The method of making dental inlay fillings which consists in melting the metal to form the filling in a crucible-shaped depression in a mold tightly fitting a flask, sealing the edge of the flask, and admitting gas-pressure to the upper surface of the mold and molten metal.

4. The method of making dental inlay fillings which consists in casting the same entire from molten metal.

5. The method of making dental inlay fillings which consists in melting the metal, introducing the same into a mold having a hollow of the size and shape of the desired inlay and against the walls of which the metal hardens, and breaking away the mold including the surface against which the molten metal was introduced.

6. The method of making dental inlay fillings which consists in casting the same from molten metal, the surface of the inlay being formed from such molten metal against the mold which is a reproduction in part of the tooth cavity.

7. The method of making dental inlay fillings which consists in casting the same from molten metal, the surface of the inlay being formed from such molten metal against a non-metallic mold, separable from the casting and which is a reproduction in part of the tooth cavity.

8. A dental inlay formed entire of cast metal.

9. A dental inlay formed of cast metal and being throughout of metal of the same composition.

10. A dental inlay formed entire from cast metal and being throughout of metal of the same composition.

11. A dental inlay cast entire from metal to the size and shape necessary to fill the cavity for which it is intended.

12. A dental inlay cast entire from molten metal and being throughout of metal of the same composition and being cast to the size and shape necessary to fill the cavity for which it is intended.

13. A dental inlay filling having that portion of its outer surface which is to contact with the tooth cast to the proper size and shape for such contact.

WILLIAM H. TAGGART.

In presence of—
J. H. LANDES,
C. W. WASHBURNE.