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# UNITED STATES PATENT OFFICE.

WILLIAM H. ROLLINS, OF BOSTON, MASSACHUSETTS.

## IMPROVEMENT IN THE ART OR METHOD OF FILLING TEETH.

Specification forming part of Letters Patent No. **215,397**, dated May 13, 1879; application filed March 28, 1879.

*To all whom it may concern:*

Be it known that I, WILLIAM HERBERT ROLLINS, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in the Art or Method of Filling Teeth, of which the following is a specification.

The purpose of my invention is to provide a material or substance for the permanent or temporary filling of teeth which shall resemble more closely than gold does the character and color of the teeth, thereby doing away with the objectionable appearance of gold fillings, and avoiding serious objection to their use.

Heretofore the general practice in permanent filling of teeth has been to use gold, which is pressed or hammered into the cavity, requiring much skill, experience, time, and labor on the part of the operator, and causing suffering to the patient.

The most serious objections to the use of gold or other metallic filling, and the advantages of the hydraulic cements, are as follows:

First, it is very difficult to insert the gold in out-of-the-way or inaccessible places, or in badly-decayed teeth.

Second, the gold or other metal is an effective conductor of heat; therefore, when closely in contact with, or near, the pulp of the tooth, it may induce inflammation, resulting in the destruction of the tooth, while my cements possess about the same conducting properties to heat as the tooth, therefore no inflammation ensues.

Third, under changes in temperature metal fillings expand and contract to a much greater extent than the tooth; hence they become in time loose in the cavity.

Fourth, the contrast in color between the metal filling and the tooth is very objectionable, while with the cement the color is more nearly like that of the tooth.

Fifth, the skill required to use gold is so great that few are able to make a good filling with it. The cements being put in while plastic, little skill will be required to make good fillings.

Sixth, the metal fillings are widely separated from the tooth substance in the electric

scale; chemical change in the presence of an acid ensues, destroying the tooth around the filling.

Seventh, the cements, aside from the purposes of permanent fillings, are valuable as linings for deep cavities.

Metallic cements have been to a certain extent used; but the color prohibits their use in exposed localities. They are also open to the objections of gold fillings.

I am aware that other than metallic cements have been used; but they are soluble, and therefore only available for temporary fillings.

In carrying out my method, I employ some one or more of the so-called "hydraulic cements," such as the ordinary hydraulic cement of commerce and magnesium cements, and those in which the hardening depends upon the action which takes place between silica, a salt of lime, and sodic or potassic silicate.

While I prefer the true hydraulic cements, those in which the efficiency is supposed to depend upon the formation of a double silicate of lime and alumina, I do not confine myself to any particular one, but consider my invention to consist in the employment of a hydraulic cement—that is, one susceptible of hardening under water, and capable of being introduced into the cavity of a tooth in a semi-liquid or plastic condition, and subsequently becoming hard, durable, and insoluble in the liquid of the mouth.

With regard to the solvent or vehicle employed in mixing the cement prior to introducing it into the cavity of the tooth, while water may serve the purpose with greater or less efficiency, I prefer to employ silicic acid, either in the form of a jelly or combined with lime to form a jelly, or as a solution in water of about eleven per cent., or thereabout, (the precise strength not being important,) as I have found that this material renders the cement less soluble than water, because it envelops the minute particles of the cement in a coating of silica, and because it brings the silica into intimate contact with the particles of the powder, facilitating the changes between the lime and silica in certain of my cements, and because it is adapted to be used as a vehicle for the salts in oxychloride cements, the magne-



sium cements, and those cements in which a reaction takes place between a salt of lime, silica, and an alkaline silicate.

In the use of silicic acid, either in solution or jelly, in lieu of water, with hydraulic cements, for instance, the silicic acid renders the cement harder and less susceptible of being dissolved, for the reason that it brings the silica into intimate contact with the lime and alumina.

The silicic acid may be prepared in various ways, but a practical one is as follows: Dissolve in hot water a certain quantity of the purest silicate of soda, and add hydrochloric acid to decompose the silicate of soda; put the solution into a dialyser, and let it remain four days, or thereabout, and at the end of this time the crystalloids will have passed through the membrane, leaving silicic acid in solution in the water. This solution may be concentrated until it contains eleven per cent., or thereabout, of silicic acid; or, if a consistency approximating to jelly is required, the evaporation of the water is to be continued, until, upon cooling, the jelly is formed.

In preparing the cement for my use I employ the best materials, and do not confine myself to any given method of producing the final result.

The following is one method of procedure which I have practiced: Take of silicic oxide, two parts; precipitated carbonate of lime, eight parts; clay, one part; mix; grind in the ordinary way, either wet or dry, until the mass is as fine as it can be made. When the mass is sufficiently dry, it is to be packed into crucibles holding, say, one-half liter, and the crucibles placed in a proper furnace, the temperature of which is to be gradually raised to a white heat. The length of time the cement should be burned is eight hours, or thereabout; but circumstances may make a longer time desirable, it being remarked that the longer the burning is continued, within certain limits, the stronger the cement will be.

The masses, after being removed from the crucibles, are to be crushed and finely powdered, after which to one part of the powder add about one part of silicic oxide, and grind the mixture to an impalpable powder, (the finer the material is ground both before and after the heating the better the cement,) and

too much care cannot be bestowed upon this part of the process. In the final mixing for immediate use, if the silicic acid is used (especially in the form of a jelly) instead of water, as a vehicle, great care should be taken to thoroughly incorporate the two, in order to bring the acid into intimate contact with the particles of the powder.

In the practical use of my cements, I employ, in many instances, an adjustable or flexible matrix or guide, surrounding the tooth or the cavity to be filled, and composed of any proper material, such matrix being of such shape or construction as practice shall determine essential, and serving to confine the plastic cement in position until hard.

With badly-decayed teeth it is, as before stated, a difficult matter in the employment of metals or amalgams to properly pack the material. By the employment of a metal or other band, as I propose, the cavity is inclosed or covered by a wall which allows the cement to be closely packed and retained in such cavity until hardened or set. After the cement has thus been pressed into the cavity the band is to be removed, and the excess of cement properly cut away.

In many instances the teeth are so close together that a band entirely surrounding the tooth cannot be used. In such cases I employ a band or plate, which I pass partly about the tooth, and confine it to the latter by suitable clamps.

I claim—

1. An improvement in the art of filling or lining the cavities in teeth, which consists in the employment of hydraulic cements, which are adapted to be introduced into the cavity of the tooth while in a plastic condition, and which subsequently become hard and insoluble.

2. In the cements for the purpose of filling teeth and for other uses, the employment of silicic acid in the form of jelly or solution, or combined with lime in the form of a jelly, as a vehicle for reducing the powder to a plastic state to enable it to be properly packed in the tooth.

WILLIAM HERBERT ROLLINS.

Witnesses:

F. CURTIS,  
L. A. CURTIS.