Tact yields the largest measure of success in the process of preparing cavities. Rules, while well as a means for general direction, are always wisely laid aside by him who finds in his own ingenuity better means for accomplishing ends. A student gains much advantage in studying, and in cutting, teeth out of the mouth, and such practice is not to be over-sufficiently commended to a learner.

CHAPTER XXII.

OPERATIVE DENTISTRY.

RELATIONS OF MOISTURE.

No tooth is filled perfectly that has not been operated upon under absolute exclusion of moisture.

A tooth is protected against the salivary flow, and against moisture from the breath, through various means now to be considered.

1. **Napkin.**—Answering in all ordinary cases we have the napkin. A dental napkin is an oblong square of linen, varying in size to suit the idea of the operator; dimensions found convenient are: length, twelve inches; breadth, three. In applying this napkin to the upper denture, it is folded upon itself in part obliquely, until one end is brought to a point. Beginning with this point, the linen is laid delicately and smoothly between the gum and cheek, being carried backward or forward according as the initial end may have been placed, until turned into the mouth at a convenient distance from the organ to be operated upon, it is made thus to envelop it, being supported on either side of the arch by the fingers of the operator's left hand.

Applied to a lower denture, the napkin is first folded upon itself into a ribbon shape of an inch in width; second, the initial extremity is back-folded until a pad is made which corresponds in length to its width; that is, being an inch each way. This pad is to be laid upon the floor of the mouth directly back of the incisor teeth, thus covering the orifices of the ducts of both the submaxillary and sublingual glands, which orifices it is the design to compress; from this point it is carried around the arch into the vestibule as required.

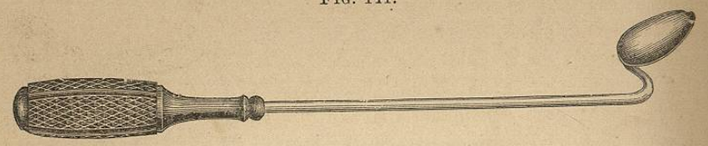
To hold the floor pad firmly in place, as is demanded, various plans are adopted. A common one, where the tooth to be filled is upon the right side of the jaw, is for the operator himself to fix it by the thumb of the left hand while the index finger is extended over the part occupying the vestibule. Where the tooth to be shielded is upon the left side, the index finger of the right hand of the patient is employed, the three remaining fingers being flexed out of the way beneath the chin.

As encroachment of the saliva constitutes about the most troublesome offence in dental operations, ingenuity has been extensively exercised for its control. Fig. 141 represents a tongue-holder devised by Dr. J. Foster Flagg.

It will be found that the use of this instrument insures additional facility

to the operator, and maintains the tongue in position with comfort to the patient, causing no fatigue nor unpleasant sensation, even removing desire to resist constraint. To apply it a fold of napkin, or a small piece of muslin,

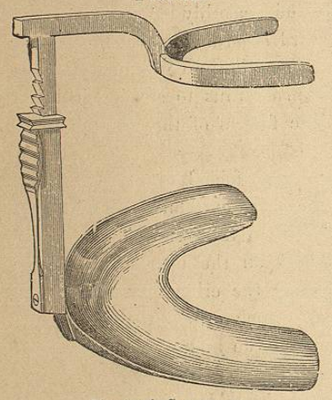
FIG. 141.



is placed under the tongue, and then covering that organ by back-folding the napkin, or by placing another small piece of the cloth upon it, the holder is put in position nearest the side where it is proposed to operate, and the patient is requested to retain it in place, using his *right* hand if the cavity be on the *left* side, and the *left* hand if the cavity be on the *right* side. The elbow is to rest upon the arm of the operating-chair.

Another instrument, a modification of an ingenious invention by Dr. Hawes, bears the name of Morrison's Compressor. (See Fig. 142.) The diagram fully illustrates its working. The napkin being put in place beneath the tongue, is held by the bars of the curve, the cup receiving the chin, the ratchet-work approximating and holding the two parts in the required relation. A later instrument of this same character is one designed by P. T. Smith, D.D.S., the variation consisting in the sliding of the bar which supports the compress, and in an ability to change the position of the chin-rest. A still later device is a porcelain compressor, the invention of Dr. Osborn, which highly commends itself. (See dental catalogues.)

FIG. 142.

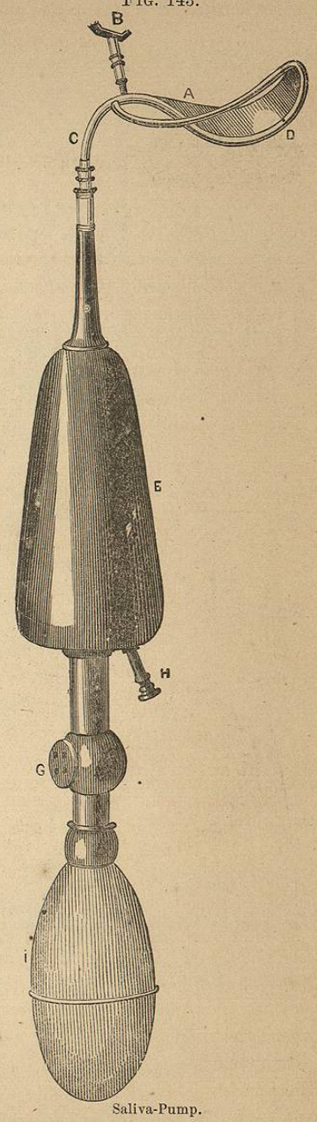


Morrison's Compressor.

Fig. 143 represents a saliva-pump and tongue-holder combined, the invention of Dr. Dibble. The object of this instrument is to facilitate the operation of filling teeth of the lower jaw by keeping the mouth free from saliva, and as a means of holding the tongue away from the parts; also as a means of supporting the upper jaw, thus assisting the muscles which keep the mouth open; the application is readily understood in studying the illustration. The instrument is composed of coin silver and hard rubber, the former heavily plated with gold. A designates the plate which keeps the tongue away from the teeth; B, the arm which supports the jaw; C, the silver tube and base which fit over the jaw; D, the opening where the saliva enters the tube; E,

the chamber that receives the saliva: a vacuum is made in the saliva chamber by the pressure of the bulb I, thereby causing the saliva to flow into the opening D; H, the opening where the saliva is discharged; G, the exhaust-valve. There are two mouth-pieces, one for the right side and one for the left side of the mouth. The instrument is readily cleaned internally by drawing soap and water through it. It must not be laid down on its side after using until emptied of saliva.

FIG. 143.

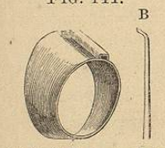


Saliva-Pump.

An automatic saliva ejector, known as Fisk's, is an elegant and convenient piece of apparatus in this same direction.

An instrument serving happily as an adjunct to the managing of a napkin by reason of facility furnished for holding in place pellets of spunk, bibulous paper, etc., is an extension-finger devised by the late Dr. J. H. McQuillen. This consists of a silver shield (see Fig. 144), to be worn upon the index finger, with a socket on the under surface, in which a steel finger, B, fits. A number of these fingers, or bits, bent at different angles, accompany the shield, being adapted to meet various requirements.

FIG. 144.



McQuillen's Extension-Finger.

A second form of instrument having similar signification with that just described, is known as Taft's Thimble and Extension. (See Fig. 146.) This thimble is to be used upon the index or middle finger of the left hand. It is also employed to aid in fixing the napkin, paper, spunk, or whatever may be used to prevent the encroachment of saliva. The point of this instrument, like the first, can be

extended into parts of the mouth where a finger, either on account of its diameter, or for want of length, cannot very well go. It is likewise found a convenience with which to reach over and draw the napkin firmly against the lingual side of the teeth.

A form of compressor for the Stenonian duct, the invention of Dr. Rich, of New York, is represented in Fig. 145. This forceps and spring assume to accomplish the closure of the duct more perfectly than any other appliance. The spring, used with a pad of bibulous paper, or with a napkin, prevents all flow of saliva, while the tip is free to yield to every motion; whereas with a wad of napkin in the cheek, the lip is tight, while very little motion frees the duct, allowing the saliva to flow.

Fig. 145.—Rich's Duct-Compressor.

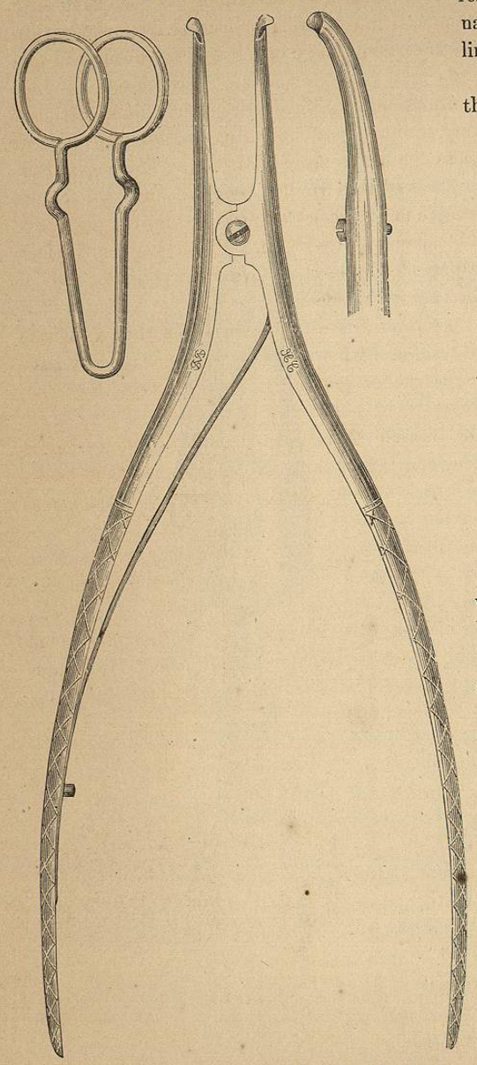


Fig. 146.

Taft's Thimble.

When in use, the recurved ends of the forceps fit in the recess of the spring, closure of the handles of which expand it. Having placed the pad in

position, exactly opposite the second upper molar, release the grasp upon the handles, the spring will close and the forceps be detached at once. An outer pad may be slipped under the spring afterwards, if desirable.

An operative plan of controlling the parotid secretions has been suggested, and perhaps to some extent practised, consisting in placing a temporary ligature about the ducts. This is certainly to be opposed as an unsurgical proceeding, and one which might most readily eventuate in stricture.

Rubber Dam.—Of the various appliances, aside from the napkin, designed for the control of the salivary secretion, not one has met with so universal an approval as what is known as the coffer-dam of Barnum. This means consists in the use of a simple sheet of thin rubber, prepared and sold for the purpose, into which one or more minute holes are punched for the passage of certain teeth associated with a proposed operation. When properly applied, even a lower tooth may be protected from the saliva for a period of four or five hours, should such time be a requirement.

In using the dam, the operator starts with the principle that a delicate round hole is to be made in a sheet of rubber; this is to be enlarged by passing the tooth through it. The rubber contracting tightly grasps the organ, putting it in a water-tight dam.

Applying this dam of Dr. Barnum to an isolated tooth, an inexperienced operator would be led to conclude that nothing in its way was left to be desired; passing, however, to a case of complicated relation, he would err as far on the other side in inferring it to be without value.

Application of Rubber Dam.—A sheet of rubber may be made to inclose one tooth, or several at the same time. We consider first, relation with a single tooth; this tooth being supposed to stand alone.

The operator cuts a piece of dam material into a size and shape adapted to the want, into the centre of which he punches a small hole. He isolates his tooth by forcing it through this hole. This simple procedure constitutes the performance.

Fig. 147.—Depressed Rubber Dam.

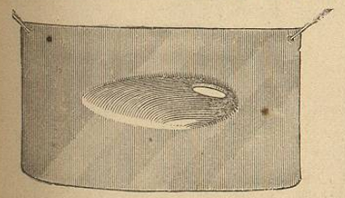


Fig. 148.

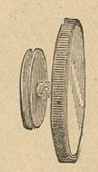
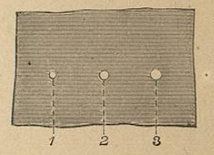


Fig. 149.



In connection with a form of dam, known as depressed (Fig. 147 shows it), allusion is to be made to the use of a mirror for lighting purposes. Such a mirror is shown in Fig. 148. It is fixed in a required position by punching for it a hole in the rubber precisely as for a tooth. It is seldom used.

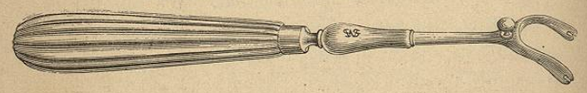
Where ordinary sheet-rubber is employed for making a dam, it will require,

even when placed on an isolated tooth, to be fixed after a manner that shall prevent its slipping off. To such end a strand of common waxed silk is tied about the tooth above the sheet. A second suggestion is practised and taught by Clinical Professor Dorr. This operator first incloses the neck of the tooth to be operated upon by a waxed ligature, the ends of which he brings through the perforation in the rubber. This ligature serves not only to direct the dam into place, but being finally tied above fixes it firmly.

Where a tooth to be placed in dam has immediate neighbors on either side, not less than three teeth require to be included in the sheet. Here the rubber is to be adjusted in the mouth, and by means of a soft pencil the position of each tooth is marked; the sheet is then removed and the perforations made. The cut, Fig. 149, shows holes adapted in size for, 1, cuspidatus; 2, bicuspidatus; 3, molar. Perforations are made by means of a punch or by a heated blunt steel probe.

The difficulty experienced in applying and keeping the rubber sheet in place as complicated locations are concerned has called out much inventive tact,—first as to application, second as to retention. For placing a sheet about the teeth no instrument can equal human fingers, or that which is their nearest representative. Education of fingers, then, stands as the highest expression of tact. The principles of the application being understood, the student is to familiarize himself with the work through practice. An instrument, duplicating fingers, applicable particularly to forcing the rubber between back teeth, is shown by Fig. 150.

Fig. 150.—Rubber Dam Applier.



Clamps.—Clamps to hold the rubber in place take the place of ligatures with many operators: these are little circles of metal made with the quality of a spring; slipped about a tooth they close tightly, and thus fix the sheet. Clamps are of many varieties to correspond with varying indications. Fig. 151 affords an idea of the instrument.

Fig. 151.

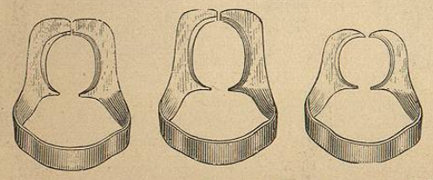
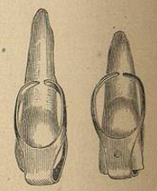


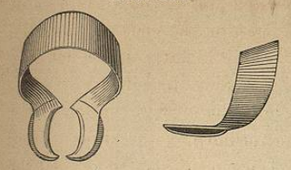
Fig. 152.



A form of clamp intended for incisor and bicuspid teeth is illustrated in Fig. 152.

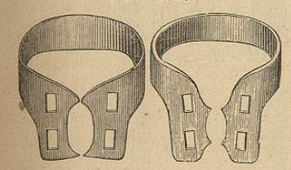
Another form is a design by Dr. Hickman, Fig. 153. Still

Fig. 153.



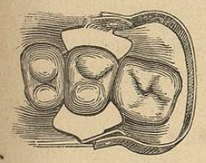
another is known as Elliot's, Fig. 154.

Fig. 154.



A clamp, Buckman's pattern, is shown applied, the rubber being in place, at the base of the three teeth shown, Fig. 155.

Fig. 155.



Clamps are put on by aid of forceps, as explained in the demonstration afforded by Fig. 156.

The sheet in place, as teeth are concerned, a matter to consider relates to that portion of the rubber outside the mouth. To keep this dependent, weights are attached by means of springs to the inferior free borders.

Fig. 156.

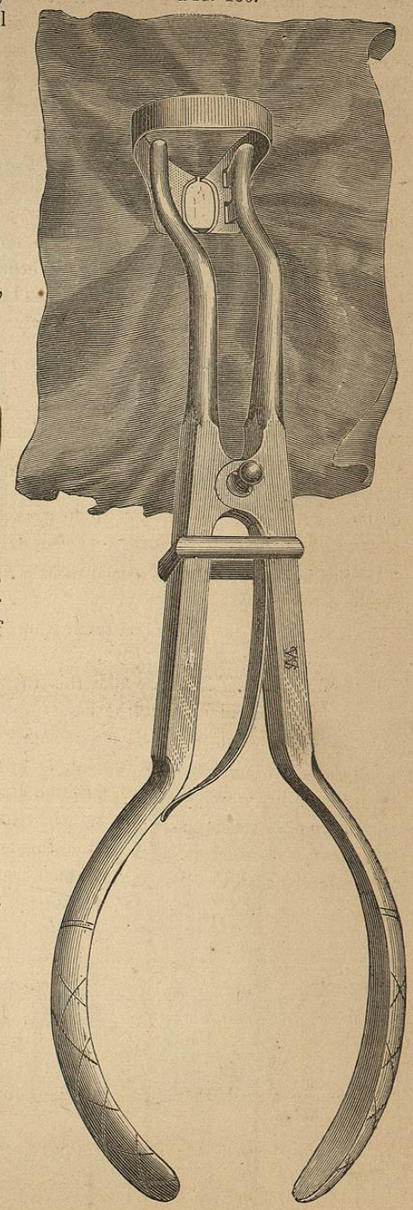
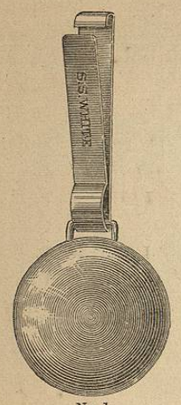


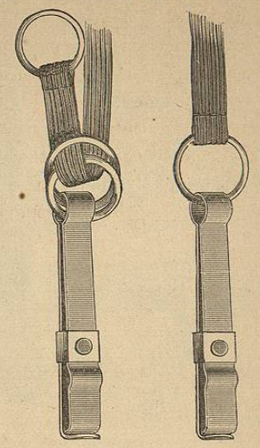
Fig. 157 affords the idea. To hold it from the lips, springs are caught to the upper borders, these springs being related by a band of elastic braid passed around the head. This will be understood by reference to Fig. 158.

Fig. 157.



No. 1.

Fig. 158.—Rubber Dam Holder.

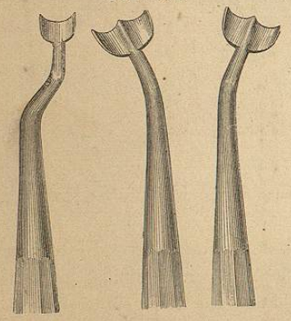


Application of the dam to special cases claims attention before leaving the subject:

1. A cavity in the side of a tooth where the cervical wall is below the margin of the gum.

To apply the sheet in a case like this the operator has recourse to cotton packing, which shall convert the cavity into one of uncomplicated character; a few hours or a few days will suffice to accomplish this. A second plan is to ligate deftly into the required position a tuft of compressed sponge; if so tightly tied as to render slipping impossible this will surely expose the neck. Still another plan is to throw about the tooth a ligature of loosely-twisted silk, this is to be forced gradually about the neck of the organ until full exposure is secured; the rubber being made to cover this, a second ligature forces the sheet upon the first. To the last a weight is suspended holding the dam in place. A valuable aid in forcing gum tissue from about the neck of teeth is shown in Fig. 159.

Fig. 159.



2. Teeth where the gum overlying a cavity is hard and immovable. Cut the gum away.

3. Partly-developed teeth. The dam does not apply. Fill such teeth temporarily.

4. Approximal cavities, the necks being beneath the gum. Wedge away the gum by means of soft pine.

5. Conical teeth. Force the rubber below the base of the double cones.

6. Cases where the rubber can be applied by the individual operator only at the expense of great pain to patient. Use other means.

Mechanically viewed, the coffer-dam is perfect; surgically considered, no means employed in dental art is more abused. Where an application compels much forcing and bruising of the gum-tissue, appliances of different character will always justly take its place. Expressed in other words, where the rubber is not to be applied without doing an injury to the parts it is best to do without its aid.

The subject is concluded by a suggestion that in proportion to skill clamps are rejected; ligatures answering every purpose of retention, and being preferable both because of inflicting less pain and less injury. Facility in using the rubber dam is to be found alone in practice. Fig. 160 affords idea of a dam as applied to certain of the front teeth.

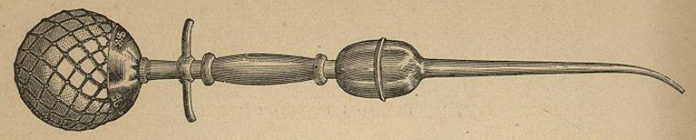
Fig. 160.—Rubber Dam applied.

Direct Drying of Cavity.—A cavity before prepared to receive the plug is to have a direct drying. To this end what is known as bibulous paper is commonly used; other agents are pellets of old and fine linen, spunk, absorptive cotton, etc.

A manner of drying much employed is the application of direct heat; such application is made by means of an air-syringe, the metal bulb of which has

been held for a moment in a flame. Fig. 161, showing such instrument, will afford at a glance an idea of the manner of its working.

Fig. 161.



In filling a cavity in the approximal face of a tooth, the napkin being used, it is necessary to consider the oozing from parts immediately surrounding the neck. To control this some operators depend on pads of absorbing paper kept close to the parts, others use a wedge of soft pine, forcing it firmly against the gum, others throw a ligature of loose silk or a twist of cotton about the neck, working it out of the way of the cavity to be filled. Another mode yet, one however, requiring care, lies in the use of cauterants, the agents used being nitrate of silver, a saturated solution of iodine, or, best of all, chloride of zinc. The mechanical means suggested are to have preference, certainly by the inexperienced, as no ulterior ill consequences are to be apprehended.

CHAPTER XXIII.

OPERATIVE DENTISTRY.

MATERIALS USED IN FILLING TEETH.

A CAVITY properly prepared, a succeeding step is the selection of a material with which to fill it. At our present view we treat of such material simply as it is found possessed of qualifications to meet mechanical requirements.

Teeth are filled with a variety of agents; prominent among these are gold, tin, amalgam, oxychlorides, zinc phosphates, gutta-percha.

Not to depart from the intention of considering the simplest and by degrees passing to the complex, the plastics claim a first consideration.

By a plastic is meant a material of putty-like consistency, which is put in its soft state into a tooth, and which quickly hardens. The last four articles named in a preceding paragraph are plastics.

Amalgam.—This is the oldest of the plastics; it consists of hard metals in union with a solvent. The hard metals composing a tooth amalgam, commonly silver and tin, are melted together and afterwards filed up; the solvent is mercury.

Amalgam is furnished the market by a number of makers; the price is so low that few practitioners care to take the trouble of preparing it for themselves. It is recommended, however, that a student familiarize himself with the processes and principles of making.

A standard amalgam is known as Townsend's formula; this preparation stands as the representative of all amalgams; to appreciate this combination is to understand the meaning of the modifications of it. All amalgams are simple, important, or unimportant variations on this common formula.

Townsend's amalgam, more properly to be called an alloy, is made as follows: take of pure silver four ounces, of pure tin five ounces. Place the first cut into small pieces in a crucible quarter filled with borax, and when melted add the tin, and stir with a pipe-stem. Next pour the molten combination into an ingot, and when cooled, rasp into grains and bottle for use. A common coke or coal fire is sufficient to secure the fusion.

Many manufacturers of amalgam claim many virtues each for his particular preparation. The virtue of a tooth amalgam consists in absence of change, either of shrinkage or expansion, and of the ability to maintain a clean, white surface and sharp edge. Amalgams obtaining a use more or less wide are known as Arrington's, the Standard Alloy, Lawrence's, Weston's, Holmes's,