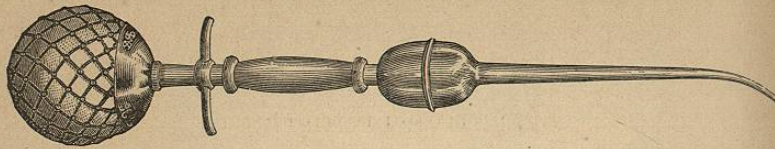


been held for a moment in a flame. Fig. 161, showing such instrument, will afford at a glance an idea of the manner of its working.

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-perchas.

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,

Caulk's, Oliver's, and Johnson & Lund's. Weston's cement, or amalgam, is prepared in three varieties,—hard, medium, soft. The Standard Alloy surpasses, perhaps, all other where sharpness and solidity of edge are required. Weston's soft is admirably suited for use in children's first teeth, being easy of removal. Besides the usual combination of silver and tin, various other metals are finding their way into the amalgam plastic. Oliver's claims precedence because of gold and platinum contained in it. Sharpness of edge is claimed for the Standard Alloy by reason of the presence of gold entering into its composition. Copper as an element in amalgam plastic yields hardness as well as a curative virtue; objection is blackness of surface apt to be begotten of it. Cadmium secures a putty-like mass, which seems to be the perfection of a working amalgam; objection is its injurious effect on tooth-bone, and the dirty yellow of a sulphide quickly forming on plugs made of it.

To afford idea as to additions made to the Townsend formula two analyses are presented:

1.		2.	
Silver.....	47.50	Silver.....	38.50
Tin.....	47.50	Tin.....	59.40
Copper.....	5.00	Platinum.....	40
Gold, a trace.....	$\frac{1}{100}$ of a grain	Gold.....	60
		Cadmium.....	1.06

It is common for practitioners at large to depend on a single amalgam; some selecting one kind, some another. Accomplished workers in the direction use a variety; five are noted by Dr. J. F. Flagg: one, submarine; two, usual; three, contouring; four, front tooth; five, facing. Submarine amalgam has a formula as follows: silver 60 parts, tin 35 parts, copper 5 parts. Amalgam denominated "Usual" is prepared by mixing one part of submarine with two parts of contour. "Contour" amalgam is, approximately, silver 58 parts, tin 37 parts, gold 5 parts. "Front-tooth" amalgam is a mix of one part "contour" with two parts "facing." "Facing" amalgam is, approximately, tin 50 parts, silver 30 parts, gold 6 parts, zinc 4 parts.

The article called submarine is, in the experience of the writer, quite preservative of tooth substance; objection to promiscuous use of it lies in a tendency to discoloration, both as plug mass and tooth are concerned. The use of this particular combination is to be recommended in the case of posterior soft teeth, and in instances where operations are not to be made without relation with the saliva. An English preparation of this class, known as Sullivan's Copper Amalgam, carries in its virtues marked self-commendation.

The alloy termed "Usual" is used for ordinary operations; front teeth excepted, this amalgam is esteemed to work with nice plasticity, to shrink but little, to hold good edge, and to discolor but triflingly.

"Contour" amalgam finds, perhaps, its best expression in what is known as the "Standard Alloy"; this compound possesses the addition of copper, works with admirable plasticity, holds its white color exceedingly well, has

great edge strength, and is quick setting. Its use is to build up broken teeth.

"Front-tooth" amalgam is deemed by many as possessing advantages over Standard Alloy as a means of preserving incisor teeth where non-interference with whiteness is particularly indicated, and where difficulty exists in the way of using linings of oxychloride of zinc. This alloy is slow in setting, and lacks in edge strength.

"Facing" amalgam is most resistive of all the alloys to discoloration; its use is in situations exposed to sight. An incisor tooth having its labial wall wanting has been built up by means of this preparation so satisfactorily as not to invite objectionable attention.*

Studying the composition of an amalgam, the writer inclines to afford peculiar conspicuousness to the presence of tin, and favors the conviction that in proportion to the extent of use of this metal in a filling of the alloy class it is found most preservative of teeth. Copper added to tin favors still further conservation, and if it be true that additions of gold to such compound antagonizes tendency to discoloration, then amalgams are to be preferred that hold the articles named in proper measure.

Silver is necessary to hardness in an amalgam, and it is true that without such influence tin would lack solidity when in combination with mercury; it does not follow, however, that silver is the virtue of an amalgam.

Zinc as an ingredient in an alloy promises more than results yet obtained from its use; it will be found, therapeutically considered, to apply in the case of all soft teeth where decomposition exists in vital rather than in chemical cause.

Copper, besides being curative or alterative, is accepted as a result of wide experimentation, to diminish shrinkage in an amalgam mass; on this latter score alone its presence is invaluable.

The presence of gold in an alloy has not impressed the writer as being of particular consequence one way or another; it is credited by Dr. Flagg, than whom there is no higher authority on the subject of amalgams, with increasing the rapidity in setting, imparting fine-grained plasticity, controlling maintenance of color, and securing desirable edge strength. Experiments made by Dr. C. S. Tomes would seem to establish the fact of a control of shrinkage by the metal. Other experiments exhibit gold as a retarder of setting.

*CHASE'S NEW AMALGAM AND MANNER OF PREPARATION.—Melt forty pennyweights of pure silver; add to this thirty pennyweights pure tin; stir, then add five pennyweights of antimony and five pennyweights of pure tears of zinc. When mixed, add thirty pennyweights of tin again; stir, and throw on the surface of the "melt" one half-ounce of bees-wax to burn off; and while burning pour the "melt" into the cup of a vulcanizing flask to cool. Cut it up with very coarse file. Remove every particle of iron with a horseshoe magnet. This amalgam must be washed in alcohol while mixing with mercury. Squeeze it in dry buckskin. This amalgam is whiter for washing, and takes less mercury. Squeezing injures some amalgams; it does not hurt this. The amalgam pellets must be dry when placed in the cavity. This amalgam remains very white in the mouth. If all the tin is melted at once the antimony and zinc do not melt. If the antimony and zinc are put in the melted silver before the tin then the antimony and zinc burn up or oxidize.

The metal platinum occupies a position not dissimilar to gold; just what it does or what it does not do seems rather undefined in the minds of alloy-workers; a view is projected that the virtue both of this metal and gold lies in some catalysis of action arising out of a relation with the other components of an amalgam mass; that is, if alloys are really found to be better because of such presence.

Cadmium is directed to be experimented with most cautiously; the opinion seems almost universal that the ingredient is hurtful to the health of tooth-bone; crevicing at edges, softening and breaking up of the plug mass, are faults arising out of its presence. Teeth filled with amalgams containing special freedom of cadmium quickly become of a dirty yellow color, while at the same time the dentine rapidly softens by reason of decalcification.

Plugging alloy combinations, however composed, have a common manner of preparation for office use; this preparation consisting in breaking up an ingot into grains or into shavings, which is done by means of rasp or lathe; grain-shape is the preferable form. Alloys possessing an excess of tin are best used in form of very coarse grains. Alloys containing excess of silver, or having as an ingredient copper, gold, or platinum, are best cut with fine files. Non-clogging of a fine file while cutting is being done is given as one of the tests of a good alloy. After being cut into grains an alloy is to be carefully sifted and magnet picked; the magnet to be passed and repassed until no more of the file particles are to be gathered. Thus prepared, and being bottled, it is suggested, as a matter of particular importance, that the material be laid aside for a period of three or four months with a view to what is termed aging. It is inferred of an alloy that mixes readily with a small relative proportion of mercury, when freshly cut, that it "will shrink notably, set slowly, bulge markedly, and have little or no edge strength."

Mercury, the solvent of alloys, is procurable in the proper purity at the shop of any chemist; the only need is that it be free from mixture with other metals, a virtue that suggests the inadvisability of using the same portion with other than one mix. The proper quantity of quicksilver to employ with the different alloys is just that weight which is found to melt the mass into an apparently homogeneous ball. When too much mercury is allowed to remain with a plug, the mass refuses to harden; too little favors easy disintegration of a filling. Making the least quantity do by using heated instruments in the packing is not to be accepted as a desirable practice.

The Plug Mass.—An alloy when in solution with mercury is converted into an amalgam; here only is the latter term applicable, although out of deference to common habit the words are used in the chapter interchangeably.

To make an amalgam mass take a portion of an alloy, enough to correspond with the size of the cavity to be filled, place the grains in a mortar, add a small quantity of mercury, rub the two together by means of a pestle for a few moments, and the solid grains will be found to have disappeared. Add now to the mass secured a few drops of deliquesced chloride of zinc, and rub

the whole together, using this last time a finger. As a result, the bottom of the vessel will be colored a dirty black, while the amalgam, robbed of its impurities, presents itself as a fluid ball of frost-white silver. The next step is to take the ball, and, enveloping it in buckskin, cotton cloth, or linen stuff, press out, with forceps, the excess of mercury; the result is now a semi-solid material, which is the preparation to be used in the cavity of the tooth.

The employment of the chloride of zinc as a purifying agent is not a necessity in the preparation of a plug mass, and may be omitted if the salt be not conveniently at hand; it is, however, a manner of treating the button deserving of high recommendation: a plug mass that has been frosted or washed with pure zinc will remain white much longer than if unwashed. This mode of cleansing amalgam was introduced many years back by the author, and seems to have passed into quite common use. After wiping away the black sediment—no water is to be used—the mass is to be absolutely dried by means of bibulous or other moisture-absorbing paper; such drying is to be insisted on, as it conduces markedly to the tenacity of the plug, through an influence on the process of crystallization.

None of the agents employed in the operation of filling teeth has elicited so much discussion, pro and con, as amalgam. That it affects injuriously the general health, as affirmed by many, is not perhaps to be accepted as true; assuredly the writer is not able to recall any decided case of such result. No material is in more common use; thousands of teeth are filled with it every day, and it is not to be denied that cases enough offer where such a filling seems the only one that is practicable. It is claimed that if a tooth be properly prepared, and the material be carefully introduced, an amalgam filling will last quite as long as one of gold. Assuredly in a multitude of instances it will preserve a tooth very much longer.

The employment of amalgam seems necessitated in many cases in which gold cannot be used because of therapeutic reasons, and where tooth-bone or the gutta-percha preparations are not able to bear the demands of the act of mastication or the action of chemical antagonists. In the teeth of soldiers, where the convenience of the service, lack of manipulative skill on the part of the surgeon with gold or tin, or the habits of most of the patients, would render the use of foils scarcely admissible, amalgam certainly recommends itself.

An explanation, in part, of a bad repute in which amalgam is held by many is to be found in poor manipulation. Being easy of preparation and of introduction into cavities, the use of the article has begotten great carelessness in its employment. A carious cavity in which amalgam is used is to receive not less attention in the way of perfect cleansing than where gold is proposed to be employed; quite as good reasons obtain for the perfect drying of it.

Another matter is the manner of introducing amalgam fillings. Experiments have clearly shown that it is not enough to smear the mass into a hole: it is to be packed in. Expert operators use a tap-blow, working piece upon

BIBLIOTECA

piece in a manner not unlike that employed in consolidating cohesive gold. Without such care an amalgam plug leaks everywhere and is necessarily worthless.*

Returning to the subject of the plug mass, attention is to be directed to a marked improvement on the manner of making a mix introduced with the "Standard Alloy"; this consisting of relation through weight. In preparing this amalgam a proportion found to result in absolute harmony lies in five parts of alloy to six of mercury; the union of the two being complete, the mass desirably plastic, and no mercury to be pressed out. To save the trouble of weighing the proportions in each plug mass the exact relative weights are found to be obtained when the alloy is put in a scale which is weighed down by the plate of the opposite side by as much quicksilver as gives a declension of 45 degrees. Absolute harmony of measure between an alloy and its mercurial solvent is to be accepted as representing absolute antagonism; the mercury is rendered inert. Alloys demand the solvent according to grade: Townsend's will antagonize and be antagonized by 36 per cent.; Lawrence's consumes 41 per cent., Johnson & Lund's 39½ per cent.; Arrington's takes 36 per cent. The solvent, as seen, is demanded in proportion as the metals used in the alloy are of high melting grade under ordinary heat. Particular stress is desired to be laid on this matter of measure for measure; it is worthy of being worked out in the instance of every lot of alloy made or purchased. Where an alloy is regular in its proportions, and the age is known, the trouble of weighing individual specimens is spared.

An alloy amalgamated, the mass is taken from the mortar and gently kneaded into smoothness by a finger of one hand in the palm of the other; this apparently simple performance requires delicacy of touch, otherwise the practitioner in place of securing a button of putty-like softness will find himself possessed of nothing but a portion of dust. A button of amalgam is to be kept warm and pliable until ready for use by being held between the ring finger and palm of left hand. It is good practice to varnish the bottom of a cavity before introduction of a plug. (See chapter on *Therapeutics* for other suggestions.)

Instruments for Working Amalgams.—Special instruments add to convenience in working amalgams. Cup tools (Fig. 162) are deemed a convenience by many in carrying the paste to the cavity. Another means which equally secures against dropping the mass into the mouth is found in the use of a file cut flat. (Fig. 163.) Amalgam demanding to be packed, instruments corresponding somewhat with those used in working cohesive gold are required; the faces are to be serrated, but the cuts must be very dull. A set here shown (Fig. 164), highly commends itself.

* A young practitioner cannot do better than inform himself of the relative solidity and porosity of the amalgam plugs he makes than by packing different specimens of the material in glass tubes and pouring over the same aniline alcohol: leakage will be found the rule.

Another, most valuable, is the device of Dr. D. D. Smith.

No. 1.—For filling undercuts generally.

Nos. 2 and 3.—For crown and buccal cavities in upper and lower molars.

Nos. 4 and 5.—V-shaped fissure pluggers for filling anterior and posterior V-shaped fissures in molars and bicuspidati.

Nos. 6 and 7.—Right and left V-shaped fissure pluggers for right and left V-shaped cavities in molars and bicuspidati.

FIG. 162.—AMALGAM CUPS.

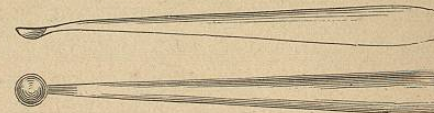
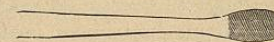


FIG. 163.—FILE FLAT.



Nos. 8 and 9.—Adapted for working in anterior and posterior approximal cavities, and specially useful in removing excess of amalgam when finishing.

No. 10.—For commencing a filling in the cervical portion of an approximal cavity.

Nos. 11 and 12.—Burnishers, applicable to a great variety of cases.

FIG. 164.—AMALGAM PLUGGERS.

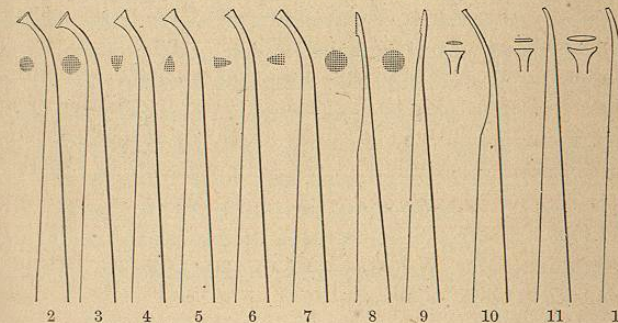


Illustration in Amalgam Practice.—We take as an illustration in making an amalgam plug an irregular cavity, dipping in part beneath the gum; situate upon the side of an inferior molar. Rubber dam or napkin in place, the plastic mass, kept pliable by being held in the warmth of the palm, as directed, is taken up by cup or file flat, preferably the latter, and, being carried to the bottom of the cavity, is condensed by tap-blows, particle after particle being added until the hole is full. To finish, a match-stick bevelled to a feather

edge removes the excess, and a little later, according to time of setting of the amalgam, a reapplication of the stick affords a clean, white, smooth surface not at all unsightly. This manner of finishing applies strictly with the Standard Alloy. With other amalgams advantage is sometimes gained by polishing and burnishing precisely as is done in making a gold plug. The observing will remark in the case absolute necessity for a preliminary treatment which shall fully and fairly expose the base of the cavity, a matter that necessarily compels the use of cotton plugs preliminarily continued for hours or it may be days.

A second illustration may consider a cavity upon the grinding face of a deciduous molar. To operate for children is at all times a tedious process. The demands are for easy and rapid execution. The cavity cleansed, engine or hand drill being used, the amalgam, a soft variety being selected, is packed precisely as in the previous case, except, indeed, as frequently enough happens, the restlessness of the child prevents. Under such circumstances instruments known as the "Arrington set" accomplish the work speedily.

The use of amalgam obtains at the present day so largely that it has become not less common to use the article with the anterior than with the posterior teeth. Here most decidedly is it to be esteemed that circumstances control indications. Undeniably is it the case that oral teeth are met with afflicted with such seat and character of decay that question narrows itself at once to extraction or to filling with an alloy. An incisor or cuspid tooth, for example, broken to the point of disfigurement, and of a frailness denying sufficient promise from the use of gold, and being of root character denying thoughts of pivoting, finds a contouring advantage from the use of amalgam of an indicated character which seems to be almost everything that could be desired. Amalgam, again, applies as ease and facility in working are concerned; with care and time any kind of a case may be entered upon with assurance as to a satisfactory outcome. A bicuspid tooth with but a trifle of its inner wall remaining intact is to be started below with submarine alloy, built into form with standard alloy, and, if desirable, faced with a zinc amalgam, the operation being found invaluable by its possessor. Certainly, as the experience of the writer is concerned, he finds himself able to refer to cases treated in the manner suggested where not only satisfaction but pride was felt in the accomplishment.

Large cavities in teeth, associated with a limit of dollars in pocket, finds great good in the direction of alloys; a plug of amalgam is to be preferred on every score to a plate tooth.

Amalgam is to be accorded its advantage, as relation is held with dental workers at large; few can fill teeth perfectly with gold; a judicious use of amalgam is to be accomplished by almost any one who will take time to try.

Objections to the use of amalgam relate most markedly, if not exclusively, to immediate local effects. As a rule all the preparations discolor; some more, some less. Teeth in which the material is used lose their translucency,

darken, and sometimes blacken. A second fault relates with porosity of surface; this being influenced markedly by the character of alloy employed, but it is so common as to compel recognition. Relation with galvanic electricity is another objection; where an amalgam-filled tooth has a gold band placed about it, galvanic action immediately results; a condition adverse to the health of tooth-bone and markedly irritative to the pulp. As here the irritation of the pulp is concerned, the effect is obviated by removing the plug and interposing between it and the bottom of the cavity a layer of oxychloride of zinc introduced dry as possible, or else using a portion of gutta-percha. Other means applied to the same end are found in varnishes, slips of adhesive plaster, layers of quill scraped very thin, oiled silk, etc. To antagonize effects on the tooth-bone is a less easy matter. Here it is recommended that the polish of the gold be removed by subjecting it to the action of a flame, and that, if the face of the plug be bright, it be smeared with a coating of an amalgam that tends to rapid and persistent blackening. Wrapping a spring with silk thread is a means,—a dirty one, however. Still another is found in mercury-coating the inside of the clasp,—that is, touching it with a film of the metal. A method that is to be tried with a certain extent of good effect consists in the free use of alkaline mouth-washes.

Putrescency of pulp, so frequently found in conjunction with amalgam fillings, is to find explanation most commonly in a chronic inflammation, which has resulted in death of the organ, the cause being extent of decay and size of plug mass rather than character of material; the same explanation applies to conditions of periostitis, ulitis, ostitis, caries, and necrosis of bone as found in connection with amalgam.

Temporary salivation (not of systemic meaning) is in rare instances attributed to the presence of amalgam in the teeth; such ptyalism is found quite as frequently associated with newly-placed gold or other plugs; it is very common as a sequel to surgical performances done on the jaws.

Bad taste in the mouth is another of the implied objections to amalgam; it is worthy of consideration here whether lack of cleanliness rather than influences of the alloy is not the root of an explanation. Amalgam fillings in approximal relation are not infrequently so indifferently placed as to form receptacles for the accumulation of debris; the writer has met with many such cases.

Systemic complications in relation with amalgams are unknown to the author; it is not impossible that idiosyncrasy exists in the direction, but assuredly the cases must be rare where observation extending over thirty years has failed in showing a single instance.

The place for, and the use of, amalgam, is to be decided by the judgment of an operator, and in proportion as such judgment is good or bad so is a patient served or abused. Amalgam is unsightly when compared with gold, consequently as an æsthetic aspect of the question is concerned, it is not suited to exposed situations. Solid and highly burnished plugs of gold be-

BIBLIOTHECA