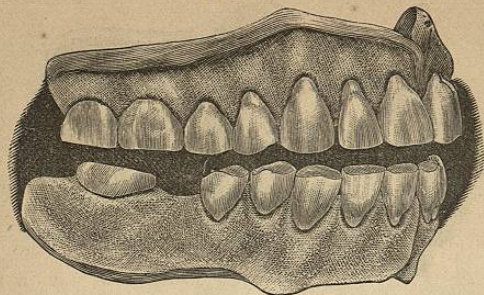


of the author to have secured such results in this direction that a toothless woman of seventy has found herself able, through a judicious use of

FIG. 331.



rouge, to compete with a sister forty years younger. An instance is familiar in which a mechanical dentist of celebrity in the art furnishes in his own person such an illustration of the capabilities of contouring that with teeth and plumpers out of his mouth he becomes instantly metamorphosed from a man full, apparently, of life and vigor, looking not a day over fifty, to one old and decrepit, whose age might be anywhere between ninety and a hundred.

A contour obtained by wax, it remains simply for the operator to pass the piece over to the mechanical dentist, who reproduces it in metal, in vulcanite, celluloid, or in whatever material it may be decided to use.

A full study of oral æsthetics is best made, and indeed is to be made only, in a study of faces.

CHAPTER XXX.

THE MATERIALS VULCANITE AND CELLULOID.

MANIPULATIONS with the materials vulcanite and celluloid are so exceedingly interesting, and, at the same time, so easy of being understood and accomplished, that the present chapter is introduced for the instruction of such as wish to enter upon the practice, either with a view to profit, convenience, or entertainment.

By vulcanizing is meant the conversion of a plastic material into a base of such solidity that it can be used for the attachment and support of artificial teeth, for obturators, and for a variety of similar purposes within the requirement of oral surgery. Vulcanite is a composition bought prepared at the depots; its components are india-rubber, sulphur, and sulphuret of mercury. It comes in form of sheets.

Dental Plates as an Example.—The author describes here the manner of making a denture, the example applying to the working of the material for any other purpose. First an impression of a mouth is taken, and an articulation secured precisely as described in the previous chapter; except that the test plate, on which the bite is received, is preferably made of wax for a reason shortly to be understood, and that also a layer of tin foil be made to underlie this wax as direct relation with the model is concerned. Teeth used are specially prepared for the purpose. Fig. 332 shows the peculiarity.

Let it be accepted that the worker has a set of teeth arranged as required, which teeth have their fixation by reason of temporary attachment to a base plate of wax, which wax, in its turn, rests upon a layer of tin foil: teeth and base rest in turn upon the plaster model. The wax of the base is required to be trimmed and formed that it shall represent accurately a base of vulcanite which is to take its place. The thickness of the wax is to vary according to position, and to requirements in general, from the twelfth to the twentieth of an inch.

It is to be added that the joints between the gums are demanded to be as close as accuracy can make them.

To replace the wax base with one of vulcanite the operation is as follows:

FIG. 332.—TEETH USED WITH VULCANITE; FRONT AND SIDE VIEWS.

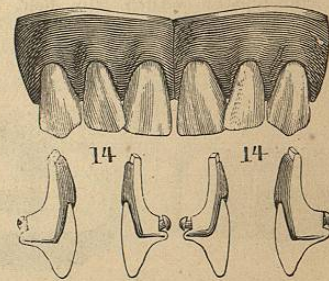


Fig. 333 represents moulding flasks, composed, as will be understood, of two horse-hoof-shaped cups. Into the lower one of these cups a thin batter of plaster is poured, when the model, holding the wax plate and teeth, is sunk in this batter until the base of the alveolar margin is on a level with the rim. (Points to observe relate to cutting away the base of the model so that it shall allow of the margin occupying the relation to rim alluded to, and as well the immersing of the model in water so that it shall not too hastily and unduly soak the fluid from the batter.) The model and batter becoming united through the setting of the latter, the worker trims up smoothly so that expression of model, teeth, the hardened batter, and the flask are as shown in Fig. 333. Here it is necessary to consider what is termed the draw, or sep-

FIG. 333.

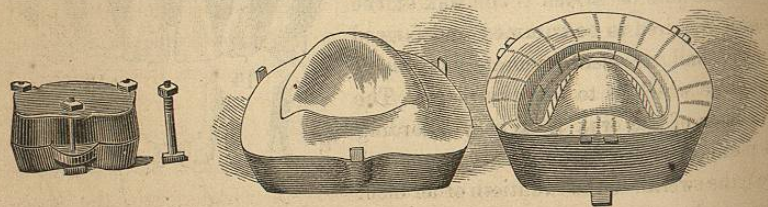


aration; that is to say, that as it is the intention to cover in this whole surface with batter-plaster, and that later this covering is to be lifted away, regard must be had to so placing the model that as little interference as possible exists in the way of the separation. Under, or receding, spaces are to be brought out as nearly as permissible to the level by means of plaster.

The draw provided for, a succeeding step varnishes or oils the whole exposed surface, as seen in Fig. 333, and, after placing the top portion of the flask, minus its cover (see same figure), fills up with thin batter: being most careful to avoid bubbles and to see that no interstice be left unoccupied. Next the cover is placed and the screw (see same figure) applied. Convenience is found in washing the batter-covered flask before the plaster has entirely set about the outside.

The plaster within the flask being allowed to rest until it has become

FIG. 334.



quite hard, the parts are separated (a matter insured by the precautions described), and the wax base plate is delicately picked away. Fig. 334 shows

the expression resulting; the model is in the portion of flask to the left; the teeth, together with the space secured by removal of the wax, are in that to the right.

As it is the intention in an immediately succeeding step to occupy the wax-space with vulcanite, and as the backs of the ground teeth abut on this space, it is recognized that imperfection in the grinding would necessarily permit the fluid gum, when brought under pressure, to insinuate itself into and between the spaces, thus destroying wholly the appearance of perfect jointure necessary to exist in a finished denture. Assuming, however, that inexperience, or undue haste in performance, shows the jointures at this stage as imperfect, the operator may, to an extent, antagonize the defect by insinuating dry plaster, touched with water, into the fissures; or, as is recommended by some experts, soluble glass may be painted into them; the manipulator being careful to clean every part, save the fissures, of the foreign material.

Turning again to Fig. 334, diagram of right side, the palatal reverse of the left is seen. Surrounding the palate, and corresponding with the curvature of the alveolar arch, the backs of the artificial teeth are seen, at least that portion of the backs which exposes gums and pins. Outside of the extreme tops of the gum a curved dig-out in the plaster is observed, the intention of this being room for that portion of gum-rim always seen on the boundary of a denture. The transverse cuts observed in the plaster are made with a view of accommodating surplusage, when the soft gum comes later to be crowded into the place of the removed wax.

Packing the vulcanite, for which the parts are now found ready, is accomplished by using gum made soft through means of a steam-heated surface. This gum, cut into strips for convenience of use, the first piece being of a size that shall cover the palatine surface, is laid upon the plate, the matrix being subjected at the same time to similar heat, and, when the flask has become warm and the gum is softened, the latter is taken up by any convenient means, and is packed into every part of the locality formerly occupied by the wax. An excess of this gum is allowed to be provided for by the transverse cuts, should it prove more than can be received. Here attention is to be bestowed on the experience that too little gum is the spoiling of the piece, too much is alike its destruction; the last owing to the undue pressure required to move it from the matrix, and most particularly does this apply where said transverse cuts are lacking in accord with requirements.

The packing completed, and the cups of the common flask being put together and the screws or clamp applied (a temperature of 212° Fahrenheit being maintained), the parts are screwed up as closely as is to be accomplished by aid of a wrench. This screwing process forces most fully the pasty contained mass into every locality, the excess escaping into the transverse cuts.

The last performance introduces the vulcanizer. Of these instruments, as of the flasks, there is a wide variety; the one shown in the cut (Fig. 335),

is quite equal, though perhaps in no way superior, to the many competitors found in the dental depots. A vulcanizer is an apparatus made up of a boiler and

FIG. 335.

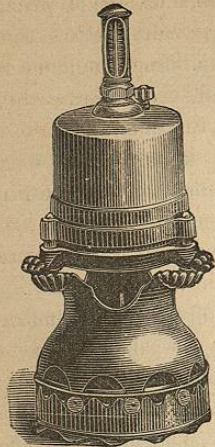
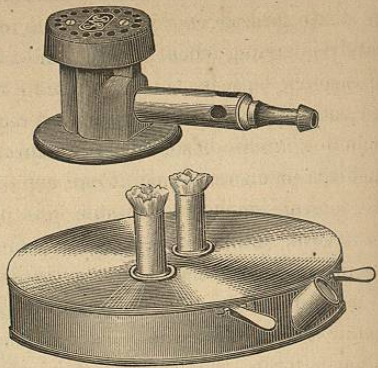


FIG. 336.



a furnace. In the one shown the boiler, surmounted by a thermometer, constitutes an upper half, the lower half is a furnace. Furnace-power signifies an ability to raise the temperature to 326° Fahrenheit, the means employed being gas, alcohol, or kerosene. Fig. 336 shows gas and alcohol, or kerosene arrangements. The boiler is rimmed internally about half an inch above the bottom, the object being support of the flask and accommodation of a few ounces of water.

The water being in place at the bottom of the vulcanizer, and being brought up to a temperature corresponding with that of the flask and contents, the latter are laid upon the rim, and the lid of the boiler screwed into place. Now begins the process of vulcanizing. Slowly the temperature is increased, it being a rule with many to expend an hour in obtaining 310°, and a second to advance it 10 other degrees; this last secured, and being held for five minutes, vulcanizing is to be accepted as accomplished. In college laboratories it is not common to spend more than a single hour in vulcanizing; the temperature being gradually brought up to 326° without an intervening waiting.

Cooling is to be gradual; a desirable plan is to leave things undisturbed until the flask is to be handled without discomfort to the fingers. The plaster, together with its imbedment, being allowed to stand a few hours after removal from the flask, is found to grow entirely crumbly, and is easily broken away from the denture; to remove it, tap the edges of the flask.

The gum vulcanized, or turned into a plate of horn-like consistency, a concluding stage refers to finishing the denture for the mouth. This performance relates to getting clear of all superfluous material, to thinning and shaping the piece into fitness and comeliness, and to compelling a polish

of the inferior surface and sides of plate, which is good in proportion as it is glass-like. Instruments employed are scrapers, files, sand-paper, rotten-stone, oxide of zinc, pumice, cone-burs,—any means found at hand and convenient. Spring callipers are necessary to measurement of the thickness of plate.

The conversion of the compound gum known as vulcanite into the hard substance distinguished as dental plate is of chemical meaning, and relates with a catalysis arising out of an intensified union of sulphur and caoutchouc produced through high heat; the difference as to softness or hardness being influenced entirely by that degree of temperature in which union is effected.

A concluding reference is to be made to the employment of the material from a medical stand-point. Ill effect upon the mucous face of the mouth is at times a result of the use of vulcanite plates, which effect is commonly attributed to the action of the vermilion, or sulphuret of mercury. The writer has given considerable attention practically to the subject, and desires to offer it as a conviction that trouble, exceptionable cases perhaps excluded, will be found to rest in the fact that the material, being a non-conductor, heats the parts, particularly as the locality of the suction cavity is concerned, thus engendering a passing inflammation, which is the nature of the offence. A vulcanite denture for this reason is not wisely kept in the mouth during sleeping hours.

Black vulcanite is preferred by many operators to the red. Here the gum is absolutely free from the coloring matter,—*i.e.*, the sulphuret of mercury. The process of preparing this form of the material is preferably by dry heat, moisture changing it to a dirty-brown color. The time required for vulcanizing is seldom less than five hours. Black base plates take a brilliant and durable polish. Objection to the preparation lies in an exposure of it when in the mouth, not at all times to be avoided.

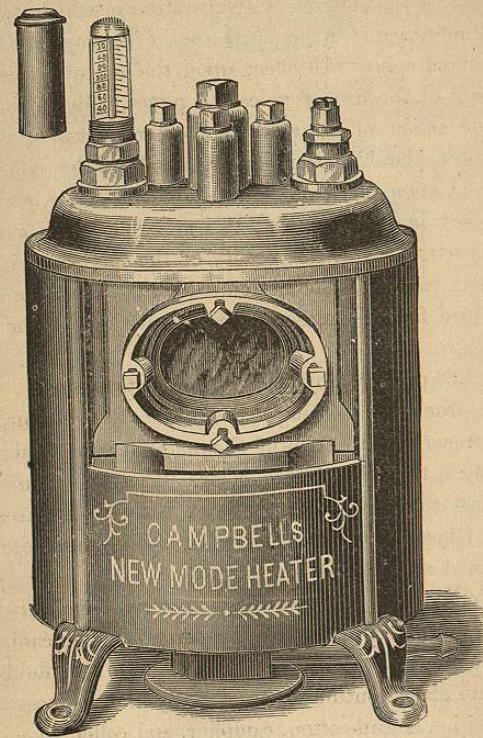
Celluloid.—Celluloid is a pink-colored material, semi-brittle in consistency, possessed of greater conducting property than vulcanite, wholesome in nature, solid to an extent that denies soakage into it of fluids, and capable of being made into plates, buttons, etc., of ivory-like coolness and characteristics; its composition is gun-cotton, camphor, and collodion.

The making of a celluloid denture finds exact correspondence with vulcanite work until the stage of packing is reached. Here, instead of the warmed strips and heated flask, what is called a blank is taken (a blank being a mould of celluloid as furnished by the manufacturers, bearing fair resemblance to the ordinary denture plate), selection being made of a size corresponding nearly as may be to the requirements in the final plate. The teeth and base exposed, as seen in Fig. 334, the blank is laid loosely in its situation, and the other section of flask placed in position.* Next the flask, with its

* Celluloid flasks differ from those used in vulcanite, being heavier in structure and provided with rods and grooves on the sides of the sections, in place of screws, as in the rubber flask, for the purpose of guiding the sections into position during the process of moulding.

contents, is placed inside the boiler, and the screw (plunger it is commonly called) is turned sufficiently to lightly compress it. Consideration of the boiler refers us here to apparatus to be used, and of such instruments, as of the vulcanizer, manufacturers offer a considerable variety. Fig. 337 shows a new mode heater, an apparatus operated with moist or dry-heat, and applicable alike to celluloid and rubber. The circular base, resting upon the

FIG. 337.



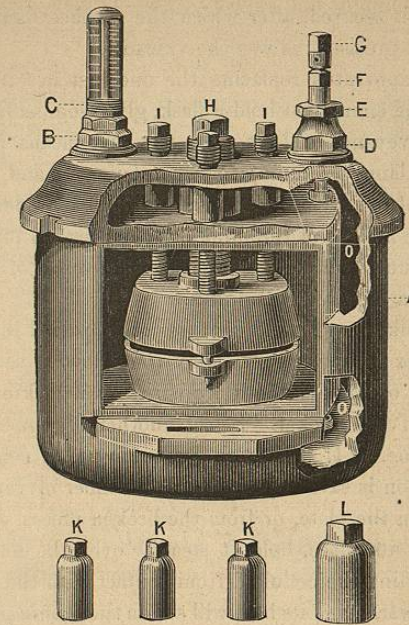
floor, is the gas-heating arrangement. The door, in the boiler portion, is a framed glass, permitting inspection of the flask-room. The screw-caps, four in number, three small and one large, seen on top, have their meaning understood by casting a glance at Fig. 338. To the right is a safety-valve. The left affords accommodation for a thermometer.

Fig. 338 is a sectional view of working parts of the apparatus, and affords, in its correctness, a full lesson of the manipulations to be described. The instrument, in its invention, is the outgrowth of what is esteemed by many the just view that perfect work, both as celluloid and vulcanite are concerned, is to be made only in a dry chamber, and that where a high degree of heat is used, such as is essential in the manipulation of celluloid, the temperature

must be kept uniform until the task is completed, and is not then to be allowed to change suddenly.

The blank, in place as described (occupying the loosely-screwed flask seen

FIG. 338.—SECTIONAL VIEW OF NEW MODE HEATER.



here under the screws within the boiler), it is the design and indication to begin its pressure only when a temperature has been obtained which is to be just below the burning-point; this is about 320° . It is common practice, however, to commence to turn the nuts when the blank becomes ductile enough to yield before a strength found in the fingers and thumb: about 212° . The mode of making pressure is understood in noticing that screws I, H, I, bear upon the top of the flask, and that compression is complete only when the divisions meet at the centre line. The screw-caps K, K, K, L, are used with a view of making the screw-holes steam-tight where moisture is depended on for the heating principle.

Observing the diagram, O, O shows a compartment separated from the flask- or packing-chamber; this is the water- and steam-box. Into this box put sufficient water to reach line A, and commence making steam by lighting the gas-furnace. Temperature, as it advances, is measured by the thermometer, C, in which connection it is to be noticed that the mercury-bath, B, is to be kept supplied with quicksilver (or what is found to answer equally well, iron filings) to an extent that covers the bulb. D is a screw-plug through which a compound steam-faucet works. E is a gum-nut for tightening the

packing of the steam-valve. F is stem of valve. G is a cap with a minute aperture, as seen, at one side. No probability of explosion lies with the apparatus.

Continuing to force the flask together, little by little as the temperature rises to the required average, the process is to be considered complete only when absolute apposition is secured, after which the furnace flame is extinguished and the case treated precisely as was the vulcanite.

An inexpensive apparatus replacing the one just described consists of a cylinder of iron large enough to hold a flask, glycerine being employed as the vehicle for the conveyance of heat. To use this means prepare and flask case. Next fix in clamp pertaining to the instrument, and, after placing the glycerine,—sufficient to envelop the flask,—put into cylinder. A subsequent step relates with the boiling of the fluid and compression of the blank. This apparatus presents, unfortunately, objection in the waste of time necessary to the preservation of a required cleanliness.

Repairing.—Breaks in celluloid dentures are repaired in the Philadelphia Dental College, under Dr. Cryer's plan, after the following very simple fashion: Remove all portions of broken tooth from the plate, taking care not to disturb the outlines of the socket. Select another of proper size and shade to replace the lost one. (If the tooth be numbered, a considerable part of the trouble of selection is saved by taking the number of the mould from the reverse impression in the plate, or from the broken pieces.) Having set the new organ partly in its place, hold it steadily over the flame of an alcohol lamp, carefully guarding the celluloid from contact with the flame. In a few seconds it will grow warm, and its heat will soften the plastic sufficiently to allow the placing of it in proper position. The attachment will cause, of course, a slight bulge, or raised spot, to appear in the celluloid opposite the oral aspect of the root of the tooth. Invest in plaster, in the deeper section of the flask, covering the whole plate and the teeth, except the small portion of the celluloid raised in pressing the tooth into place. Complete the investment, part the flask, and dry the case, after which insert a piece of rather thick writing-paper or heavy tin foil over the raised spot, and place in the oven. Heat up to the usual temperature for moulding and close the flask. When the case is cold the tooth will be found firmly fixed in its position, and there will be no mark to show that the plate had been repaired. In case a small portion of the celluloid is chipped away from the front of the socket,—enough only to expose the end of the root when in position,—drop a little wax upon the vacant spot, after placing the tooth, and carve to the shape desired. Without removing the wax, invest and mould as before described. The wax will pass off into the plaster, and its place will be supplied by the celluloid, of which there is usually enough to permit the flowing of the minute quantity required without damage.

If there is a similar deficiency on the inside of the plate, exposing the pins of the tooth, drop wax into the vacancy, and proceed as before, except that

in this case the wax is to be removed when the investment is made, and the bit of writing-paper or tin foil is to be placed just below instead of over the pins, so as to force the flowing of the celluloid to cover them.

To detach a tooth from a celluloid plate, *hold* the outside surface of the one to be removed in the flame of a lamp until the heat softens slightly the plastic about the pins, when it may be taken off without trouble, and it will come away clean, without any of the celluloid adhering to the metal. Do not move the plate back and forth through the flame, or others than the desired tooth may be loosened, or articulation may be interfered with. There is no danger of cracking a heated tooth so long as the flame does not come in contact with the pins.

Continuous Gum.—The writer inclines to the conviction that continuous-gum work will, later on, be accomplished exclusively by means of celluloid. The agent allows imitation of the natural part, it is tenacious in its hold of teeth and plate, it denies all interspaces, it is in itself clean and sightly. Continuous-gum work is, undeniably, the highest accomplishment in artistic dentistry; each tooth is available for placing in any position desired and for study as expression is concerned. Objection to the plan, as the ordinary manner of preparing with porcelain is concerned, relates with weight, absence of elasticity, and expense in repairing accidents.

The following are the directions that apply to the new mode continuous gum, vulcanite being used as a base:

Employing teeth made expressly for continuous-gum or celluloid work (Fig. 324 shows such), set them up in wax after the usual manner, leaving the front, or outside, of the roots exposed. Cut a thin strip of the wax, warm, and attach it to the upper edge of the portion of the wax plate representing the gum, forming a rim which extends all around the outer margin. Finish the palatine surface to the form desired, invest in the flask in the usual manner, remove the wax, pack with rubber, and vulcanize. When removed from the flask, the case will present the appearance shown in Fig. 339, the front or outside of the roots being exposed and the narrow *undercut* rim extending all around, leaving a space with retaining-grooves between the teeth, for forming a gum of celluloid, looking very much as though the substance of the plate had been gouged out for the purpose. The vulcanite plate is now completed, with the teeth firmly attached to it.

To put on the gum, fill up the groove with paraffin and wax (this compound, not being sticky, does not adhere to the instrument, and is therefore more easily carved to the form desired) until all the space inside the rim, including the retaining-grooves

FIG. 339.—CASE READY FOR GUM.

