

**A practical treatise on the operations of surgical and mechanical dentistry  
/ by Samuel C. Harbert.**

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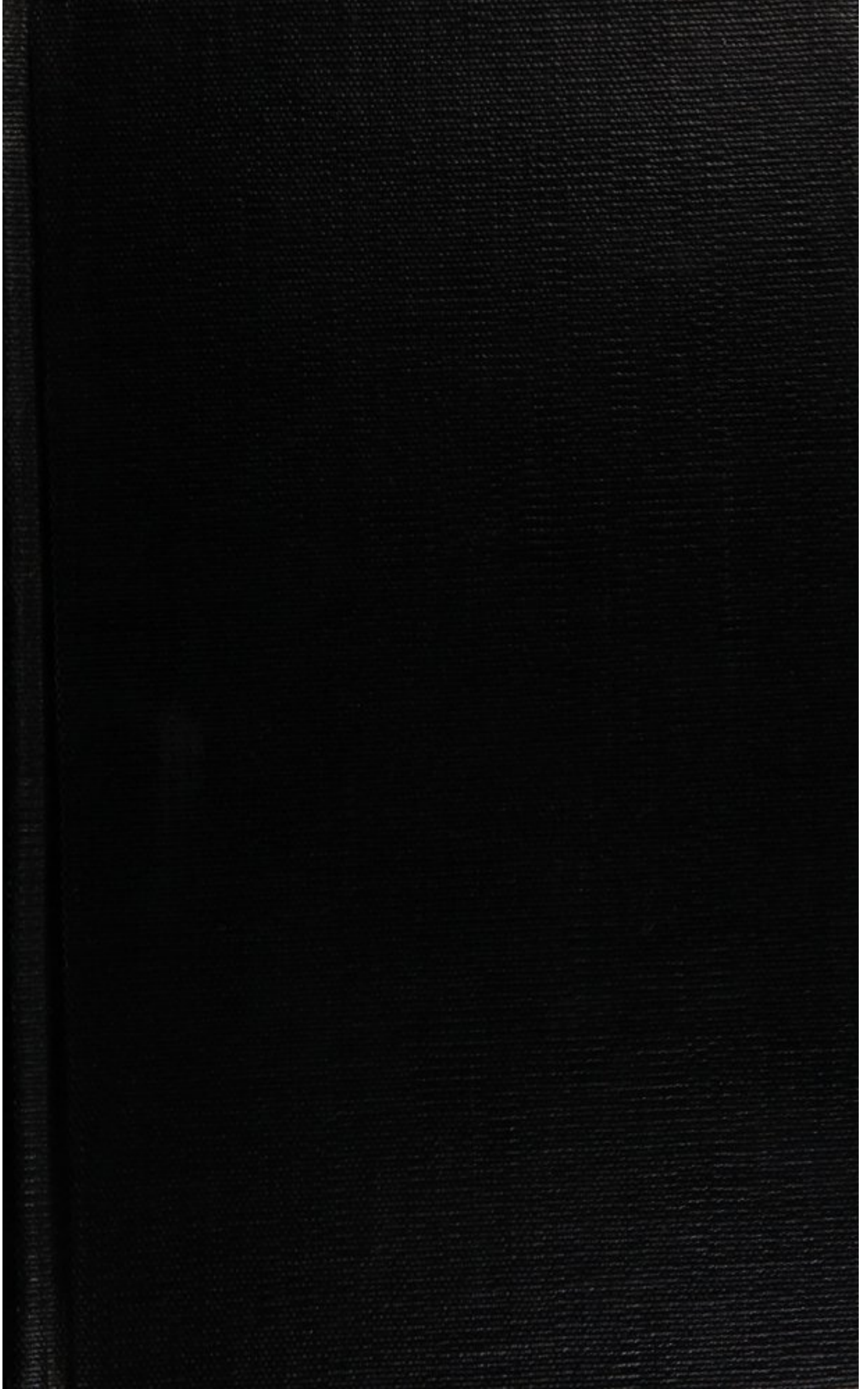
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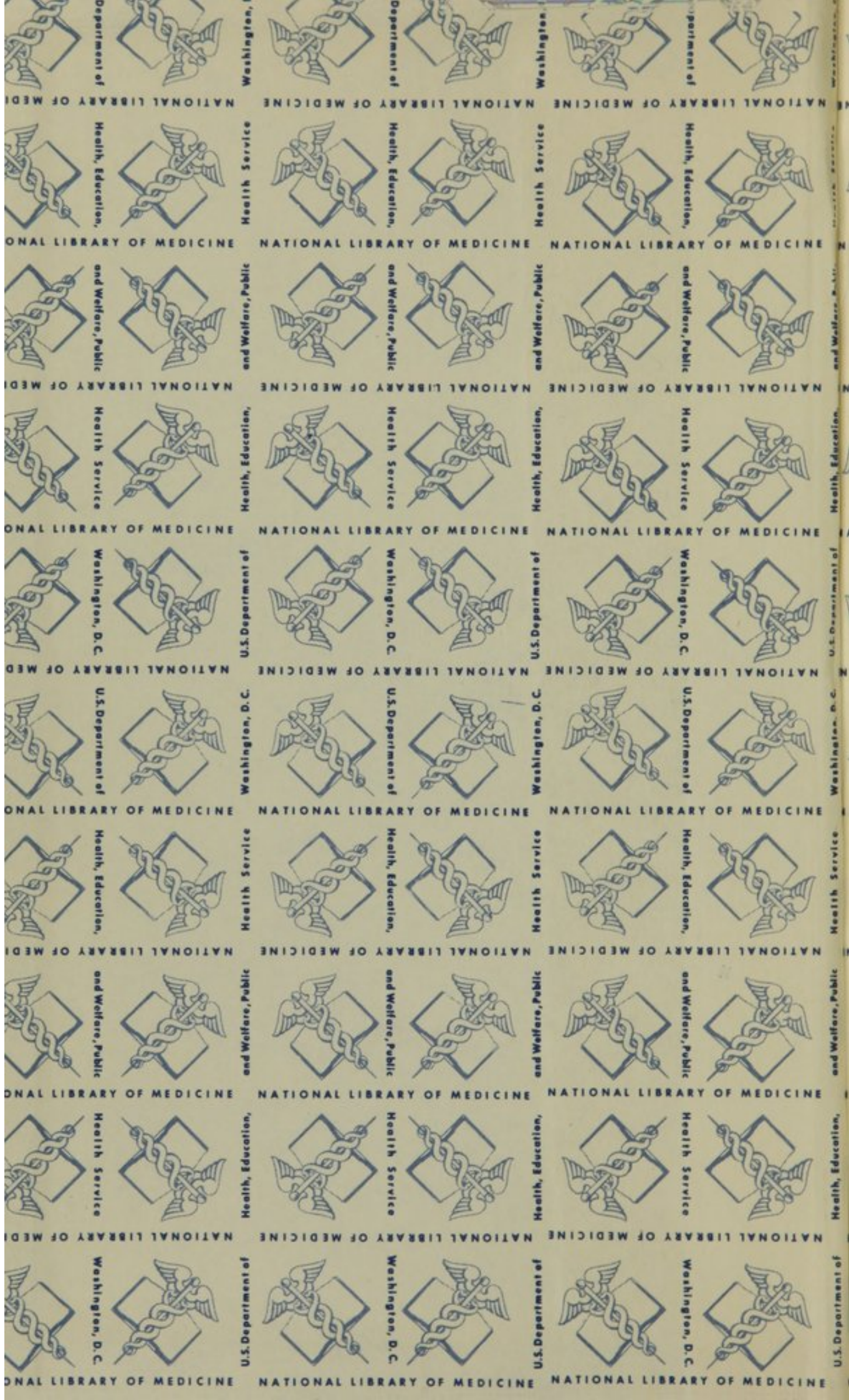
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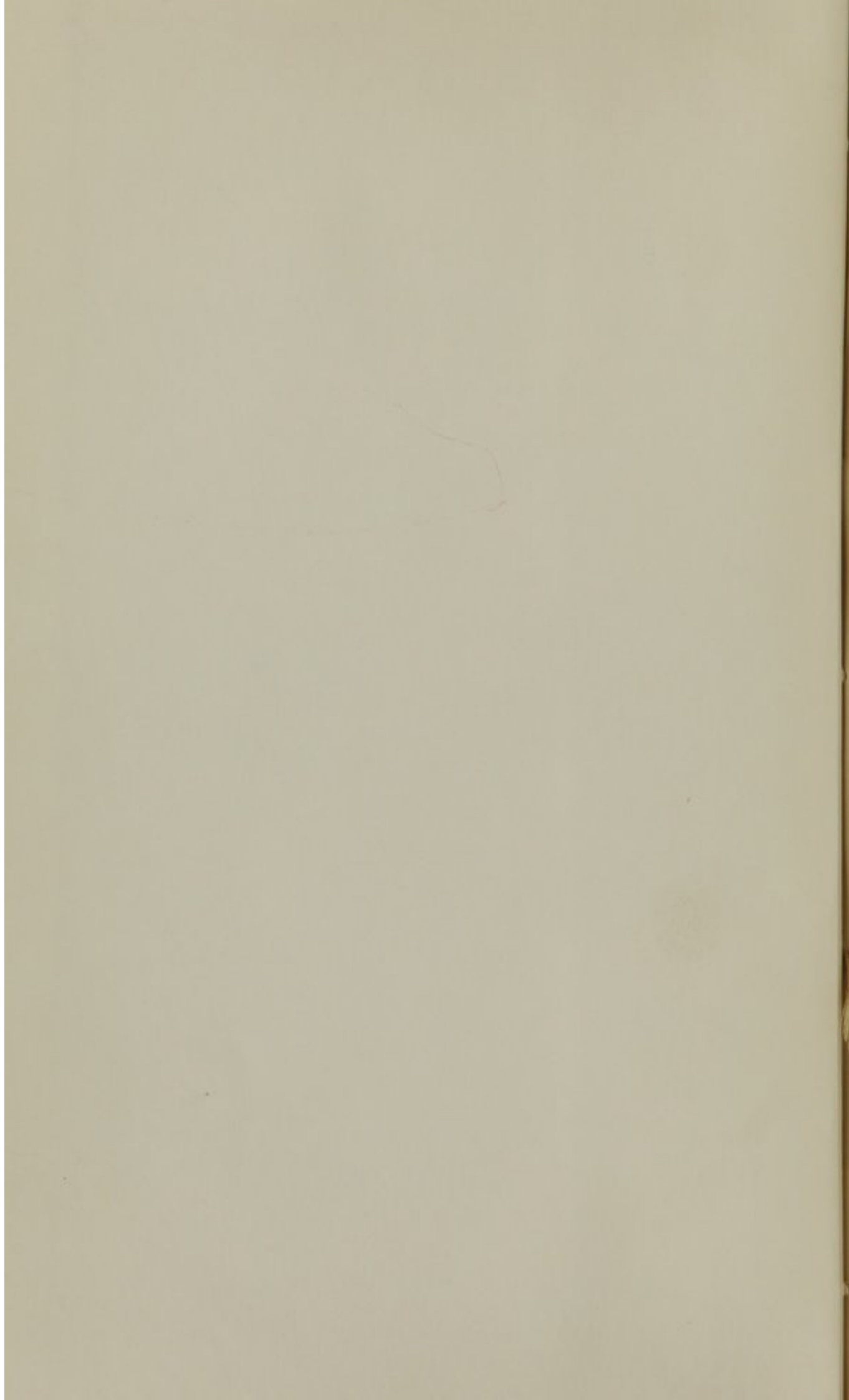
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# PRACTICAL TREATISE

ON THE OPERATIONS

OF

SURGICAL AND MECHANICAL

DENTISTRY.

BY SAMUEL C. HARBERT,

SURGEON DENTIST.

~~~~~  
"Tu rem impeditam et perditum restituas."—Terence.  
~~~~~



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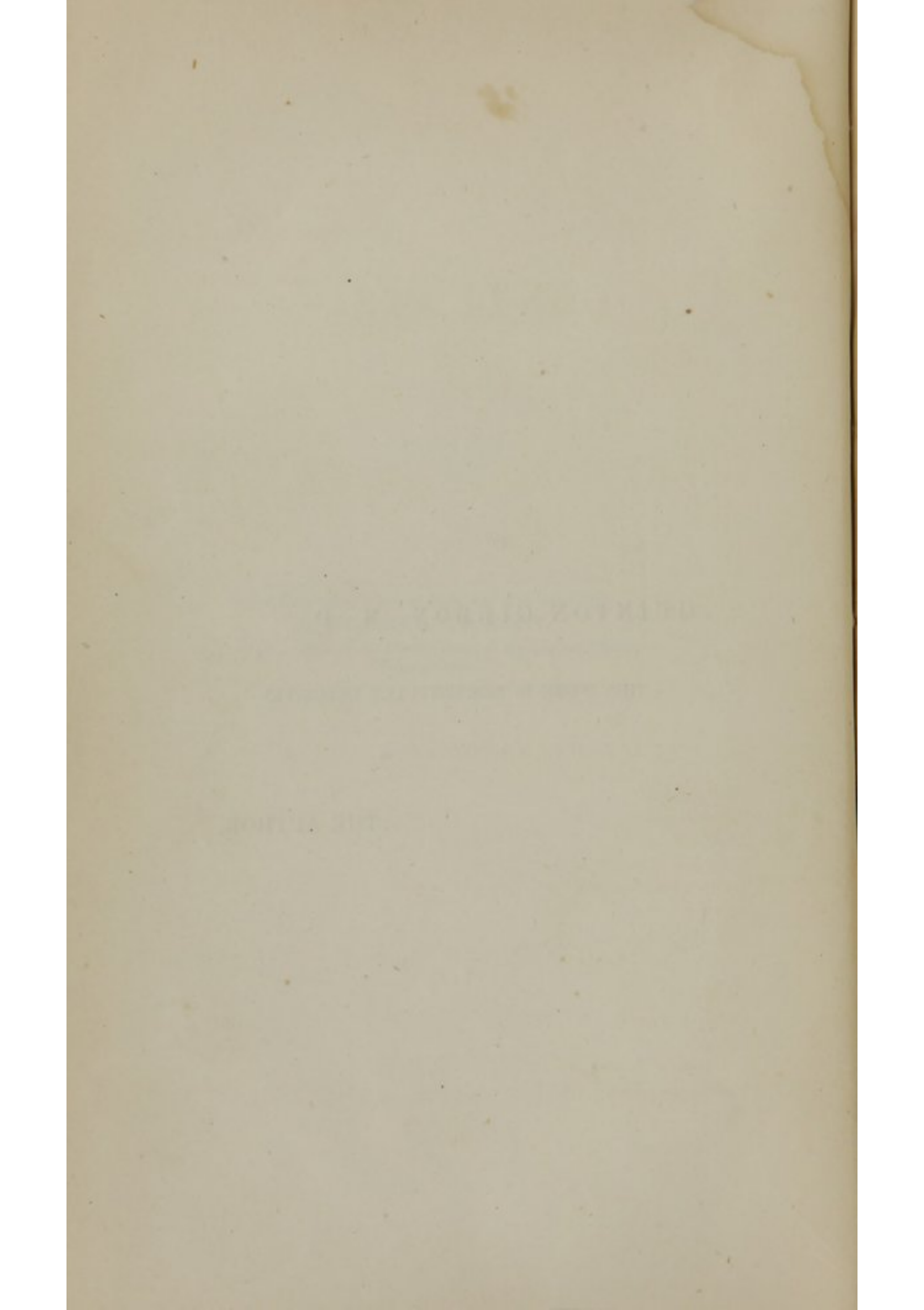
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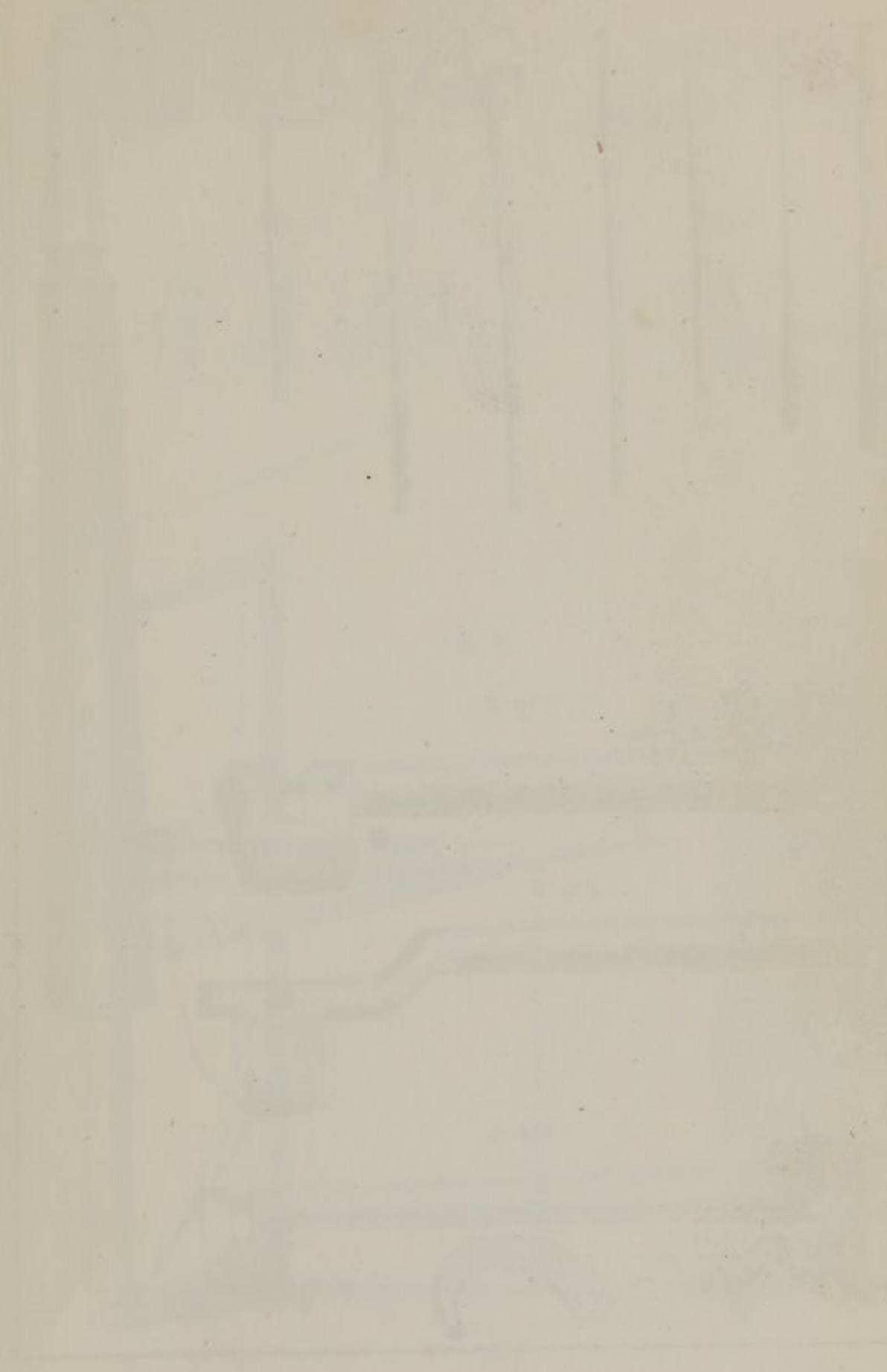


Plate I.

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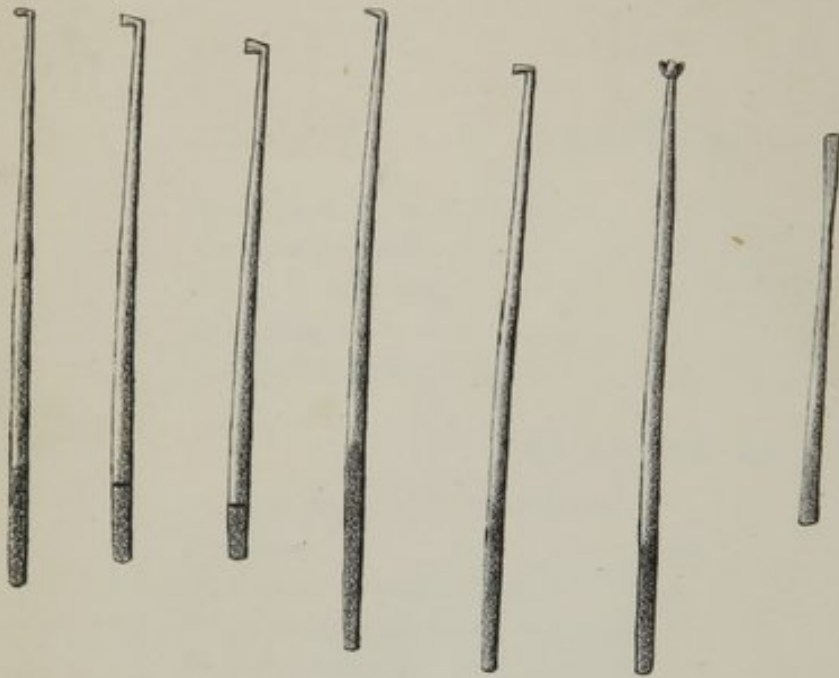


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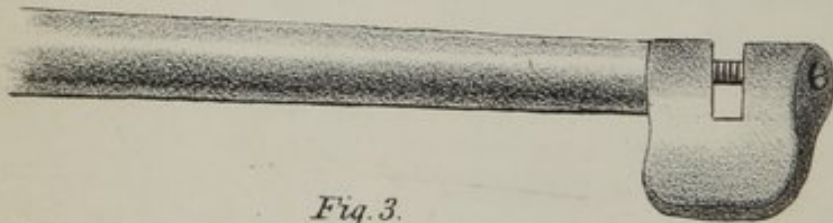


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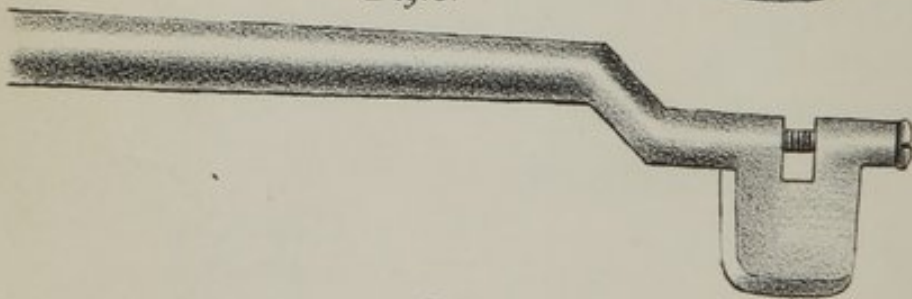


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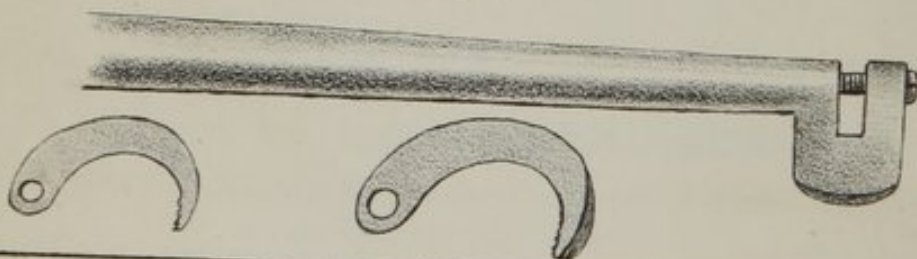


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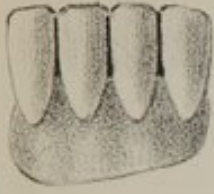


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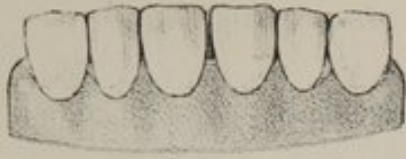


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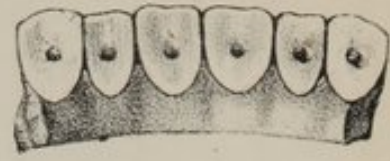


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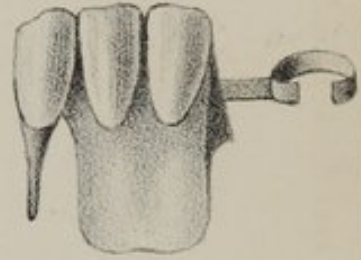


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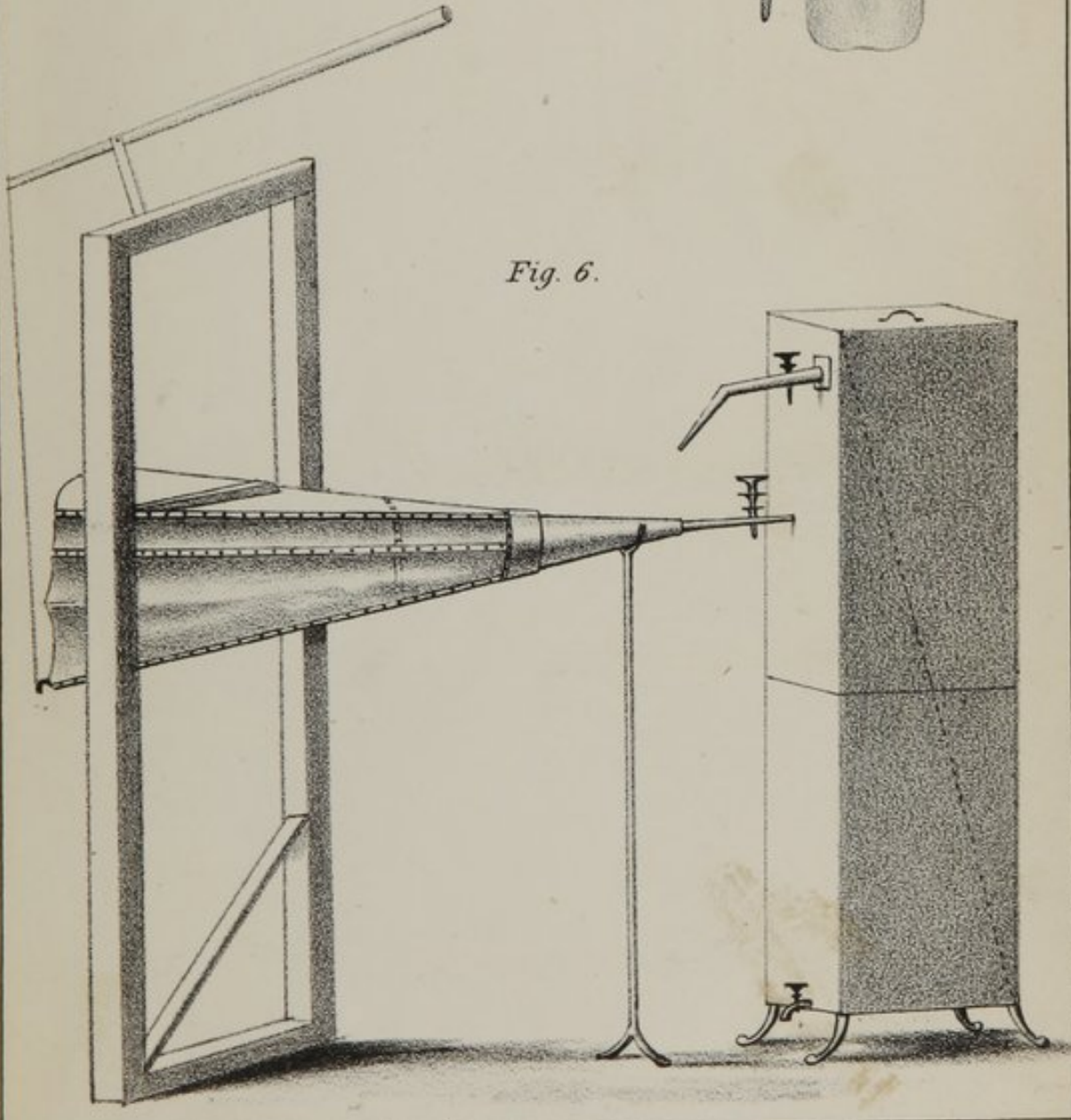




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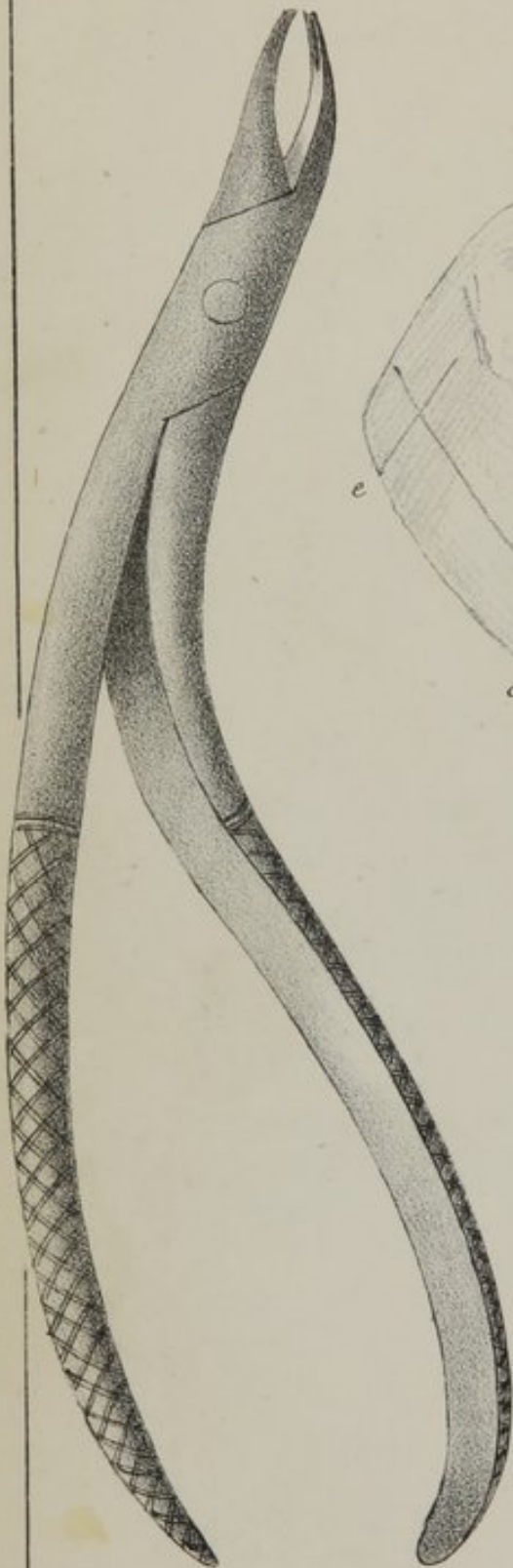


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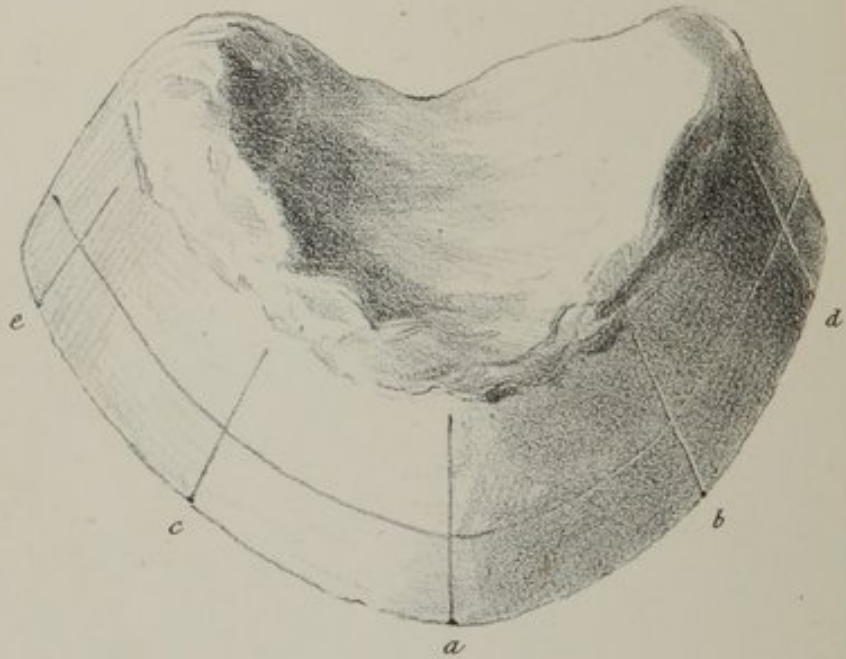


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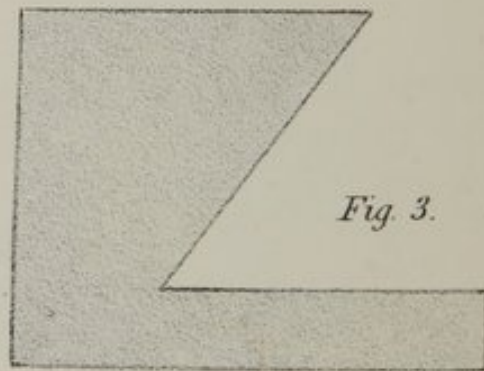


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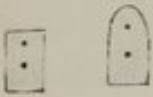
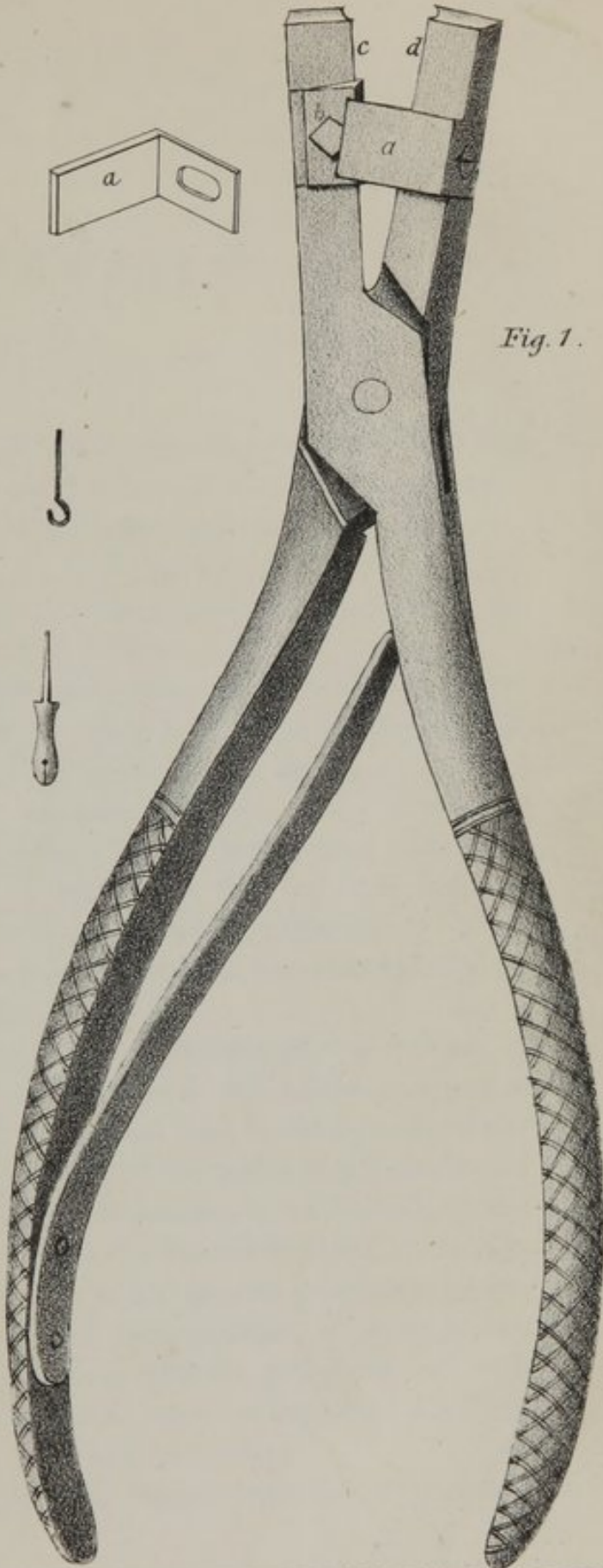
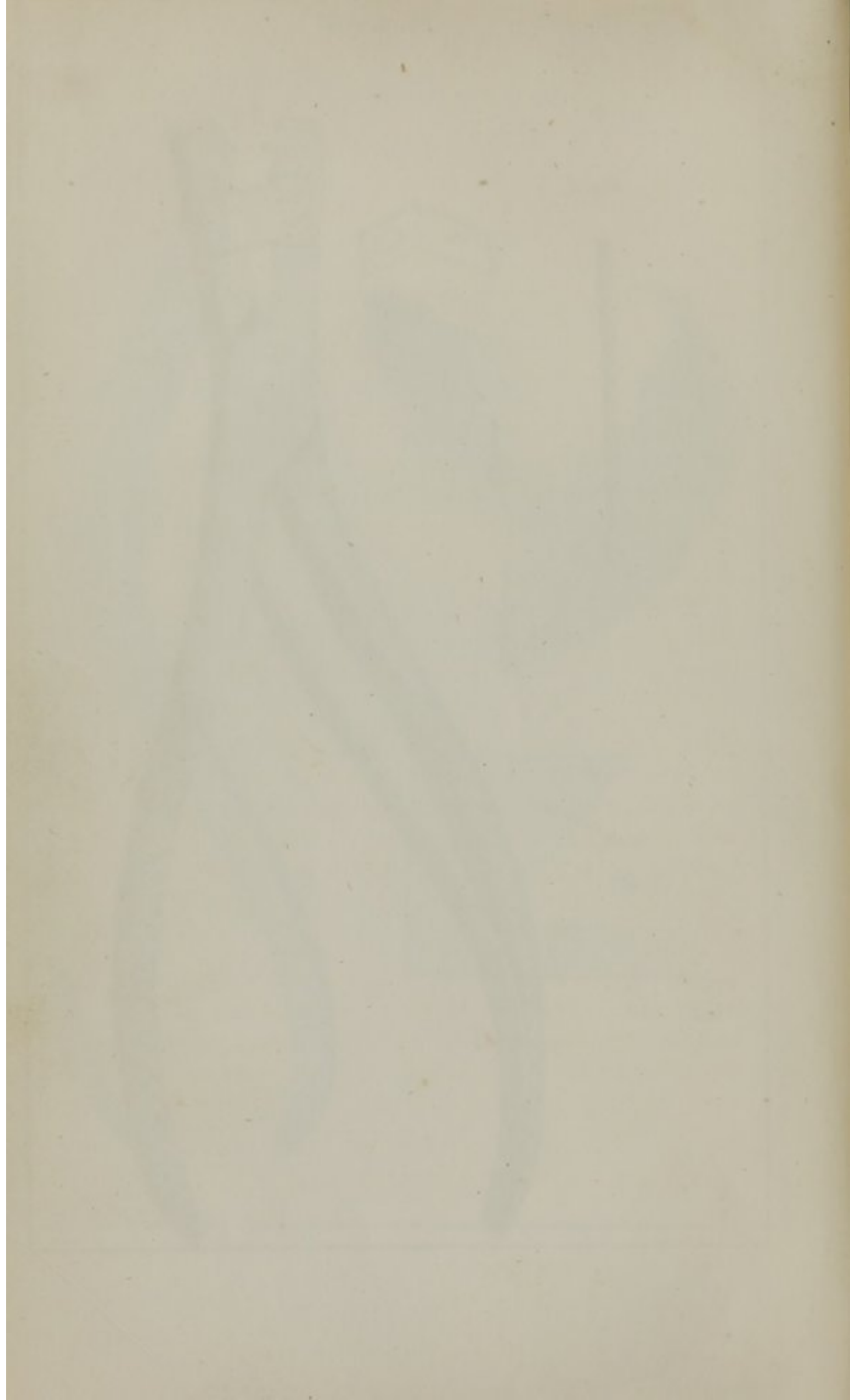


Fig. 1.





## P R E F A C E .

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THE Science of Dentistry has, in accordance with the advancement of the art, become divided into two separate branches : that of Dental Surgery appertaining to the operations on the teeth in their natural condition ; and the mechanical, or that part which provides a substitute for the deficiencies that occur in nature.

Several useful works have been published on the operations of Dental Surgery, while the mechanical department, as yet in its infancy, has received but little notice. The manipulations and valuable formulas, essential to the proper performance of the art, have been almost universally held under the seal of secrecy, so that but little becomes known except it be acquired by actual experiment. Many recent discoveries and improvements have conduced to its importance and usefulness.

It was designed, in the publication of this volume, to endeavor to fill an existing void in the mechanical part of dental practice, and, at the same time, to aid the practitioner in Dental Surgery by means of the author's experience and research. That nothing more remains to be learned, or that the author has revealed all the known facilities of the art, he does not pretend, but, in the general principles, he has striven to impart, from his own practice, all he considers important and useful, which, with the judgment and skill of the artizan, he hopes will prove an important auxiliary in the duties of the office and laboratory.

With regard to a full and explicit execution of purpose,

more attention has been paid to perspicuity of style and manner, than elegance of diction or perfection of language. A life of practical experience, exercised with the growing operations of the art, and in the theatre of its most successful experiments, form the basis of the writer's resources, from which he has drawn liberally and unreservedly, withholding nothing he considered important in the prosecution of the dental art, and advancing no speculative theories calculated to deceive or bewilder the operator.

To a more thorough knowledge of the pathology and physiology of the teeth, together with the anatomical structure of the system, or that part upon which the functions of the teeth depend, the student is referred to some of the many and valuable publications extant; as this work was not designed for such a purpose, it will be found inadequate to a thorough acquirement of it.

# DENTAL SURGERY.

---

## CHAPTER I.

### THE HISTORY AND IMPORTANCE OF THE DENTAL ART.

THE necessity of knowledge in the anatomical structure and organization of the teeth, and the treatment of diseases to which they are subject, are matters of more importance than would be inferred from the practice of a majority of dental operators, who, content with the merest exhibition of mechanical ingenuity, and more frequently depending upon the assistance of adjuvants to the profession, without reference to the physiological laws that reflect upon diseases of the teeth, operate in all cases alike, and determine the fate of an unhealthy organ, by filling or extracting it, sometimes to the serious inconvenience and comfort of the patient, or to the actual loss of a valuable member, that might have been, by judicious treatment, preserved for life.

It is a lamentable fact, that the dental profession is, to a considerable extent, in the hands of charlatans and imposters, who willingly sacrifice every principle of honor to the prosecution of their deceptions, and their own aggrandizement. No penal enactments can reach them, and by their insidious arts and schemes, they conceal the real character of their operations until too late to avoid them.

These remarks, of course, are not designed to apply to the mass of dental operators ; such a declaration would be the supremacy of folly and injustice. The superior qualifications and eminent abilities of a host of practitioners, in this and other countries, are too well established to be effected by the mere exposition of a common evil.

A ray of hope has dawned upon the dental art in this country, by the establishment of collegiate institutions in the cities of Baltimore and Philadelphia. I am aware, though I regret the fact, that a great amount of jealousy exists in the fraternity, which circumstance must necessarily retard the operations of a dental institute ; but the object and the effect of such institutions cannot fail to eventually awaken a proper spirit of interest and liberality of feeling, and give an impulse to the profession which will elevate it to a position equal to its kindred art, that of medicine ; with such a prospect only, can a hope be cherished of relief from the flood of empiricism by which this country is deluged.

The science of dentistry has made but a slothful progression when compared with other arts ; that it attracted the attention of the ancients is evident from the writings of Hippocrates, the most eminent of ancient physicians, and who was considered the father of medical science. He was born 460, B. C. In his writings he treated of the diseases and functions of the teeth. Celsus, a Roman physician, of the Cornelian family, who lived under the reigns of Augustus Tiberius and Caligula, was born either at Rome or Verona. He wrote various works, but his Treatise on Medicine, in eight volumes, was his chief production.

Therein he also referred to the diseases of the teeth and their remedies. The works of many other celebrated physicians of antiquity, from their time, have established the fact that the teeth have received the notice and attention they were capable of, but not with the same degree of excellence and perfection of art of later years.

---

### THE NECESSITY OF A PROPER REGARD TO THE HEALTH AND PERMANENCY OF THE TEETH.

THE value of the teeth as auxiliaries to the support of life, is seldom fully understood or justly appreciated. Nature has endowed man with certain faculties, performing specific and positive functions—the destruction or incapacity of either must produce injury, in a corresponding degree, to the physical or mental structures; among the most valuable and important of which are the teeth, a set of nicely adapted organs, designed for the comminution of food, preparatory to its reception into the stomach, and for the formation and articulation of words. They are, notwithstanding their silicious structure, constantly liable to disease, and in that condition exercise a varied and injurious influence on the general health—first, by preventing or interfering with the mastication of food; secondly, by exciting the nervous system; thirdly, the vitiating effect which they impart to the atmosphere inhaled into the delicate structure of the lungs; and, fourthly, their sympathetic influence upon the gums. The necessity of a proper division of the food, to prepare it for the action of the

*Mastication*



gastric juice, is evident from the numerous experiments that have been made, many of which have been conclusive and satisfactory.

The effect of an aching tooth upon the nervous system, has been experienced by almost every one that has attained to mature age ; few, indeed, escape its torturing influence—and such as have endured, can testify to the aching head, and violent pains in the face and jaw, occasioned by it. Diseases of the lungs may be frequently traced to the inhalation of an impure air, and no more immediate or active medium can exist than ~~a canal lined with~~ carious teeth, filled with putrid matter. The healthy condition of the teeth and gums depend reciprocally upon each other : disease in the one produces a corresponding effect in the other ; pain in the teeth causes inflammation in the gums with all its resulting evils. “ Abscesses of a serious nature are frequently produced in the gums by cold striking against the nerve of a decayed tooth. This state of things is not unfrequently characterized by severe general symptoms, such as pain, first centered in the gum, extending itself to the eye, nose and ears ; headache, restlessness, catarrh, cough, occasionally diarrhœa and dysentery ; dejection and oppression of spirits, fever, unusual irritability, furred tongue, spasms, fits and convulsions ; in females, high fever and delirium.” Tumors, scurvy, sponginess of the gums, and a variety of other affections, that exercise an injurious tendency upon other parts of the system, may be frequently referred to decayed teeth.

~~A French writer has said,~~ “ A mouth without teeth is a mouth with charms.” If such an hypothesis is correct

and who can doubt it, we have, independent of all other motives, a sufficient one to induce a proper care of the teeth, for with the decay or loss of any one a proportionate arrival to such a condition is effected, and the first, if not the greatest part of female beauty is destroyed; again, a pleasing countenance meets the eye, and we are almost led to exclaim "how beautiful." She smiles, and all our raptures vanish before an array of diseased and blackened teeth, or, perchance, a breeze wafts to our sensitive olfactories a breath contaminated by the unwholesome medium, and we turn away sickened and disgusted. The savages teach a lesson in the care and attention they bestow on their own teeth, though the peculiar operations they perform on their masticators are by no means worthy of imitation. The following remarkable instance of a disregard of the value of the teeth, appeared in evidence of the abandoned and intemperate character of a woman; for the credit of human nature such instances of depravity are seldom met with.

After making way with all her substance, and being without the means of procuring drink, she actually sold all her teeth but two, to procure her favorite beverage, gin. The price she received was fourpence each.

History tells us that the teeth were regarded in ancient times as a feature of beauty. Ovid says:—

“Let not the nymph with laughter much abound,  
Whose teeth are black, unseemly, or unsound.’ ’

Cicero compared the teeth with the strings of an instrument, which modify the sound. Indeed every evidence is presented to us of their usefulness, and the necessity of proper skill in the culture of them.

*care*

## MASTICATION.

MASTICATE is derived from the Latin verb mando, signifying to chew or grind with the teeth.

The process of Mastication is performed with the aid of the muscles of the lower jaw, by which the food is cut off by the incisores, and carried back to be divided and reduced to a state of comminution ; through the action of the molars, it is then prepared for deglutition, and final reception into the stomach.

“No one can enjoy health, unless the digestive process is well performed, and as an indispensable preliminary to perfect digestion, the food must be thoroughly masticated, finely divided by the teeth, the organs provided by nature for that purpose, or by some artificial means ; it is therefore important our meals should not be swallowed in haste, for it is absolutely impossible that food can be prepared to enter the stomach with the rapidity that meals are generally dispatched at our large boarding houses. Eating in haste causes more dyspepsia than error in quantity or quality of food ; besides it shows too much of the animal in our nature, a kind of greediness that may, with propriety, be dispensed with. The Americans are very generally and very justly, too, accused by other nations of being unsocial at their meals ; of making it a business, and dispatching it as if it were an unpleasant task ; sociability at meals tends to a good effect in two ways ; first, by protracting the time, we eat much slower ; and, second, by cheerful conversation the due performance of digestion is greatly facilitated.”

In consequence of the necessity of having the food tho-

roughly chewed, those who have bad teeth are peculiarly liable to derangement of the digestive organs, but since the science of Dentistry has attained to the perfection it has, most people have within their reach the means of supplying themselves with artificial teeth, answering very well all the purposes of mastication.

Dr. Beaumont in his experiments, introduced different articles of food directly through an orifice in the side into the stomach of a young man, upon whom he experimented; and he says, “that the process of mastication, insalivation, and deglutition, in an abstract point of view, do not in any way affect the digestion of food; or, in other words, when food is introduced directly in the stomach, in a finely divided state, without these previous steps, it is as readily, and as perfectly digested, as when they have been taken,” thus exhibiting the necessity of comminution or mastication alone to the proper digestion of food.

---

## THE ANATOMY AND PHYSIOLOGY OF THE TEETH.

THE teeth differ in their organization from the other bones of the system; they are composed of two distinct substances, the body, or bone of the tooth, which is vascular and extremely sensitive; and the enamel or that portion which covers the crown of the tooth, and serves as a protection for it from the effect of external action. Anatomically, the

tooth is divided in two parts; the crown being the exposed part, and the fang or root, situated in cavities, in the upper and lower maxillæ, called alveolar processes, between the edges of the alveolar and distinct line of division; between the fang and crown, the gum is attached. The teeth are held in their sockets by the intervention of a membrane which embraces the roots and is firmly attached to the gum at the neck of the tooth—called the periosteum; this membrane exercises an influence upon the permanency of the tooth, and its retention in the socket that demands for it a remedy against the causes that lead to its destruction; as it is supported by vessels leading from the gums, care is requisite to keep them in a constant state of health, otherwise teeth that are perfectly sound being deprived of the means of nourishment and support, may fall victims to a disease of apparently less consequence than that of caries.

The body of a tooth in a healthy state is of an opaque slightly yellow color, and the enamel of a bluish white appearance; sometimes the enamel inclines more to the yellow, and frequently both colors are found blended on the same tooth, the yellow next the gum and the blue near the cutting edge; the deep yellow or green found on teeth, generally is attributable to depositions of salivary calculus; the incisors are mostly of a lighter shade than the other teeth. The seed of the teeth is a mucous matter like albumen deposited in the cells of the jaw bone, and continues to grow until it obtrudes through the gum. The rudiments of two sets are found very early in the fœtus. Mr. Bell thus describes that very curious process, “About two months after conception, if the jaws be examined with

care, an extremely soft jelly-like substance is found lying along the edge of each maxillary arch. At the third month this has assumed rather a firmer consistence, and contained within a shallow groove of bone, which constitute the first step towards the formation of the external and internal alveolar plates. At this period the pulpy substance becomes partially divided into two distinct portions, and corresponding filaments of bone are seen shooting across from one side to the other of the bony groove, to form the future transverse divisions of the alveoli. These pulps are the rudiments or basis upon which the teeth are formed. At this time they lie upon the vessels and nerves which run along the bottom of the groove; they are very soft, gelatinous and semi-transparent; and each is partially enclosed in a membrane or sac. At the fourth month, if the sac be opened a small point of ossification is found to have been deposited upon certain of the pulps, and this is the commencement of the formation of the bony substances of the teeth."

The analysis of the human tooth, according to Berzelius, in the enamel is in 100 parts.

Phosphate of Lime,	-	-	85.3
Fluate of Lime,	-	-	3.2
Carbonate of Lime,	-	-	8.
Phosphate of Magnesia,	-	-	1.5
Soda and Muriate of Soda,	-	-	1.
Animal Matter and Water,	-	-	1.
			<hr/>
			100

In the bone is,

Phosphate of Lime,	-	-	-	62.
Fluate of Lime ,	-	-	-	2.
Carbonate of Lime,	-	-	-	5.5
Phosphate of Magnesia,	-	-	-	1.
Soda and Muriate of Soda,	-	-	-	1.5
Gelatine and Water,	-	-	-	28.
				<hr/>
				100

The first sett of teeth are less dense than the succeeding ones. The enamel of the tooth is formed by secretions from its pulp, which are thrown out upon the cutting edges of the incisores and the points of the molar teeth, until it extends over the whole surface of the crown, depositing a thin crust of enamel; the cavity of the pulp gradually fills up with bone in the formation of the tooth, leaving but a small orifice, extending through each fang to the centre of the body of the tooth; this canal is supplied with nerves and blood vessels, that ramify through the bony structure of the tooth to its surface, affording it nourishment and sustenance. The enamel serves as a protection to the nervous sensibility of the tooth, to its confines, the edge of the alveolar. If by accident or decay, any portion of the enamel be removed, the internal and vascular part of the tooth will be found extremely sensitive, and so continues, until the sensibility is removed by exposure or the application of caustic agents; the same effect will ensue by a displacement of the gums, a circumstance often caused by depositions of tarter.

Dr. Wesley, in his work on Natural Philosophy, says

that the teeth only, of all the bones, grow in length during a man's whole life. Dr. Wesley, though very learned in many features of animal mechanics, and philosophical facts, nevertheless has certainly committed an error in the advancement of the above theory ; he has very probably been led into such a conclusion from the gradual displacement or elevation of a tooth upon the loss of its antagonist.

Another writer, referring to the reproduction of osseous matter in the animal system, says, it is very pleasing to observe the different means employed where a slight change of circumstance demands it. This earth of bone—the phosphate of lime—is changing continually, but the teeth admit of no change ; bodies calculated for such violent attrition, and with a surface so hard as to strike fire with steel, would be ill accommodated with such a property of changing as we find in the bones. They must, therefore, fall out and be succeeded by new ones, and this process, familiar as it may be, is very curious when philosophically considered. There are no teeth whilst yet the infant is at the breast ; and when they arise they are attended with new appetites and a necessity for change of food. When perfected they form a range of teeth, neat and small, adapted to the child's jaws and the size of its bones ; were they to grow at once, or to fall out at once, it would prove a disturbance to the act of eating. They fall in succession ; their fangs are absorbed ; they are loose and jangling, and are easily extracted. But now comes the question. Why are the teeth of the infant old at six years ? Why are those that are to succeed and be stationary for a series of years, to germinate and grow at the



appointed time, like the buds in the axilla of a leaf; and when fully formed, why do they remain perfect for sixty years instead of six, at the end of which time the first were old and decayed. No difference can be observed in the material of the first or second set, the one will be as perfect as the other after remaining one hundred years in the charnel house. Can any one refuse his belief, then, when he sees so accurate a mechanical adaptation of the teeth to their places and offices. Can he, we say, refuse assent to this, also, that there is a law impressed, a property by which the milk-teeth shall fail and be discharged from the jaw in six years, whilst the others will last the natural life of the adult, if not injured by accident or decay, to which all parts are subject.

The infant or first set are twenty in number.

The succeeding, or permanent set, when complete, are thirty-two in number, and are arranged in each jaw in the following order :

Two large or central incisores.

Two small or lateral incisores.

Two cuspidati or eye teeth.

Four bicuspidati.

Six molares.

The posterior molar, situated at the angle of each jaw, is commonly called the wisdom tooth, from its appearance at that age known as the period of discretion.

## CHAPTER II.

### FIRST DENTITION.

THE time of teething is with children the most dangerous period of their lives; the eruption of the first set is generally attended with great irritation and severe constitutional affection.

The period of first dentition varies according to the health and vigor of the constitution. Children that are strong and healthy generally commence to cut their teeth at the fifth or sixth month; occasional instances have been known of their appearance at the fourth month, and even at birth; with those of a delicate frame the process is more tedious, and is sometimes delayed to the tenth or eleventh months; the teeth continue to advance in pairs, at intervals, until the second or third year, by which time the deciduous dental arch is complete. No definite rule can be laid down for the time and order of their approach, as it varies so much under different circumstances. The following may be regarded as a fair proportionate average:

The Central Incisores, at seven months.

“ Lateral “ at nine “

“ First Molares, at fourteen “

“ Cuspidati, at eighteen “

“ Second Molares, at thirty “

The lower teeth precede the upper ones about two

months ; the reverse sometimes, though very seldom, occurs. The process of first dentition cannot be too carefully guarded ; for from it, not unfrequently arises the origin of many diseases that are revealed later in life.

The irritation that precedes the cutting of the deciduous teeth is occasioned by the pressure of the advancing tooth against the investing membrane, and is in accordance with the proportionate absorption of this membrane and the growth of the tooth.

The approach of the teeth may be known by severe general symptoms ; the child becomes fretful and peevish ; the salivary glands secrete more freely ; drowsiness follows, attended with a moderate diarrhœa. These symptoms are the operations of nature in her efforts to counteract the more dangerous consequences, and as they are influenced by the teeth that have produced the irritation, subside upon the eruption of those teeth.

It is, however, frequently the case, that the process of first dentition becomes more alarming and dangerous ; the disease assumes a constitutional character ; the fever increases, attended with an excessive diarrhœa, or, as it sometimes occurs, ceases entirely ; the breathing becomes more difficult, and the little sufferer writhes under severe pain ; spasms take place, succeeded by occasional fits, terminating, unless speedily relieved, with the patient's life.

The treatment of these diseases should be constitutional and local, observing a proper regard in the condition of the bowels, and immersing the child in warm water, which, with other remedies on the surface of the skin, produce a counter termination of the blood from the brain. An

immediate and the exciting cause should not be forgotten—the pressure upon the gum should be relieved.

This operation has been the subject of much groundless opposition, but the objections are rapidly disappearing before the advancement and revelations of science, and it is now performed by almost every practical medical or dental surgeon.

For a proper convenience and success in lancing the gums, the operator should possess a curved lance, with a broad, round point, made very sharp; and with it, incise the gum, parallel with the edge of the approaching tooth, making also a transverse incision across the centre of the first, and pressing the lancet in the gum until it is felt against the hard substance of the tooth.

Such is the relief often afforded by this operation, that I have known children who have suffered severely for several days, to immediately cease from crying as soon as the instrument had penetrated the gum, and seem rather to court than resist the operation.

A very cruel practice of nurses and parents cannot be too much condemned, I refer to the frequent habit of rubbing the gums with coral or their thimbles; it not only inflicts useless and unnecessary pain, but may occasion more serious consequences.

When the deciduous teeth have all made their appearance, and the jaws of the child are filled with their compliment, then another and responsible duty devolves upon the parent or guardian. As this set is designed for an especial and preparatory purpose, any thing operating prejudicially must be attended with future evil.

A proper care should be exercised for the retention of

these teeth in health and cleanliness, until they are superseded by those which are to follow, the necessity for which may be explained by two reasons. First. As nature provides, by absorption of the fangs of the deciduous teeth, their removal to give place to a succeeding set, so any thing acting contrary to that economy must be more or less liable to occasion derangement in their progression and character. Secondly. As many of the teeth of both sets exist in the mouth at the same time, and as contamination is a fruitful source of decay, another and very powerful evidence presents [itself of the necessity of health in the deciduous teeth. The use of a tooth-brush of a proper form and size becomes necessary at an early age, in order to remove the deposite that settles upon the teeth, in their indentations and interstices.

This process must be performed by the parent until the child has learned the use and object of the brush; it is sometimes necessary to employ dentrifice, of which care is necessary in the selection. An equal proportion of orris root and prepared chalk, finely pulverized, is all sufficient.

When caries has taken place in the molar teeth, they should be filled, as it is very important that they be retained until thrown out by the process of absorption. The premature extraction of these teeth is likely to occasion bad results, and should only be resorted to when all palliative remedies fail. As this set of teeth is only designed for a temporary purpose, and the increased energies of the child require a different kind of aliment, they give place to, and are succeeded by a set larger and stronger, and better adapted to the purposes of the adult.

## SECOND DENTITION.

THE period of second dentition gives data to one of the important natural changes that take place in the life of man.

As the child depends upon the maternal breast for sustenance in the early stage of its existence, it needs no teeth, and as it advances in growth, its constitutional requirements demand a more substantial nutriment ; then nature assists with the production of a set suited in size and number to its age. But as the child increases in strength and vigor, these teeth are found inadequate, and another set, in regular progression, gradually usurp their place. In order that the mouth may not be destitute at any time of a sufficient number of teeth, the anterior permanent molares advance through the gum before the moulting of the temporary ones. As these teeth emerge behind the posterior teeth of the first set, they have less resistance to overcome, and consequently do not require the necessary absorption of other teeth to enable them to occupy their position.

The first molares of the permanent set are succeeded by the central incisores of the lower jaw, in from one to two years ; by this time, frequently the corresponding upper teeth have also advanced ; in another year the lateral incisores make their appearance ; the bicuspidates follow next in about the same intermission of time ; then come the cuspidati or eye teeth, one year after the second bicuspidates, and by the time the child has attained to the age of thirteen or fourteen years, the second molares complete the

permanent set. The wisdom teeth are very uncertain in the time of their eruption, varying from nineteen to forty, or even fifty years. These teeth have been universally classed with the permanent set, but in their general characteristics resemble more the temporary teeth; they are so called, the *dentes sapientiæ*, (or teeth of wisdom,) because of their appearance after the age of puberty, or at that time of life when man assumes a proper discretionary ability.

Second dentition is not accompanied with the severe symptoms that attend the obtrusion of the first set, owing no doubt to the increased strength and vigor of the constitution, together with the fact that a passage is opened for them by the moulting of the temporary teeth.

The means employed by nature in the growth of the second set, is concluded by an absorption of the fangs of the primary teeth, by which they fall out and give place to their more permanent successors. This order is not unfrequently disturbed; from some concealed or apparent cause the absorption is slow in comparison with the growth of the advancing tooth, and, in consequence, it is forced from its proper course, emerging upon the inside or outside of the temporary tooth.

It is with the commencement of second dentition that the importance of professional supervision is necessary, for if a proper care is observed in the regularity of the permanent teeth, many of the diseases to which they are liable might be avoided.

The pressure of teeth crowded together soon destroys

their vitality, and decay follows, which, if not speedily remedied, must eventually result in their loss.

Many of the deformities of the face may be traced to neglect in the growth of the second denture. The eruption of the incisores of the lower jaw, before the absorption of the fangs of the temporaries, frequently occur on the outside of the remaining teeth, and lay the foundation for an entire overjutting of the lower jaw, by which the upper teeth close inside, contrary to the natural articulation. The same results follow from the advancement of the superior permanent incisores inside of, and before the loss of their temporary antecedents. This malformation has frequently been supposed to be caused by an elongation of the lower jaw, when, in reality, it is almost solely attributable to neglect in dentition.

In order to assist in the regularity and order of the second teeth, the mouth should be examined frequently for the purpose; if a tooth is found emerging through the gum, opposed by a contiguous temporary one, the opposing tooth should be at once removed; if any doubt exists as to the tooth to be extracted, the one posteriorly situated is to be preferred.

The dentist should not be too hasty in the extraction of a deciduous tooth; if done prematurely, it endangers injury to the pulp of the advancing tooth, and may operate against its completion and final obtrusion; to which cause, doubtless, may be referred, in many cases, the want of certain teeth belonging to the second denture.

It seldom becomes necessary to extract a temporary tooth before its alternate has made some show of eruption,



unless effected with caries, and insupportably painful to the patient ; even then it were advisable to soothe the pain, if possible, without extracting the tooth ; in fact, this should only be a last resource. The pain may generally be allayed by the application of laudanum, a preparation of equal parts of camphor and opium, or kreosote.

Liquids should be dropped on cotton or lint, and, when placed in a cavity, covered with soft beeswax, to prevent it from mingling with the saliva.

If all remedies fail, and the tooth continues to ache, then it becomes necessary to extract it, which should be done with every possible care, to avoid injury to the approaching permanent tooth.

Parents generally entertain a misconceived opinion of the necessity of extracting a deciduous tooth, "because it is loose," and at the same time deny the propriety of extracting one more firm, that probably offers all the resistance, thus urging nature in her successful efforts, and refusing assistance when most needed.

The inferior central incisors are liable, in their protrusion, to be forced inside or outside of the primitive teeth, and as they are larger than those teeth, generally require the extraction of the laterals, as well as centrals, to give them sufficient room ; though a probable change may be made to correct a subsequent irregularity, it is highly important that it be done as early as the facts may appear to demand. Mr. Bell and Mons. Delabarre both recommend the application of a file to give space for teeth that are crowded, of which Dr. Harris says, "Notwithstanding the deservedly high authority of these two gentlemen, my own

experience compels me to reject the practice." The objections given by Dr. H. are to some degree applicable, but in my opinion do not constitute the only ground of objection.

In order to obtain the necessary amount of space, i. e. half the amount of a tooth, it requires so much to be taken from the enamel of the tooth as to expose the bony substance, and, in cases that have been presented to me, I have found a total necrosis of the tooth, that could only be referred to inflammation produced in filing it excessively, soon after its passage through the gums, done for the above purpose by followers of Mr. Bell's theory.

The superior central incisors are much larger than the same temporary teeth, and often require the extraction of the lateral to give them a sufficiency of room.

The cuspidati are the most liable to derangement, they being the last to appear, excepting the posterior molares; oftentimes the whole circle is filled by the permanent teeth, which have already protruded, and the cuspidati find egress only through the upper parts of the gum, on either side of the dental circle; when this occurs the second bicuspid should be immediately removed; in fact it should be performed in anticipation of the arrival of the cuspidati, if circumstances warrant it; the anterior bicuspid will soon fall into the place of the one extracted, and the cuspidati will assume its proper place.

I cannot conclude this subject without recommending especial attention to the health, as well as the beauty of the arrangement of the permanent teeth. It is frequently the case, that the first molares decay in a few months after

their eruption, and as they follow the deciduous teeth so soon, parents are deceived, believing them to belong to the first set, consequently they remain indifferent to the preservation of them.

The dentist should, on every occasion, when consulted in reference to the dentition of children, explain the character of the different teeth, and the mode of treatment to be pursued; the use of a tooth-brush should be urgently recommended, and any decay that may insiduously enter upon the teeth, remedied or removed at once; for which the operator will enjoy the satisfaction and reputation of having been the means of securing a sound and well-arranged set of teeth.



### THIRD DENTITION.

INSTANCES of a third set of teeth are of rare occurrence, though sufficiently well-attested evidences of their existence have been recorded,—placing the fact beyond cavil or doubt.

They generally appear at a very advanced age, and usually precede a material change of the constitution. For a short time the system seems endowed with recuperative powers, and regains a youthful vigor and energy; but nature speedily relapses, and death soon follows.

Mr. Bell doubts the reality of a third set as of new formation, but regards them rather as “the retarded comple-

tion of certain of the second set ;” at the same time Mr. B. admits the frequent occurrence of what he calls “supernumerary teeth,” which, appearing with the second set of teeth, entitle them to that appellation, the origin of which he thus describes. “It not unfrequently happens that the pulp of a temporary tooth, in addition to the rudiment of the permanent one naturally destined to succeed it, gives off, also, a second process, which produces a supernumerary tooth.” That a third set, or any number of supernumerary teeth, may be formed by the same process, and prevented from eruption by the existing teeth, does not seem to me improbable, though I incline to the opinion that other causes exist in their formation. The following appears in evidence, and is a well-authenticated fact. Extract of a letter dated at Venice. “The renewal complete of all her teeth, in the mouth of a woman ninety years old. She is the sister Theodosia of the Carmelite Convent in that city. What makes the case still more remarkable is, that the same nun renewed all her teeth at the age of forty-seven, and again at sixty-three. She has grown a complete set of teeth five separate times during her life.”

That a second set of teeth should be formed from the pulp of the primitive ones seems plausible enough, but that four other sets should be produced from the same cause admits of much improbability.

Dr. Good, in his study of medicine, mentions a case related by Dr. Besset, of Kuayton, in which the patient, a female in her ninety-eighth year, cut twelve molar teeth, mostly in the lower jaw, four of which were thrown out soon afterwards, while the rest, at the time of examination,

were found more or less loose." Dr. Hunter relates a case in which he witnessed the reproduction of a complete set in both jaws, apparently with a renewal of their sockets.

Antiquity, as well as modern history, furnishes many instances of more than two sets, and all agree in the advanced time of life of their appearance, and the physical changes that attend their growth.

Dr. Harris relates two cases of parts of sets that he witnessed himself, as also one mentioned by a friend of his, Dr. McCabe, of Virginia, of which he says: "He, 'the patient' is now in his seventy-eighth year, and, as he playfully remarked, 'is just cutting his teeth.' There are eleven out, five in the upper and six in the lower jaw. Those in the upper jaw are two central incisores, one lateral and two bicuspidæ, on the right side. Those in the lower, are four incisores, one cuspidatus, and one molaris. Their appearance is that of bone, extremely rough, without any coating of enamel, and of a dingy brown color."

A case, of a gentleman living in Cape May county, New Jersey, was related to me by a friend, in whose veracity and judgment I have the most implicit confidence; the said individual renewed a set of teeth at the age of ninety, complete in both jaws.

I have never seen an example of entire sets in third dentition, but have known several cases of supernumerary teeth, one of which I found situated contiguously with the dens sapientiæ of the left side of the upper jaw.

## IRREGULARITY OF THE TEETH.

It is seldom that any disorder exists in the arrangement of the primary teeth, nor is it a very important matter, as the early loss of these teeth, by natural causes, must take place before the evils of crowded teeth would be felt.

The free, unobstructed state of the gums, prior to first dentition, offers no obstacle to the progress of the infant teeth, and they, consequently, emerge in a regular and symmetrical manner, while the second set, operated upon by different causes, are very frequently forced into a crowded and irregular group, a condition prejudicial to their appearance and health.

The irregularities of the permanent teeth may be generally attributable to two principal causes—the premature extraction of a deciduous tooth, by which an absorption of the parts take place, and the adjoining teeth are brought in contact, to the exclusion of a succeeding tooth; and the protrusion of a permanent tooth, before the absorption of the deciduous fang.

The evil consequences of crowded or irregular teeth are so apparent to every one, as to demand every necessary care in the avoidance of it. There is no feature of the face more conspicuous than the mouth, upon the beauty and symmetrical form of which depends its grace and elegance. A very frequent deformity of the lower jaw, a projection occasioned by the lower teeth closing outside of the upper ones, is mainly attributable to neglect in second dentition; generally it is supposed to be caused by a natural elonga-

tion of the jaw, which is almost always an error, as the first is the principal and most frequent cause.

The teeth most liable to derangement in their order, are the incisores and cuspidati of both jaws.

The central incisores sometimes present an acute angle, with their contiguous sides turned outwards, in other cases the reverse occurs.

The laterals being preceded by the central, from an insufficiency of room, frequently occupy a diagonal position, either overlapping the central teeth, or having their inner surfaces resting upon the sides of those teeth.

The upper cuspidati often protrude above the crowns of the adjoining teeth; either upon the outside, by which they become a serious inconvenience in causing a prominence of the lip; or upon the inside, proving an obstacle to the tongue in its articulation.

The bicuspidates of the same jaw are also subject to this derangement, but less frequently, as they appear before the cuspidati, and follow in the bifurcation of the fangs of the temporary molars; when it does happen, it occasions a greater inconvenience than a similar irregularity of the cuspidati.

The cuspidati and bicuspidates of the lower jaw are frequently crowded outside of the dental circle, producing results similar to a like deformity of the corresponding teeth in the upper jaw.

The upper teeth are sometimes found to incline with their cutting edges to the inside of the mouth, the opposite teeth closing outside of them. As this generally appears to be a natural disposition, it is more difficult of correction

than any other kind of disorganization, and should be treated, with any hope of success, in the early progression of those teeth.

The cuspidati are sometimes found entirely excluded from the dental circle, and situated behind the other teeth, so that upon the occlusion of the jaws, they are altogether concealed from view.

Another species of irregularity, by which the dental arch becomes contracted at the medial line, giving to the mouth a pointed appearance, is often the result of a premature extraction of certain of the temporary teeth, producing an undue absorption before the advancement of the permanent ones; thus confining them to a less space than they should occupy, and crowding them into an elliptical form instead of the regular circle.

The varieties of irregularity are numerous, but as those already stated constitute the most frequent characters, it will be unnecessary to recapitulate cases that have been recorded by other writers, the certainty of which is perpetuated only by records of a single instance in their experience.

To avoid the evils of crowded and irregular teeth, a proper care should be exercised in maintaining the health of the primary set, to keep them from decay and the necessity of extraction, before the proper time for their moulting and succession of the permanent teeth.

The mouth should continue to be examined, during the whole course of second dentition, at frequent intervals, and the peculiar characteristics explained to the child's parent



or guardian, that they may be able to guard against the causes that operate in producing irregularity.

Professional supervision should not stop even at the completion of the permanent set; a little subsequent care may conduce to preserve the teeth in health and beauty to an advanced age.

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### TREATMENT OF IRREGULARITY.

THE teeth may be altered in their relative position to each other by a proper course of treatment. Any required change should be made before the patient exceeds fourteen or fifteen years of age; after that time the probabilities are against success, though not without hope. I have succeeded in correcting a very prominent deformity in the teeth of individuals several years older.

If the dental surgeon is consulted before the entire completion of the second denture, and any of the deciduous teeth remain in opposition to a regularity in the advancement of teeth belonging to the second set, he should at once extract the opposing tooth. It is frequently necessary to remove more than one—the permanent tooth being larger than the temporary one requires more room. In every case where the extraction of a second tooth is considered necessary, the one posteriorly situated should be preferred, as it gives an opportunity for the teeth to spread, and a consequent enlargement of the dental circle. If, as

is frequently the case, the whole course of dentition has been allowed to proceed unassisted, and the teeth, instead of presenting a systematic arch, appear in a confused mass, he must then use mechanical means to remedy the neglect.

If the upper teeth, or a portion of them, strike inside of the lower ones on the occlusion of the jaws, it may, when only partially so, be overcome by directing the patient to use a piece of ivory, flat on both sides, and held by one end, with the other resting upon the anterior side of the lower and posterior side of the upper teeth, and closing the jaws whilst held in that position; but as it is difficult to ensure a constant practice of it, a more certain and convenient recourse should be had.

I have, with universal success, substituted a metallic regulator acting upon the same principle. By obtaining a cast of the mouth, a plate is made to fit the posterior side of the teeth, with the end clasping a molar on each side; upon the clasp a cap is soldered to fit the teeth on their grinding surfaces, which, meeting those of the opposite jaw, prevent their entire occlusion. Another piece is also soldered to it, to cover the cutting edges of the teeth that are to be corrected, and inclining in a position the same as would be given by the ivory. A very short time will suffice to change the relative position of the teeth. After they alter enough to allow them to close naturally, the regulator may be removed, the power of the jaw being sufficient to force the teeth into their proper place, when once they have received the necessary inclination.

When the front incisores are situated with their central edges turned out, it is generally occasioned by a contraction of the jaw, and an insufficient amount of room for the necessary number of teeth; the only remedy is to extract the first bicuspid of each side; the other teeth will gradually fall back, until the spaces occupied by the teeth that have been removed are filled up; and the irregular incisores will regain their proper situation.

It has been a common practice, when the lateral incisores are crowded out, to extract them; thus bringing the cuspidati forward to occupy their places, though in a line with the front teeth; the error of this practice would appear evident to any one, could they see the result. The same mode of treatment suggested to correct a prominence of the centrals should be resorted to in this case.

A protrusion of the eye teeth above the crowns of the adjoining ones, may be remedied by the extraction of the second bicuspid; if the first one be decayed or deranged in its position, or from any other sufficient cause, it may be preferred to the second; but in the absence of a particular motive a choice should be given to the drawing of the second bicuspid.

When these teeth are thrown entirely from the dental circle and are shut from sight upon the closing of the jaws, but little prospect can appear of bringing them out to their proper place. The operator must judge, from the circumstances of the case, the practicability of extracting a bicuspid, and by the aid of ligatures to the adjoining teeth forcing the tooth into the circle, or an extraction of the

errant member ; if the first expedient is adopted, it will be necessary to obviate the pressure of the opposite teeth as already recommended.

To correct an unnatural occlusion of the front teeth, is the most difficult of all defects to remedy. The only way by which I have ever been able to effect an alteration has been by resisting the pressure of the jaws and preventing the teeth from coming in contact ; and by removing the lateral bearing of one tooth against another : the first is to be accomplished by inserting caps upon a molar tooth of each side, stamped between a die and lead, to make them fit accurately. The second by extracting a bicuspid from each side ; after which, by a constant pressure exerted upon the posterior edge of the front teeth, they may be ultimately forced out, until they close outside of the lower teeth ; an apparatus such as is described at page 39, modified to suit the peculiarities of the case, might be used to advantage.

Of the many practices suggested for the correction of irregularity, that recommended by Mr. Bell, of filing the teeth to obtain space, is the most to be deprecated. Ligatures are also objectionable, as the silk or thread used is liable to force its way upon the neck of the tooth and under the gum, producing inflammation and injury to the parts.

## CHAPTER III.

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### CARIES OF THE TEETH.

THIS is a disease of no small importance, as by it, those useful conservators to our health, happiness and comfort, are almost universally destroyed; all the teeth are subject to it, the primary as well as the second set, and both claim a merited degree of care and professional skill to save them from its destructive influence. The character of caries is the same in any of the teeth affected by it; in some cases, however, it is more rapid than others; the tooth in the mouth of one person may be infected with caries, and without any sensible increase will remain so for years, while with another, in a very short time after it is first discovered, the disease extends rapidly through the body of the tooth, until it is irrecoverably consumed.

A considerable difference exists in the liability of the teeth of different persons to be affected by this disease, influenced by attending circumstances with each.

Teeth that are uniform and firm, surrounded by a healthy gum, and kept in a proper state of cleanliness are not liable to caries, while those in the mouth of a person whose constitution is shattered by disease, and whose gums are swollen and turgid, and bearing all the characteristics of disease, are constantly liable to it, or even those who exert every

necessary care in keeping their teeth clean, but have them in a crowded and confused disorder, cannot avoid the insidious operations of caries. A peculiar coincidence in the attacks of decay, by which corresponding teeth are known to be frequently affected at or near the same time, has been attributed, by some writers, to a physical debility operating during the time of their formation, either produced by a general constitutional disorder or from the effects of mercury.

That an unhealthy state of the constitution existing at that time may contribute to render the teeth imperfect, admits of much doubt, inasmuch as the disease originating, according to that theory, in their very formation, would more probably continue immediately after their eruption; whereas we often find disease so situated, delayed for twenty or even thirty years after the perfection and final passage through the gums of those teeth.

A fact, that the teeth decay by pairs, may most generally be traced to a like peculiarity in the order of their arrangement and corresponding situation with adjoining teeth, for when such was not the case I have found the rule variable.

Caries is not confined to particular teeth, but all are alike subject to it. The incisores and cuspidati are generally affected upon their sides and anterior and posterior surfaces; the bicuspides upon their sides, and the molars on their sides, in the indentations of their cutting edges, and upon the front surfaces.

Decay first presents itself in the form of a speck or dark

spot upon the external covering of the bone of the tooth, and progressing into the bony structure, unless arrested by proper remedies, continues until it reaches the dental canal.

Upon the first exposure of the bone, an acute soreness is experienced, by taking water into the mouth, or inhaling the air over the affected tooth; this feeling subsides in a few weeks, owing to the death of the fibrous nerves that have been exposed, and the tooth remains free from sensibility until the decay has extended to the lining membrane, which becomes evident by the violent throbbing pain felt in the diseased tooth. At this stage of decay no permanent relief can be guaranteed; if caustic preparations are applied to deaden the sensibility of the nerve, inflammation is likely to supervene with all its accompanying evils, and the only remedy that remains is a removal of the tooth.

Some controversy has taken place relative to the application of the word "Caries," whether it correctly defines this peculiar disease of the teeth. Mr. Bell introduces the term "gangrene" as he supposes more explicit of the character of the disease known as decay.

Gangrene, from *Gangræna*, was admitted into the Latin *clavis*, derived from the Greek noun *γὰγίλος*—(*Gagilos*); signifying a cancer, or eating of the flesh, and so authorised by Celsus, who used it only to express an ulcer or mortification of the flesh; it consequently cannot properly belong to diseases of the bones.

Mortification is also applied to this affection of the teeth; it is not strictly applicable, as a tooth may be, to some extent, decayed, and so remain for years without the death

of the organ. Messrs. Fox & Hunter both use this expression as significant of decay in the teeth.

Caries is literally from the Latin, expressive of rottenness or decay, and therefore more properly defines that disease of the teeth.

Instances of the bad effects arising from decayed teeth, are of frequent occurrence, and oftentimes the dental surgeon is consulted in extreme cases, when not only the health and comfort of the patient is at stake, but the life itself endangered. Many remarkable cases have happened in the course of my practice. One was that of Mrs. K. of Salem. After filling several teeth for her, and performing other operations on her teeth, I advised the removal of a tooth, which bore all the characteristics of inflammation; she however declined, in opposition to every remonstrance. A few days subsequently I was sent for, and found her suffering all the agonies of a complicated decay, in the tooth aforementioned. Her face was swollen, and one eye entirely closed, and it was with difficulty that even a knife blade could be forced between her teeth. After directing the proper remedies I left her; in the course of twenty-four hours, the suppuration gathered to a point and broke; but the inflammation, having extended to the throat, caused her to suffer for several weeks with a malignant disease of that part. The same lady again endured almost as much as on the first occasion, but so great was her dread of having a tooth extracted, that she retains that tooth in her mouth to this day. Another case, though not so serious in its consequences, was that of Mr. P. of



Woodstown. The second inferior bicuspidati gave him considerable pain, and he applied to a neighboring physician to extract it, who, unfortunately, broke off the crown, leaving the fang in the jaw; violent inflammation took place, and suppuration followed; it finally broke on the outside of the jaw, and continued to discharge for more than a year, when he applied to me to remove the fang. After its extraction the wound soon healed, but left a scar to mark the spot.

Diseases of the above character are not confined exclusively to the adult teeth; children often suffer from aggravated cases of complicated decay; and as the consequences are sometimes fatal to the second growth, the cause should be removed without delay.

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#### CAUSE OF CARIES.

CARIES has been regarded as arising from constitutional causes by some writers, while others maintain it to be the effect alone of local agents.

There can be no doubt that a diseased state of the system is a remote cause of decay very frequently, and that a hereditary predisposition to caries in the teeth, exists to a certain extent in some families.

I have seen the same character of disease from the elder to the younger branches of a family, and have found them, to lose by decay, corresponding teeth at the same ages.

Individuals of a delicate constitution, or laboring under continued disease, particularly of the digestive organs, are subject to bad teeth; in the former, partaking of the general debility, and in the latter, by its effect upon the salivary secretions.

Constitutional predisposition cannot be regarded as a universal cause of decay. A tooth, from some remote constitutional effect, may be more susceptible of caries than one less apparently healthy, and the immediate existence of an active solvent would sooner operate upon that tooth than another: but without the agency of a local cause, the tooth would probably have withstood for a longer time, the effects of ordinary use and exposure.

Inoculation is frequently produced from a diseased crown or fang lying contiguous with a sound tooth, by sustaining the calculus convenient for its operation, or by the attrition of its rough jagged points.

Crowding of the teeth is another ultimate cause of caries. We find teeth, particularly the superior incisores, sound in every other respect, and presenting all the appearances, externally, of strong, healthy teeth, but lying in immediate contact, to decay upon their contiguous sides. \*There is doubtless an attrition between teeth pressing against each other, aided by the salivary secretions that are deposited between them, that produces, to some extent, a denudation of the enamel, and consequently renders the surface rough, and more capable of retaining an active agent in their

\* Since writing the above I have found the same idea advanced by Mr. Waite, in his "Treatise on the Gums." I was not aware that such an opinion was entertained by any one but myself.

decomposition. Some teeth are more susceptible of decay than others ; those of a pearly whiteness seem the most predisposed, while teeth of a yellowish cast are generally the longest lived. The wisdom teeth are often found decayed by the time the tooth is fully developed, and in fact they seldom remain sound for any length of time. The inferior incisores and cuspidati are more permanent, and less subject to decay than any other teeth in the human mouth ; which may be attributed to the greater proportion of enamel to the bone in those teeth, and their situation relative to the salivary glands.

Acrid food, or acidulous fluids, hold a decomposing influence upon the teeth, which is evident from the fact, that hogs fed upon apples during the summer season, have their teeth so much destroyed as to be unable, when the time arrives for fattening them, to properly masticate their corn. Some farmers forbear feeding them on fruit for this reason.

Fractures of the teeth are immediate causes of decay ; by exposing the bony structure, the tooth is deprived of its natural covering, and soon falls a victim to corrosive agents.

Unskilful dental operations are frequent inciting causes of caries ; by leaving a filed surface, rough and uneven, lodgments are afforded for depositions of tartar ; and also by scaling the teeth with sharp pointed instruments. An evidence was presented to me recently. A Mr. C. whose teeth were remarkably good, was induced by an itinerant operator to allow him to practice on them, or in other words, "to clean them." In doing so he ploughed the

whole external surfaces into deep acute furrows, which soon filled up with depositions of tartar, and at this time, a lapse of two years, his teeth present an exterior of decayed lines upon the whole surface.

The sympathetic relation of the gums and teeth, without doubt, produce by disease in the one a corresponding influence upon the other, and hence a necessity for a continual regard to the health of the gums to maintain a healthy condition in the teeth. I have long been impressed with a belief, that inflammation in the gums leads to the production of a matter, which being deposited in the indentations and interstices of the teeth, speedily occasions a decomposition of them, and consequent loss by caries. Mr. Waite says: "If a question were asked as to what most influenced the loss of teeth, it could not be denied that it is the sympathy between the gums and the constitution. If a second question were put as to the immediate influence the gums transmit to the teeth, the answer would be that they send their influence to them in a two-fold degree.

1st. The morbid exhalations and exudations from diseased gums decompose the structure of the enamel, and, by decaying the teeth, exert a primary influence over them.

2d. Regarding their loss through looseness, the sympathy between the gums and the constitution is greatly concerned; for when the former become inflamed the periosteum is also in the same state. There are also many other considerations of great importance to the gums. A properly regulated diet, adapted to the exigencies of the

constitution, and according to the strength and fatigue the system is capable of enduring. We see the gums of a *bon vivant* swollen and unhealthy; and when the system is below par we also see them unhealthy and irritable.

From observations I have made in my intercourse with various classes of society, I would give the former gum to luxurious citizens, and the latter to the refined branches of our female aristocracy.

In all diseases of the teeth, whether resulting from constitutional disturbance or from the effects of external application, the gums are in a certain measure affected. If, at the onset, when a decay is incipient in a tooth, there should not appear any degree of irritation in the gums, still, the moment the nerve is affected, irritation is known to supervene.

On the teeth, themselves, diseased gums exert a primary influence throughout all the variations of life; the child and the adult, the middle-aged and the old person; each possessing these organs in a bad state, if the gums be unsound and impure.

The accumulation of a viscid secretion, commonly called tartar, is a powerful agent in the destruction of the teeth and alveoli.

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### TARTAR.

THIS substance is a deposite of salivary calculus upon the enamel of the teeth, and is of two kinds. That which accumulates upon the molares, and the inside of the lower

incisores, is generally of a dark yellow or brown color, and collects to a mass, sometimes greater than the size of the teeth. Frequently it settles upon the alveolar ridges, and, insinuating itself under the gum, destroys the periosteum, causes the absorption of the alveolar, and finally the loss of the tooth.

The other is of a green appearance, and a softer consistence than the first, presenting more the character of a stain; it is most frequent on the teeth of children, and more likely to produce caries than the harder kind. Various theories have presented the origin and nature of this destructive agent in different views.

One writer has discovered the existence of a set of minute glands in the gums, destined to subserve the purpose of secreting tartar only. Another says, "that this substance is neither deposited by the saliva, nor secreted by any glands proper to that office; but that it is produced by the mucous follicles of the mouth;" and to support his argument, he contends that all other calculous concretions are produced by a similar action either of the mucous or synovial membranes.

Mr. Bell asserts, that it is a deposite from the saliva, from the fact that it is found in greater quantities opposite the openings of the salivary glands; and upon analysis, is ascertained to contain the same ingredients, of which the saliva is composed.

Tartar, I think, may be attributed to various sources, of which the saliva is the vehicle by which it is conducted, without possessing any of the principles of its formation. The exudation from diseased gums, doubtless contributes

freely to its accumulation ; a peculiar character of secretion of the mucous membrane during an unhealthy condition of the stomach ; the agglutinous nature of the food and many fluids taken in the mouth ; and the use of mercury, tobacco, and dentifrices made with sugar and honey, are all active causes of it.

M. Mandl, in a paper read before the Paris Institute, entitled "Microscopic Investigations as to the Nature of the Tartar and Mucous Covering of the Tongue and Teeth," says, "the human mouth is a perfect cemetery, where millions of infusoria find their catacombs."

Leuwenhoeck also says, "that the human mouth is peopled with infusory animals, and that the mucous secretion on its surface served as the medium in which they exist." But it remained for M. Mandl to discover that the tartar which covers the teeth is formed of the mountains of the dead of this medium.

I question very much the correctness of such conclusions. The tartar, when taken from the mouth, is of a putrid character, and as likely to generate infusoria, after that, as that it should exist while in the mouth, even though but a moment of time elapse.

Certain diets are supposed to contribute more than others to the formation of tartar. By some it is believed that animal matter is productive of stronger viscid secretions than vegetable.

The inhabitants of the Isle of Maderia are remarkable for the soundness of their teeth, their food being principally vegetable, eaten in a raw state.

The natives of the slave coast of South America possess

the same characteristic, and their food is chiefly vegetable also. But we are told that some tribes who depend more on animal food are equally favored in the health of their teeth. Such a contrariety of evidence deprives us of any reasonable conclusions as to the effect of particular kinds of food.

Fluids drank too hot or too cold, are liable to induce inflammation in the teeth, which renders them more susceptible of disease.

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#### THE EFFECT OF TOBACCO UPON THE TEETH.

THE dentist is frequently consulted concerning the effects of tobacco upon the teeth ; whether it exercises an injurious tendency or is beneficial to them. Were it not for the universal habit of chewing and smoking, no apology would be sufficient for such a question, as the visible effects must be evident to every one, who will impartially examine for themselves.

Some writers, and a few eminent practitioners, have encouraged and recommended its use, denying that it was productive of injury, and accepting a few isolated cases, have based their decision upon such, without sufficiently investigating the real nature and effect of its operations. That it is injurious, may be inferred from two circumstances. First, the action upon the gums, and thence indirectly upon the vital functions of the tooth ; and, secondly, by absorp-



tion of its active properties into the bony substance of the tooth. Individuals long accustomed to the use of tobacco are very apt to have turgid and swollen gums, and the sympathetic action between the teeth and gums soon produces a morbid condition in the former, by which they are the more predisposed to disease. The teeth, not only externally, but upon an anatomical examination, will be found highly impregnated with a yellow fluid, evident only in the teeth of persons who use tobacco.

An argument, very general in extenuation of the use of tobacco, is the influence supposed to be exerted by it upon an aching tooth. There can be no doubt, when the pain arises from inflammation of the investing membrane, that the narcotic properties of tobacco will for a time give relief, but the effect will also subside by a continuation of its use.

The use of tobacco is a national peculiarity, and belongs more particularly to the people of the United States than any other part of the world; it is with us as opium to the Chinese; differing only in the objects of its use. We use tobacco as an employment; (for no other actual purpose can be attributed to it;) they opium, for its narcotizing effects. The one is as reprehensible as the other; either must produce consequences, fatal or injurious, according to the extent of its use.

Independent of the effects of tobacco on the teeth, the baneful influence exercised by it upon the physical organization should alone discard it for ever from common use.

Few persons can long indulge in the use of it, without they experience an almost continued sensation of sickness

and vertigo, debility, loss of appetite, and nervousness, which must rapidly destroy the constitution and lay the foundation of fatal disease. Other accomplishments may be studied, without half of the repugnance felt in striving to acquire a fondness for tobacco, more creditable, and beneficial to the health and general comfort. Dr. Woodward, speaking of tobacco, says:—

“The use of tobacco, in whatever form, is injurious to health, incompatible with cleanliness, and offensive to decency. It is equally repulsive to the outward senses, and disgusting to the inward tastes.”

Dr. Rush says: “It impairs appetite, produces dyspepsia, tremors, vertigo, headache, and epilepsy. It injures the voice, destroys the teeth, and imparts to the complexion a disagreeable dusky brown.”

Dr. Boerhave says, that, “Since the use of tobacco has been so general in Europe, the number of hypochondriacal and consumptive complaints has been increased by its use.”

Dr. Cullen says: “I have known a small quantity, snuffed up the nose, to produce giddiness, stupor, and vomiting. There are many instances of its more violent effects, even of its proving a mortal poison.”

Dr. Darwin says: “It produces disease of the salivary glands and the pancreas, and injures the power of digestion, by occasioning the person to spit off the saliva which he ought to swallow.”

A volume of matter might be compiled, from the highest authorities, to prove the injurious effects of tobacco. It is not our purpose, here, to enter into a disquisition of its

constitutional effects, further than to refer to any unhealthy influence exercised upon the teeth by it, which must be a natural result of disorganization of the general system.

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### THE EFFECTS OF MERCURY ON THE TEETH.

THIS mineral, when given in quantities sufficient to produce ptyalism, exercises a deleterious action indirectly upon the teeth. As we have already endeavored to show that a diseased condition of the gums lead to a corresponding effect upon the teeth, so we might trace the operations of mercury, as evinced by the irritation it excites in the mouths of persons who have been long subjected to a course of treatment under it, to its ultimate effect upon the teeth. The free use of mercury produces an increased glandular action and vascularity; a spongy and ulcerous condition of the gums; and not unfrequently necrosis of the teeth and alveolar, and sometimes of the bones of the jaw.

It is not in the power of the surgeon to counteract the evils of this medicine during the process of its operation, or by any means to avoid the necessary results of its use; but after its discontinuance, the frequent and most fatal (to the teeth) effects that it produces, may, in a great measure, be arrested.

The gums should be treated as in diseases of a corre-

sponding character. Astringent washes and frequent scarification of the gums will be found highly beneficial. To correct the unpleasant fœtor that usually attends the exhibition of this medicine, a diluted solution of the chloride of soda, triturated with the powder of orris root, will generally be found effective. In persons of advanced ages, the effect upon the teeth is more certain, and a morbid condition of the gums is brought about, which soon results in a loss of the teeth. As the value and medicinal character of mercury is becoming better known and understood, the use of it is more judiciously resorted to; in consequence of which, we do not so frequently meet with bad results from its administration.

## CHAPTER IV.

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### TREATMENT OF CARIES.

THE treatment of caries in the teeth, must be determined by the extent of its ravages, and according to the circumstances that have caused it. If it be occasioned by a diseased condition of the gums, a restoration to health in those parts must be effected, before any permanent relief can be obtained. If it is caused by a contiguously decayed tooth, too much diseased to admit of being filled, it should, as an incipient measure, be extracted. Or if a crowded condition of the teeth has been the exciting cause, the proper means for correcting their irregularity should be resorted to.

Without these preparatory steps, all the operations of filing or plugging teeth will avail but little. While the cause still remains, the disease will not only continue, but will spread until the whole dental system becomes a mass of decayed bones—a useless and noxious encumbrance.

It is not always in the power of the dentist, to pursue altogether such a course as his judgment and experience would dictate. In such cases, it becomes his duty to point out to his patient the proper course, and then be governed as far as compatible with his own views, in the treatment

and operations he is called upon to perform. After all the necessary preliminaries are accomplished, he is prepared to remove or arrest decay by either filing it out entirely, or plugging the cavity with some durable metal capable of resisting the acrid juices of the mouth ; of which gold only should be used, except in very rare cases. Large cavities are sometimes considered not worth filling with this metal. My own opinion is, that a tooth worthy to be filled, is worth filling with gold. When it is past the hope of remedy, it had better be extracted, than to prolong the inconveniences and evils of it, by useless experiments.

The operations of filing and plugging teeth, when correctly and judiciously performed, will, in a majority of cases, successfully arrest the further progress of decay ; but mal-practice in either, may be productive of more harm than good.

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### FILING OF TEETH.

THIS performance in dental surgery, is susceptible of more abuse than any other operation on the teeth ; a fact which has led to an unwarrantable degree of opposition : for errors in any practice, should not be universal causes of condemnation. When properly performed, the experience of any practical operator will prove its utility.

The chief purposes for which teeth should be filed, are, to remove superficial caries, to separate teeth that

require to be filled, so as to give a convenience in the performance of that operation; and, occasionally, to make room for a clasp to which artificial teeth is to be attached.

The almost universal habit, of separating sound teeth with a file, is a practice, in my humble estimation, much to be deprecated, and should be considered a perversion of the proper office of the instrument. It is time enough to remove the affection when some evidence appears of its existence, and not to anticipate, in every case, that which occurs in but one of three. Another important objection to it, is the vulgar custom of attributing decay to some remote dental operation. And as the file has to sustain the greatest burthen of the responsibility, when it has been used, policy would dictate to us not to sacrifice a useful purpose to doubtful and objectionable operations.

In removing caries with a file, different degrees in the cut of them should be used, finishing with the finest; by this procedure the evils commonly arising from the use of the file is obviated. The surface is gradually brought to a polish, after the main substance is cut away, and finally completed by scraping with an edged instrument, and rubbing it with a strip of muslin.

It is always necessary to avoid removing too much of the enamel, thus exposing the bone to the liabilities of further decay, and irritation from any thing coming in contact with it.

If the decay is only superficial, it may easily be eradicated with the file, but should it penetrate to any depth, recourse must be had to filling. After filing superficial caries, it will sometimes be found essential to cut away,

with suitable instruments, such portions of it as would otherwise consume too much of the tooth. These instruments should have round edges, to avoid making acute indentations in using them.

It is frequently necessary to separate the incisores, either for the purpose of cutting away a carious part, or to give a convenience in filling them, in the performance of which, the general appearance and natural form of the teeth should not be injured. The posterior part of the incision should be made the broadest.

∟ A file with one safe side, and carried in a lateral position, will most suitably effect this object, and should be changed from one tooth to the other, on each side of the opening, until completed, unless it be required to cut the whole amount from a single tooth. The file should be held longitudinally, between the first and second fingers and the thumb of the right hand, in first<sup>e</sup> making the opening, the operator standing behind the patient; after which, by holding the file at right angles with the hands, and standing at the side, he may continue the process until finished.

Spaces cut between the bicuspidati, or molares, should form an acute angle at the gum, for which files, cut on both sides, radiating at an angle of fifteen degrees, are required. If one of the teeth is very much decayed, and requires more taken from it than the other, a file (diverging at an angle of about thirty degrees) with one safe side will be found more suitable. By placing the safe side against the sound tooth the decayed portion is easily cut away, and a sufficient space is obtained to guard against the liability



of decay in the healthy tooth, and to give a proper convenience for filling the diseased one. An excellent substitute for the file-carrier, is obtained in a form given to the handle of files, used in operating upon the molar teeth, by which a double bend at right angles receives the cheek and allows the blade to be exercised at a horizontal level upon the teeth.

When teeth are to be separated for the purpose of attaching a clasp, the opening should be made with a flat-sided file (cut all over) through to the gum, and then enlarged as much as may be necessary; the corners of the cutting edge of the tooth, on the posterior side of the aperture, rounded off, and the sharp edges made with the file cut away with a scaling instrument.

If a tooth to be filed is loose in the socket, it should be held firm with the fingers of the left hand during the process of filing.

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### FILLING OF TEETH.

THIS is an operation, the importance of which the practice of many centuries has served to fully establish; it is a custom coeval with the earliest operations on the teeth, and if practised at a time when the means and conveniences in the performance of it were very imperfect, compared with the present age, what must now be its utility, assisted by

the advancement that has been made, and the increased discoveries of the art?

The principle is a guarantee, if properly performed, that a tooth well filled, is as good as if never decayed, and is fully sustained, by the substitution of an indestructive material for a corruptible one, in parts most predisposed to decay; the effectiveness and success of the operation of course depending upon the skill and judgment with which it is performed. The causes of failure, and of consequent discredit to the operation, is very generally the result of too much haste in the execution of it, by which the cavity is either unfitly prepared, or the filling inserted in a careless, inefficient manner.

The preparatory process in filling a tooth, is upon the surface circumjacent with the decay, by filing it, in order to remove the projecting corners that may be presented, or for the purpose of obtaining a necessary convenience; and to restore a fair and smooth exterior, evenly assimilating in surface with the filling when inserted.

The next object is to carefully remove all extraneous and decayed matter, until the healthy part of the bone is exposed, with excavators necessary for the purpose, of which the dentist should possess a great variety of sizes. Their shape may be confined to a better advantage to about eight or ten, than the countless numbers used by some operators.

The simple removal of foreign matter from the cavity is not always sufficient; sometimes it is necessary to alter its internal shape to assist in the retention of the filling, which is done by the excavators already spoken of. After the

carious matter is removed from the cavity, it should be cleaned out with some cotton dipped in alcohol or cologne, and then thoroughly dried before the filling is inserted. To prepare a cavity situated upon the side of one of the incisores, if, as is generally the case, and without which they seldom decay, the teeth press against each other, it will be necessary to separate them, as directed at page 61, of this work. When a sufficient space is obtained, the cavity may be prepared for the plug, by entering a straight drill towards the fang, longitudinally with the tooth; then with an excavator whose cutting edge inclines towards the shaft of the instrument, the lower part of the cavity may be suitably formed. This mode of operation, differing a little from that to be generally followed, is only necessary when the sides of contiguous teeth are so near each other, as to preclude the possibility of operating upon them in the ordinary way.

Caries is often found upon the exterior and posterior surfaces of the front teeth. When it is situated upon the exterior, the surface around the cavity should be dressed smooth with a very finely cut file, and then polished: the edges of the cavity cut evenly with an instrument, and the interior excavated under the borders of the decay.

As the decay generally found on the posterior sides is small, not covering much area of surface, a brooch with three edges terminating in a point should be inserted, and turned round to cut out the fragile and decayed portions on the edge of the cavity, and then further prepared with excavators, as before described.

If caries is situated between the bicuspides or molares,

upon their lateral surfaces, an opening should be made with a file, and the cavity prepared in a suitable manner, to enable it to retain the filling. When these teeth are decayed in their natural indentations, the edges of the cavity should be cut off by twirling the brooch in it, heretofore described.

It is always proper to avoid, in excavating a cavity much decayed, an approach towards the dental canal; for by unfortunately making an opening to the nerve, where it could have been avoided, a useful tooth may be injured, or rendered almost useless. When the lining membrane is exposed, the extreme sensibility of it, and the danger of inflammation, forbids the filling of a tooth without previously preparing it; either by cauterizing the nerve, or by the application of a shield to protect it from the pressure of a plug. The channel, by which formations of matter are discharged in diseased teeth, being closed, it must necessarily collect, and escape through the gum by an abscess, or penetrating into the antrum, produce disease in that cavity.

The pressure of a plug upon an exposed nerve is productive of inflammation by the irritation which it occasions.

When a slight exposure of the bone is apparent, or the tooth is sensitive upon mere irritation in the bony substance, the application of some caustic preparation will destroy the sensibility, sufficiently to allow it to be filled without pain.

Of the different articles used for this purpose, I have found the white oxide of arsenic, in equal proportions, with the sulphate of morphia, to be the most certain.

The extract of cicuta, pure arsenic, and kreosote, in equal quantities, is used by some operators altogether.

The oil of ergot, I have found in some cases singularly effective, having the peculiar quality of decomposing the membrane, without producing inflammation of the remaining part. Great care should be exercised in the introduction into the mouth of any powerful cauterly; no more should be used than sufficient to cover the exposed nerve, and should be placed on a very small piece of cotton, previously saturated with alcohol or water, forced into the cavity as far as possible, and covered with softened beeswax. A small towel should defend the mouth from any particles that may accidentally fall in the process of insertion.

Of the danger attending the use of cauteries applied to diseased teeth, several instances have come to my knowledge—the two following circumstances will be sufficient to show the fearful consequences that may attend their application.

A friend related to me the occurrence of a case, by which a young man in the State of Connecticut lost his life. Having called upon a dentist for the purpose of getting a tooth extracted, he advised him to save it by having the nerve destroyed, and the tooth filled; anxious to preserve a valuable member, and, at the same time, forego the dreaded pain of extraction, he consented; but from the inefficient manner of its application, or some unavoidable cause, he swallowed the preparation inserted for the purpose, a few hours afterward, resulting fatally, before the effects could be counteracted.

The same gentleman related another instance, of a prominent literary man from one of the Eastern States; who, while on a visit to London, applied to a dentist to operate on his teeth: in one of them he placed a cautery of some kind, which acted so powerfully on the nervous system as to deprive him almost entirely of his physical energies, and he is now a shattered wreck of his former self.

It is not always necessary to remove by cautery any slight sensibility existing, whether occasioned by irritation of the bony substance, or the remains of a thin plate of bone covering the dental cavity; in the first case, but seldom any inconvenience is felt after the tooth is filled; in the latter, as well as in cases in which the natural canal is open, pressure may be obviated by inserting a convex cap of gold over the opening; if inflammation is to be apprehended, a small tube soldered in the cap and cut off flush with the surface of the plug, will allow the discharge of any matter that may form, and by that means prevent the difficulties that generally attend the entire stoppage of such teeth.

It is not my purpose to recommend the filling of teeth, where the nerve has been exposed; at the best, it is an uncertain operation, and fails more frequently than it is successful; my only reason for ever resorting to it, has arisen from the local value of the tooth, either by its exposed situation or importance in mastication.

Of the different materials that have been employed for filling decayed teeth, gold stands pre-eminent, as it will resist the action of every thing that can be held in the mouth, and its great malleability admits of its being beaten

to any required size, suitable for dental purposes. Of the different sizes manufactured, the operator will sometimes find occasion for three numbers—four, six and eight; for general practice No. 6 is preferable; for very small cavities No. 4 is convenient, and for the larger ones No. 8 should be used. The numbers are regulated according to the grains in a sheet. The baser metals are used to a limited extent—principally tin and silver—and a cement of silver amalgamated with mercury, the alloy, known as *tutenag*, has been recommended. I have never seen a case of its application to my knowledge; its utility cannot, in opposition to other known remedies, for a moment be admitted.

Cement, for teeth presenting a mere shell, or for roots that a patient may be anxious to retain, will be found highly useful, and not as objectionable as is generally imagined; it can be applied without the preparation that should be exercised previous to filling with other substances, and soon acquires a hardness that will resist any ordinary attrition. I have used it in large quantities, and have never found any bad effects from it; it is also used by many practitioners whose celebrity should entitle their judgment to some respect; by their practice, they must agree with me, in the utility and harmlessness of it; the small amount of mercury retained in the amalgam properly prepared, is proven, by actual experiment, to be about four grains to the hundred, and in six or eight large cavities would not exceed the ordinary dose of mercury for an adult, taken into the stomach. It is prepared by granulating the silver with a fine file, and

rubbing it with an equal amount of quicksilver in a small mortar; when sufficiently united it is to be transferred to a piece of sheepskin, and wrung as long as any of the mercury will ooze out. No more should be made at one time, than is needed for immediate use, nor should the same material be used a second time.

It is only necessary in preparing a tooth for the reception of cement, that the extraneous matter be removed from the cavity; teeth filled with it, being almost worthless and very much decayed, will not generally admit of the same preparation that should be given to others less sensitive, and worthy of a better substitute. This article should not be used in teeth, in which the lining membrane is exposed; in the event of inflammation, owing to its solidity, it is with difficulty removed.

In selecting gold foil, that which is soft and well annealed should be preferred; if too hard, it is liable to crumble in the insertion of it.

A sheet of foil should be cut into strips, from a half to the twelfth of a sheet, and crumpled lengthwise—not rolled or twisted—it is then to be cut into pieces half an inch in length, pinching or twisting the end to a point before cutting it off. These plugs may be kept in a partitioned box, assorted according to their sizes, using the smaller ones for small cavities, and the larger for large cavities, discriminating according to the decay to be filled.

In filling the incisores or cuspidati on their lateral surfaces, a piece of gold is inserted with a small pair of dissecting forceps, and with a straight plugger forced into the cavity, until about two-thirds is entered; another piece



is introduced under the first in the same way, unless the cavity is very small. The second piece is then entered in the hole left by the plugger, and so continued, in either process, until a sufficiency is inserted; the external ends are then turned in, and are forced together with a flat-sided plugger, either straight or bent at an angle. To finish; the surplus is carefully removed with a file or small scraper, and then smoothly burnished. To fill large cavities more fully exposed, and easier of access, such, for example, as those on the grinding surface, or the front of the molar teeth, the plugs of foil should be placed in, and around the circumference of the cavity until it is full, and a straight plugger with a short handle held in the centre. The gold is to be forced in all around it. Finally a piece is inserted in the opening in the centre, and the whole pressed into a solid body.

For filling decays on the posterior side of the molar teeth, pluggers with a double curve or bend are necessary; in such cases, it is more convenient that the gold be applied in one strip.

It will generally be found necessary to protect the plug from the saliva, by the use of a soft towel, held in the mouth with the left hand.

I have often found it convenient to wedge the front teeth apart, to get at the decays more easily.

As success in the operation of filling teeth, depends in a measure upon the purity and preparation of the foil, the dentist cannot be too particular in the choice of it. Mr. Hastings, of North Fifth Street, above Race, Philadelphia, has furnished me with what I have used for several years, and with entire satisfaction.

## SCALING OF TEETH.

THE operation of scaling, applies to the removal of all extraneous matter from the surfaces and interstices of the human teeth; and is, if carefully performed, generally attended with beneficial results. A careless or awkward use of the scaler has, in many instances, produced injurious effects, and frequently proved an incipient cause of decay. One of the numerous evidences, that I have witnessed in the course of my practice, is related at page 48. For the removal of tartar and other foreign matter, to be found on the teeth, other remedies are resorted to, of which suitable dentifrices, prepared without the admixture of any thing calculated to operate on the teeth by any other means than that of friction, is injurious. All solvents should be discarded; the mineral acids are frequently used, and hawked about by empirical knaves, who, regardless of their effects, are willing to sacrifice a valuable set of teeth for a mere pecuniary pittance, gained in their pernicious traffic.

Tartar is sometimes found to have accumulated to an extent sufficient to produce deformity of the mouth. One very remarkable instance I will relate, that occurred a few years since; the subject was a grocer; I mention his calling, for to that fact, I attribute the means that led to the occurrence.

The patient, a young man, consulted me for the purpose of having the four superior incisores artificially inserted. I was struck, at first sight of him, by a remarkable protrusion of the lower lip, which, to my surprise, upon examination,

I found to be occasioned by an immense accumulation of tartar, to the amount of at least one-fourth of an ounce, when removed from the anterior and posterior surfaces of the inferior incisores and cuspidati. Two years subsequently he again called, with his mouth in the same condition as before, except that the matter was less concrete than upon the first occasion. The cause of this deposite originated, doubtless, from the glutinous character of substances he was in the habit of constantly chewing, the convenient access to which was obtained from among the goods sold in his store, such, for instance, as cheese, sugar, etc. A little cleanliness on his part, might have prevented the disgusting results of such negligence; according to his own admission, he never used a tooth-brush.

For scaling the teeth, two varieties of instruments only are necessary, of different sizes; the round edge, and the two-sided ending in a point. The first is of different curvatures, and the latter forming a right angle with the shaft, the end of which is screwed or riveted into the small plate, of which the blade of the instrument is made. A very common form in present use, is a sharp-pointed curve, affording no convenience or preference over the others, in my opinion. Those above described, I conceive to be sufficient, if dexterously used, for any purpose.

The scaler should be held between the three last fingers and thumb of the right hand, using the forefinger as a purchase, and resting it upon the tooth to be operated on; then, by a contractile motion of the fingers, the instrument is brought to act upon the teeth.

A degree of caution is necessary, to avoid injuring the

gums. The scaler should be gently forced under the gum, to completely remove all tartar that may be deposited there; the remains of a small portion of which, may serve to keep up an irritation, or be the means of a new formation.

The position of the operator, in scaling the upper teeth, should be upon the right side of the patient, holding the lip out of the way with the thumb of the left hand; and commencing with the tooth posteriorly situated, with a round-edged instrument, carefully remove from the surfaces all the adhering tartar. After traversing the entire dental circle, he should return, and with a pointed scaler dislodge any portion that may remain between the teeth or under the gum. Sometimes it is more necessary to commence operations with the pointed instrument, particularly when the deposite is hard, and situated more directly under the gums, a single quick motion with which, will frequently scale off large flakes; frequently bringing it all away at a single movement.

In scaling the lower teeth, the dentist should stand a little to the left, behind the patient, except when operating upon the front surface of the bicuspides and molares of the right side, and the right side of the inner surfaces of the front teeth, when it will be found more convenient to stand on the right. Occasional deviations from these general rules will be found necessary, of which the convenience to the operator will be his best guide. After performing all that can be done with the instrument, the sides of the teeth may be polished, by rubbing between them strips of muslin, until perfectly cleaned.

When the process of scaling is completed, the teeth should be brushed thoroughly with a suitable dentifrice, and the mouth occasionally rinsed with some tonic or astringent wash. The importance of a constant use of the brush and dentifrice, at least three or four times a week, should be urged. Small brushes, having only a tuft of bristles at the end, will be found very convenient for brushing the insides of the teeth, particularly the lower front teeth, which are very liable to accumulations of tartar, and cannot easily be got at with the ordinary kind of brush.

## CHAPTER V.

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### ODONTALGIA.

“ But tooth-ache, hell o’ a’ diseases!  
Aye mocks our groans !”

THE poet has very significantly and energetically portrayed the horrors of this dread king of scourges; of which the life of almost every member of the human family, has, at some time, borne evidence by a painful experience to its tormenting and torturing miseries. It commences with the tender infant, ere yet it has learned to know the cause, and continuing from infancy to youth and maturity, at intervals of a long or shorter duration, is finally disposed of, only by the loss of the last vestige of those members, which, barring their inconveniences, have afforded us, through a long life, the means of contributing to its nourishment and support. When the malady is situated in the primary set of teeth, it is attended with a feverish uneasiness, and the severe constitutional derangement that occurs, renders the extraction of the tooth positively necessary, unless the pain can be subdued by a local treatment; the continuance of which will undeniably exercise an influence upon the disposition, of an ultimate tendency, much to be regretted.

The effect of the pain of a violently aching tooth, with those of riper years, is also productive of serious consequences, and with persons of a sensitively nervous temperament, has, in many instances, produced results of a very serious character.

The toothache is believed to be unparalleled by any other pain, in the catalogue of human sufferings, and its consequences, in the absence of the necessary means of relief, fearful, and though probably not immediately or directly, but eventually, fatal.

Pain in the teeth arises from inflammation of the lining or investing membranes of the tooth affected; and sometimes by a sympathizing nervous irritation proceeding from another tooth. Another character of pain is sympathetic, arising from a disordered nervous temperament, or a vitiated state of the stomach. Pregnant women are also often afflicted with periodical achings of the teeth, sometimes continuing for weeks after delivery, and often centered in teeth perfectly sound.

“We frequently see pain centre itself in the tooth, when the uterus is undergoing changes, and the gums assume a swollen condition, sympathizing with the physiological state of that organ; nor is it less remarkable, that in delicate females, the nerve of a tooth being irritated, the uterus sympathizes to so great an extent, that miscarriage is frequently produced.”

The exposure of the lining membrane is generally attended with an acute, darting, throbbing pain; the irritation produced by the pressure of any foreign matter upon it, when the dental canal becomes opened, renders it

liable to such severe and sudden sensations. That of the membranes of the periosteum and alveolar, is not so violent, but generally more protracted; the first, by its severity, impels us to some speedy means of relief, while the latter may exist for several days, without receiving any efficient treatment.

When the membranes of the periosteum or alveolar are affected, if allowed to continue uninterrupted, a consequence will frequently result, prejudicial to the permanence and health of the teeth.

In the treatment of an aching tooth, the first step is to remove the cause; if produced by an exposure of the lining membrane, the only certain and permanent remedy, is an extraction of the diseased tooth; the pain may sometimes be relieved by the application of soothing agents, such as opium, kreosote, the oil of ergot, &c.; the preparation of arsenic and morphia, recommended for destroying the nerve, is more efficacious in the destruction of that membrane, than any thing else I have ever tried; but as has already been stated, is objectionable from the inflammation which is likely to ensue; it is very severe during the time of its operation, making "the remedy worse than the disease." The most effectual method of destroying sensibility, is by the insertion of a heated needle, which, from the situation of other teeth in the mouth, and the diverging form of the fangs, cannot be used in any but the incisores and cuspidati.

The front teeth, from the convenience of grafting upon them artificial crowns, are too valuable to admit of their extraction; occasional cases occur, when the inflammation



has proceeded so far, as to render that operation fruitless ; then no other resource is left for success, but the removal of the entire tooth.

When toothache arises from inflammation of the investing membranes, or those of the alveolar, a loss of blood from the parts, will sometimes give relief ; the gums should also be bathed with the following, diluted as used, with three times its bulk of warm water :

R. Ol. Sassafras, - - - - - ℥ss.  
 Tinct Myrrhi, - - - - - ℥j.  
 Misce.

If the pain is occasioned by a disordered condition of the stomach, the administration of epsom salts, magnesia, or some other gentle cathartic, will generally procure relief.

The operation of starting a tooth from its socket, is but a futile and frequently a pernicious practice ; if it is sufficiently dislodged to sever the connection with the vessels of the alveolar, the tooth becomes at once an extraneous body, and liable to all the evils of such ; it therefore can never be performed with any hope of entire success.

## EXTRACTING TEETH.

THIS operation is the dernier resort in incurable diseases of the teeth; upon the proper performance of it depends the ease and relief to the patient. No dental operation is more simple when properly understood, and none more serious in its consequences when unskilfully done. The blunders committed by the various kinds of practitioners that have exercised this branch of dental surgery, from the strong arm of the blacksmith, to the puny brachia of a barber's apprentice, have entailed upon many who have been so unfortunate as to come under their influence, misery and suffering, and sometimes horrid deformity to the ends of their life. It is a lamentable fact, that practitioners in medicine, generally, have neglected to acquire a proper knowledge of the manipulations in this operation, and, for the want of a little practical information, fail in almost every effort. To them is allotted a frequent occasion for extracting teeth, and consequently a necessity for skill in the performance of it.

Numerous cases of fractures of the teeth and alveoli, and sometimes of the bone, have been presented to me, and many others of a serious character have been noticed by different writers. Upon one occasion, a lady from the Eastern Shore of Maryland exhibited to me a tooth with a large piece of the inferior maxilla, that had been broken in its extraction. She endured excruciating pain for some time, and finally recovered with a lasting deformity of the face. Mr. M., a gentleman well known in the mercantile community at Philadelphia, carries with him a conspicuous

evidence of mal-treatment in the extracting of a tooth. And almost every day reveals the suffering of some martyr, to the brutal ignorance of a tooth-puller.

The instruments now in general use, for the extracting of teeth, are the preparatory, or gum lance, key, forceps, punch, screw, and thumb-elevator.

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### THE LANCET.

Success in the extracting of teeth depends, in a great measure, upon the proper excision of the gums. First, because it disengages the tooth from its connection with the gum; and, secondly, it affords a better opportunity to embrace the neck of the tooth with the extracting instrument.

Dr. Thomas Bell discourages the use of the lancet, and says, "that it can in any way facilitate the removal of the tooth from the socket, is too obviously absurd to require refutation;" and as strangely at variance with anatomical facts, and practical experience, as his theory is, there are, notwithstanding, a few operators of the present day that are proselytes to it.

A strange pertinacity to operate differently from the "common herd," I conceive to be an exciting motive for such derelictions.

The gum is firmly attached to the neck of the tooth which it embraces, and without this preliminary measure,

is liable to be torn away with the tooth, upon its extraction ; besides, roots of teeth are often so completely invested by the gums, as to otherwise preclude any opportunity of securing a hold sufficient to remove them.

The practice is in opposition to my judgment, and, consequently, I have never experienced an instance of its bad effects. A note before me, from a medical friend of this place, refers to a case, in which he says that he once saw an entire denudation of the alveoli, occasioned by extracting a tooth without previously lancing the gum.

The extraction of deciduous teeth never require it, the adhesion of the gum being so imperfect.

The lancet should always be applied as deeply towards the socket of the tooth as possible, both on the external and internal margins, and also between the teeth. Two varieties of lance are necessary ; the straight-edge ending in a round point, adapted to the superior and inferior incisores, cuspidati, and bicuspides ; and another, with the blade describing an angle of  $45^{\circ}$  from the shaft of the instrument, designed for separating the gum around the molar teeth. The instrument should always be examined previously to using it, and keenly sharpened.

## THE KEY.

THE key is the oldest accredited instrument for the purpose, now in use, and may, with propriety, be considered the universal tooth-extractor; for with it, a greater facility in general practice is obtained, than with any other kind. In the hands of an unskilful operator much injury may be done by the key. The results commonly attending an awkward application of it, are an excision of the crown, and consequent exposure of the pulp of the tooth; a crushing of the alveoli, a fracture of the bone, and sometimes the extraction of two teeth instead of one.

An important service of the key, is the facility furnished by it for extracting roots of teeth when too much broken or decayed off to admit the application of the forceps, or so situated, as to render the inconvenience of access a bar to the use of a punch, or thumb fulcrum. It is, in fact, only upon such occasions that I ever use it. When enough of the solid bone of the tooth remains to afford a necessary hold for the forceps, the conveniences and preferences belonging to them, invariably impels me to choose them rather than the key.

In the selection of this instrument, more regard should be paid to its simplicity than complication of style; the various crooks and bends of the shaft, and different arrangements of the bolster or fulcrum, only tend to confuse the operator, and in the adjustment of the instrument, to detract his attention from its most important purpose; besides, many of them are calculated, from their peculiar

forms, to render the hand unsteady and uncertain in its operation.

The set which I have, are of the same form as used by my deceased parent for twenty-five years, and my own estimate of their correctness, warrants me in the belief that others may find them more serviceable and convenient than the generality of those made at the present day.

Plate 1, fig. 3, is the largest size, and is four inches long in the shaft, from the handle to a quarter inch bend at an angle of  $45^{\circ}$ , and then continued parallel with the shaft, one inch to the end in which the screw is fastened, to hold the hook. The fulcrum is flat, slightly depressed on its sides, and rounded on the lower edges.

This form and size of the key is adapted to the extraction of the lower molares.

Fig. 2 has a straight shaft, with a larger fulcrum than fig. 3. This is designed for the removal of the first and second superior molares, and the bicuspidæ of both jaws. The front teeth, when necessary to use the key in their extraction, may also be removed with the same instrument.

Fig. 4 may be shaped in every respect like fig. 2, though much smaller in the fulcrum; it is used exclusively for extracting the dentes sapientiæ. Those teeth being situated at the angle of the jaw, where the bone and sockets are shallow, and the tooth almost entirely invested by the soft parts, require the fulcrum to be of the smallest possible size.

In regard to the form of the fulcrum there ought to be but one opinion; the objections to the round one, and

advantages of the flat, must be evident to any practical operator or reflecting mind. The pressure of a cylindrical body upon a flat one must be confined to a very small space, and upon a surface rather convex than otherwise, the pressure would necessarily be still more limited. This is not the only, though a sufficient objection; it is almost impossible to retain a round fulcrum where it should be, for it is constantly liable to slip from its position. The only advantages of it are fully met in the flat fulcrum, by wrapping it with muslin, and rounding the edges of it, to prevent injury to the gum.

The hook is the next principal feature to be noticed in the key, for without a proper regard to its peculiar points, the instrument becomes inefficient, and dangerous in its application. Two specific objects should be observed; the first is the form and size, and the second the condition of the edge or points. The curvature of the hook should be sufficient to make it clear entirely the crown of the tooth, and no longer than actually necessary; by which means more power is obtained with less pressure upon the gum, the fulcrum being brought nearer to the crown or surface of a broken fang; a very important feature in the use of the key. The edge should be made sharp, with a short bevil, to avoid the liability of breaking in the operation. If the instrument is dull, it is liable to slide from its proper place on the fang, and endanger an excision of the crown.

Preparatory to applying the key, the fulcrum should be wrapped with a strip of muslin, half an inch in width, carrying it alternately on each side of the hook, and

occasionally transversely around the fulcrum, terminating with the end wrapped around the shaft, and held under the finger.

The key should be grasped, with the handle between the thumb and three last fingers of the right hand, and the forefinger resting horizontally upon the shaft.

After the gum is properly lanced, the hook should be inserted far upon the neck of the tooth, to the alveoli, and the fulcrum sustained as nearly opposite as possible, avoiding to let it settle down upon the gum, and produce the unfortunate results that usually attend such a situation of it; then gently rotating the instrument, and pressing with the forefinger of the left hand upon the hook until it is felt to take hold; after which, continuing the raising power, the tooth will be started from its socket; at this juncture, some writers have directed a sudden elevating motion to the key, which, unless the tooth is entirely disengaged, may be attended with unpleasant results. The most safe and certain method, is to use a pair of forceps; previously reconciling the patient, by a simple statement of the truth, that the tooth is loosened from the socket; in a large majority of cases, no succeeding attempt is necessary, as the tooth will come out with the key.

It has been a matter of dispute, which side of the tooth the fulcrum should be placed, though without any just causes of doubt; the position of the teeth, together with the anatomical arrangement of them in the jaw, seem to me to afford a sufficient guide, to preclude the possibility of error; the upper teeth having their inclination outward, would most certainly indicate their easiest extrac-



tion in that way, and consequently with the fulcrum placed upon the outside.

Mr. Bell,\* in referring to the extraction of the first and second molares of the upper jaw, says that "the fulcrum should always, if possible, be placed on the inner or palatine side;" and subsequently goes on to say, "The application of the fulcrum to the outer side, as recommended by most writers on this subject, appears to me to be a very important error. Not only is the instrument much more readily fixed in the situation which I have directed, but the basis on which the fulcrum rests is more firm and solid. If the fulcrum be fixed on the outer alveolar plate, it will certainly pass upwards during the turn of the instrument, and fracture of the process is almost inevitable. On the inner side, on the contrary, there is a firm, solid, and sufficiently broad basis for the fulcrum to rest upon, and, as it is thus prevented from rising whilst the instrument is turned, the oval of the fulcrum presents a higher and higher portion to the place on which it rests; thus assisting the extraction in the very direction in which it is required." The arguments offered by Mr. Bell, to substantiate the truths of his practice, do not, in my opinion, sustain themselves by facts. In the first place, the ready convenience of fixing the fulcrum, is as great upon the outside of the tooth as the inner, and the position of it more firm and steady; if placed upon the palatine side, it rests upon an incline plane; whereas, on the outside, the surface is nearly perpendicular, and consequently parallel with the raising power, by which the instrument can be managed with

\* Bell on the Teeth, p 298.

more firmness, and less liability to slip, than if applied upon the inner side. As to the danger of the fulcrum passing upward, during the turn of the instrument, there is none, no matter which side of the tooth it is placed, provided the hook is short enough, *and the flat fulcrum be used*, unless so much of that side of the crown be broken or decayed away; in that case, another mode of operating will be found upon a subsequent page.

In the extraction of the lower teeth, I again differ with the highly respectable operator recently quoted: by placing the fulcrum upon the inside of those teeth, when it is possible; the objections given by him to this mode of operating, are counteracted in the proper form of the hook, and its correct application to the tooth; it will be observed, that if the instrument is properly applied, the first motion given to the tooth is a perpendicular one, and after it has progressed a little, or until the edge of the claw becomes opposite the centre of the counter-force of the leverage, it begins to describe the arc of a circle; and then being sufficiently elevated to clear the edge of the alveoli, is assisted by the direction of the articulation of the tooth.

The superior wisdom teeth always require that the fulcrum be placed upon the outside, their inclination generally being outward, and the delicate character of the maxillary bone rendering it so liable to being broken; many cases of which I have seen, from the application of the instrument upon the inside. The wisdom teeth of the lower jaw may more determine the position of the fulcrum, by their situation or peculiar inclination, it varying so much in different mouths, than by any fixed rule.

For the extraction of the superior incisores and cuspidati, the fulcrum should be placed on the inside, as also in removing the bicuspides.

The deciduous teeth rarely, if ever, require the aid of the key; in fact, the injury that may arise from the use of it, should entirely forbid it, in the extraction of these teeth.

For the removal of broken or decayed fangs, the key is invaluable; in a majority of cases, other instruments that are made expressly for the purpose, will conveniently and safely effect the object; but the roots of molar teeth, that are firmly set, will sometimes resist all efforts with a punch or elevator, and can only be extracted with safety by means of the key.

If the gum entirely invests the fang, it should be incised longitudinally with the root, until a proper opportunity is afforded for taking hold with the claw of the instrument; as upon the first seizure, depends the success, very frequently, of the operation; should the fang be broken off, a greater difficulty will occur to obtain a second fastening.

The operator will frequently meet with cases, where one half of a crown will be found broken off, together with a large portion of that side of the fang, thus occasioning a hollow place, into which the fulcrum is liable to slip, and by that means lose the necessary purchase; such a difficulty may be remedied, by using hooks with a double bend at right angles, which is calculated to throw the fulcrum against a posterior or an anterior tooth.

The position of the operator must be determined, principally by his own experience, in the one most convenient to him. As a general rule, in the extracting of the upper

and lower bicuspidati and molares, and the cuspidati and incisores of the left upper and lower jaws, he should stand upon the right of the patient, a little in advance; and in removing the incisores and cuspidati of the right side of either jaw, his position should be upon the left.

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### THE FORCEPS.

THE forceps have almost superceded the key for the extracting of teeth; they are applied without any dependance upon the gum or adjacent teeth, and with less pain than generally attends the use of the key.

A large variety of forceps are now in use, many of them well suited to the extraction of the different teeth for which they are designed. More care and attention to the peculiar adaptation of the instrument to the convenience of the hand, and the application of it to the teeth, is now observed in the form of the forceps than formerly, and any operator may be able to select an assortment in every way appropriate to the extraction of all the teeth, from the incisores to the molares. The ingenuity exhibited by some of the artificers in dental instruments, is worthy of much commendation, for to the combination of ideas, gathered by them from different operators, many of the improvements may be referred. Mr. Kern, of North Eighth Street, Philadelphia, has attained a celebrity to which he is well entitled. By my own obser-

vation, I am satisfied that the reputation of a dental surgeon may suffer from the use of bad instruments.

One general fault in the construction of the forceps, is the want of sufficient excavation in the bowl of the claw, to allow them to grasp the neck of a tooth, without the liability of crushing the crown ; another, is in making the nibs, or points, too long and slender, by which they are oftentimes either broken in the application of them or penetrating too deeply in the fang of the tooth, endanger the splitting of it.

For general practice, the operator should possess at least nine pair. One pair of straight forceps, designed for removing the upper and lower incisors and cuspidati. These forceps should be slightly indented in the claw, and a little concave at the points. For the extraction of the superior bicuspidati, two pair are necessary, one for each side, having a double curve to throw the jaws of the forceps horizontal with the tooth. Similar forceps may be used for extracting the molars, having longer curves, and of a larger size in the claw ; these forceps should terminate in the inner claw, with two points, corresponding with the inner fangs of the molar teeth ; the outer claw should terminate with two grooves similar to the fangs on the outside of those teeth.

The forceps for removing the lower molares, may be of similar construction, except in the terminus of the claw, which, to correspond with the form of the roots, there being two ranging posteriorly, one with the other, should terminate each in two grooves having three points.

For extracting the lower bicuspidati, a pair of the ordi-

nary "hawk-bill," as recommended by Mr. Bell, are necessary.

The incisores and cuspidati of the lower jaw may be more safely extracted with forceps of the following description. I consider them superior to the narrow beak hawk-bill, inasmuch as the application and use of them is more consistent with the range and situation of those teeth. The jaws are narrow, terminating in one groove; from the hinge the handles are curved outward, the outer handle continuing the curve to the end; the inner handle, one inch from the hinge, curves inward, and terminating with the end inclining to the outer handle.\*

For removing deciduous teeth, three pair only are needed; one pair similar in construction to those last described for extracting the lower front teeth.

One pair of small straight forceps for the upper front teeth and small grinders; and one pair bent at right angles, or nearly so, with the edge of the handle. In the use of the forceps, the operator must generally decide according to the greatest convenience in performing the operation, his relative position with the patient. As a general rule, the right side is to be preferred, as it gives an opportunity to support the head with the left hand. A few hints, however, may not be unacceptable, of the positions most convenient for the proper performance of this part of dental surgery.

To extract the incisores, cuspidati, bicuspides, and molars of the left side of the upper jaw, the dentist should stand on the right side, at an angle of forty-five degrees front of a line parallel with the back of the patient.

\* Vide plate 3, fig. 1.

To extract the bicuspidates and molars of the right side, he should stand on the right, nearly in a line with the patient.

In removing the inferior bicuspidati and molars of the right side, his position should be in the rear, elevated so, that with the left hand situated on the left of the patient, he may be able to hold away the lips, and apply the forceps upon the teeth, bending over the head of the subject.

The same position is necessary for extracting the lower front teeth. The removal of the inferior bicuspidates and molars require that the operator stand upon the left side.

Before applying the forceps, the gums should be separated from the neck of the teeth as thoroughly as possible, and if the crown is much decayed, an incision should be made parallel with the fang, to admit of the instrument entering far on the neck of the tooth, to guard against any danger of breaking it; the forceps should, in every case, be forced upon the fang as far as possible.

A frequent cause of accident in the use of this instrument, is the unrestrained pressure applied upon the tooth. Many operators grasp the forceps with clenched hands, as if they were extracting a spike from an oak plank, and thus frequently excise the crown of very solid teeth. To avoid this liability, the first and second fingers should be placed on the inside of the handles, one to act upon each in restraining the power, by which means a proper control is exercised in the pressure of the instrument; sufficient force only should be applied to retain hold upon the teeth.

In extracting the front teeth, a slightly rotary motion facilitates very much their removal. Those teeth which

have more than one fang, require that an undulating motion be given to separate the walls of the alveoli.

Deciduous teeth demand the utmost care to avoid injury to the approaching permanent set; they do not require any preparatory separation of the gum.

### THE PUNCH.

THE punch is designed for removing broken or decayed fangs, unfit to be extracted by the forceps or key; to avoid injury to the mouth, some operators recommend the insertion of a towel, so arranged as to receive the point of the instrument, in the event of its slipping. In the use of this instrument, the operator should firmly brace the head with the left arm; and with the right arm resting against his body, any undue force or sudden motion may be prevented, with more certainty and safety, than by a mere dependence upon any thing placed in the mouth. The instrument is a dangerous one, and should be used with caution.

The punch I employ for the purpose, is of a different construction from the ordinary one: having the point a little curved; with it, a leverage is obtained, and less danger exists in its use.



## THE SCREW.

THIS instrument is used for extracting the roots of front teeth, that have had artificial crowns inserted on them, and will be found very convenient, particularly when too much decayed for the key. It is applied, by gently screwing it into the cavity of the fang, until a sufficient hold is obtained to bear the force of extraction. Sometimes it is necessary to enlarge or deepen the hole with a drill.

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## THE THUMB-FULCRUM.

THIS is the most convenient instrument in general use for extracting fangs of teeth, and may sometimes be employed advantageously in removing teeth that are entire; the form is a bend at right angles of about five-eighths of an inch, from a shaft of two and a half or three inches, with a short handle; the bend should also have a slight inclination at the end, which should be at least the eighth of an inch in width, and made very sharp; this is the description of the primitive instrument, and is in every respect preferable to the modern one. In the application of the thumb-fulcrum, the gum should be well lanced, and the hook forced as deep upon the neck of the tooth as possible; the operator placing himself in the position directed for the punch, with it may easily remove a very firm tooth;

by this position, an acquisition of power is obtained, without any danger of injury to the mouth; for the extraction of roots comparatively loose, the thumb may be used as a fulcrum, by placing it upon the gum opposite the tooth or fang, or upon an adjoining tooth: it is in this way I mostly use it, and for that reason have given it the above title.

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#### EXCESSIVE HEMORRHAGE FROM EXTRACTION.

It seldom happens, that the parts bleed more from the extraction of a tooth, than essential to reduce any existing inflammation; it is even necessary, in some cases, to promote it by warm applications. But with individuals of a hemorrhagic diathesis, instances of an alarming character have occurred, produced oftentimes by the slightest puncture; when a known constitutional predisposition exists, the extraction of teeth should, if possible, be avoided.

Various remedies have been suggested, and tried, to arrest hemorrhage; the application of powerful styptics, cauterly, wedges of cork, and lint, firmly pressed into the cavity; but frequently without producing the required effect.

In ordinary cases, kreosote, blue vitriol, pulv. alum, or the muriated tinct. of iron, will be found sufficient, and in protracted cases, the following expedient, suggested by my

deceased parent, and practiced by him for many years, will prove most generally successful.

Some years since, a young man residing in Philadelphia had a molar tooth extracted, after which the parts continued to bleed profusely for several days. Dr. Physic was called in, and administered all the known remedies without avail; he consulted my father, and together they visited the patient; new remedies were suggested and tried, but still the bleeding continued; while they were watching the patient, my father observed the man to contract his cheek, as if in the act of sucking, preparatory to ejecting the blood from his mouth; it immediately occurred to him, that by propping his mouth open, the exciting cause would, in a measure, be removed, and the blood would soon coagulate; accordingly they placed a cork between his teeth, and with a bandage, passing under the chin and around the head, secured it. The result was that the bleeding ceased entirely in less than an hour.

I have seen many severe cases, but have been able, upon every occasion, to succeed in arresting hemorrhage from extraction of teeth, by the above process, when resorted to. When local remedies prove insufficient, a constitutional treatment is the only alternative. The annexed case is one of some interest; it is extracted from Robertson's Retrospect.

[The patient, a boy about fourteen years of age, was found by Dr. Clay laboring under profuse hemorrhage in consequence of the extraction of the third molar tooth of the upper jaw; the gum and cheek were very much lacerated. Various styptics had been applied: as N. of

Myrrh, F. Ferri. Mur., Arg. Nitrat., &c., without stopping it. Dr. Clay used Matico, Secale, Ruspini's Styptic, and even the actual cautery, without the slightest benefit. Constitutional treatment alone remained, and, in consultation, it was decided he should take the following mixture:]

R. Plumb. Super. Acet,	-	-	-	-	℥ss.
Acid. Acet. Dil.,	-	-	-	-	℥ss.
Syr. Rhead,	-	-	-	-	℥ss.
Mist.					
Camp,	-	-	-	-	℥v.
M. Ft. Mist.					

Sumat æger coch., magn., duo omni tertia hora.

Thus five grains of the acetate of lead were given every three hours, or nearly so; in addition to which pads, saturated with the liq. plumb. diacet. were applied to the bleeding surfaces with as correct a pressure as possible. Twenty-four hours passed under this treatment without improvement.

At a second consultation with several gentlemen, in addition to whom, Mr. Bamber, a retired practitioner, and for many years medical attendant of the family, was present. It was agreed to persevere with the acetate of lead mixture until the following day, continuing also the pads of lint saturated with the matico. On the following morning, much to the satisfaction of all parties, the bleeding was checked; this was the tenth day, and up to this time he had taken nearly a drachm of the acetate of lead. The boy began to complain of pain in the head and

stomach; it was therefore evident that we could not proceed further with the acetate of lead; and as the bowels had not been moved since the exhibition of it, it was determined to substitute the sulphate of soda, which the American physicians speak so highly of. A saturated solution was ordered, to the extent of half a wine glass every four hours, and in a very short time the bowels were acted upon.

The bleeding was perfectly arrested from the tenth day, great care being taken, for some time, in removing the pads, and which were for several days moistened with the liq. plumbi. acetat. dil. I have omitted to mention the head was shaved when the constitutional treatment commenced, and that evaporating lotions were kept constantly upon it.

From the tenth day the boy very gradually recovered, though extremely reduced. He is now, December twenty-ninth, comparatively well, and the soft parts of his mouth perfectly healed.

## CHAPTER VI.

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### EXOSTOSIS OF THE FANGS OF THE TEETH.

EXOSTOSIS is an unnatural osseous formation, and is a disease common to all the bones. In the teeth it attacks the fangs only; it generally commences at the point, sometimes extending throughout the entire root; but the most common appearance is of small knots, from the size of a pinhead to a cherry stone.

This disease affects teeth that are, to all external appearances, entirely sound, and therefore cannot depend exclusively upon any diseased state of the tooth; it is, doubtless, the result of inflammation in the fang, occasioned by an unhealthy condition of the gums. The peculiar appearance of this osseous product identifies it at once as to its character. When found on the teeth it presents an amber-like, yellowish color, more transparent and more porous than the healthy bone of the fangs.

I recently extracted a molar tooth for a man, who had suffered for several weeks the most violent pain, accompanied with great distress in his head. Upon a subsequent examination, the tooth, in every fang, was found affected with general exostosis of the root. After the extraction he

speedily recovered. Frequent cases have been noticed in which much suffering has arisen from this disease of the teeth, though I have known but few instances of it in teeth in other respects sound.

The only remedy is a removal of the tooth or fang, necessity for which becomes evident from the general symptoms.

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#### THE DENUDATION OF THE ENAMEL.

THE origin and cause of this peculiar affection of the enamel of the teeth, remains, as yet, involved in doubt and speculative theories. It is a disease confined chiefly to the external surfaces of one or more teeth; and sometimes, though very seldom, embraces the entire dental system. The peculiar characteristics by which it may be known from ordinary caries, are horizontal lines or grooves, on the exterior enamel of the incisors and cuspidati; and a multiplicity of small dot-like cavities, or indentations, which sometimes unite in forming one general decay, continuing frequently through the enamel, until it penetrates the bone.

Another character of disease, which has been classed under the same head, is that of a black, opaque spot, extremely hard and highly polished in its appearance,

which is found on some teeth, remaining for years without any sensible increase.

Mr. Hunter, who was the first to notice this affection, supposes it "to originate in the tooth itself, and not to depend on accident, way of life, constitution, or any particular management of the teeth."

Mr. Bell acknowledges his inability to account for it, but thinks it "connected with the manner in which the enamel is deposited during its formation; for it will be recollected," says he, "that it first covers the apex of the tooth, and gradually invests the crown, by successive circular depositions; it is therefore not improbable, that from some temporary cause, acting during its deposition, certain circular portions may be more liable to mechanical abrasion, or other injury than the rest."

Mr. Fox attributes it to some solvent power of the saliva.

Dr. Harris denounces all the above theories, but does not favor us with his own opinion, in regard to the causes of its origin.

For many years, before I was aware of Mr. Fox's theory, my own observation led me to suppose it attributable to the action of the saliva, or the mucous secretions of an unhealthy mouth, as ordinary caries, though the symmetrical order and peculiarity of location of its appearance, has always remained unaccountable to me.

It differs, however, from caries in its character and locality, as it is rarely found, except only upon the external surfaces of the teeth.

A few weeks since, I was visited by a young girl of about seventeen years of age, whose superior central and lateral



incisores of the right side, were affected by a denudation of the enamel of those teeth in its apparently incipient stage ; the central tooth bore a deep horizontal groove upon its front surface, and the lateral tooth a combination of four small cavities. She stated to me, that when a child she received a blow on the corresponding deciduous teeth, and that the affected teeth wore the same appearance they now do, as long as she could remember.

This case, if correctly stated to me, would appear in opposition to Mr. Fox's theory, and tend to confirm that offered by Mr. Bell, in view of the dependence of the permanent teeth upon the temporary ones.

In the treatment of denudation, where the disease is only superficial, the enamel should be filed smooth and polished ; but if it has penetrated to the bone, or deeply into the enamel, the cavity should be filled as in caries.

## NECROSIS OF THE TEETH.

THIS condition of the teeth is analagous to that of the other bones of the system in its character, with the exception, that it produces the entire death of the teeth; but in the bones, by a process belonging to them only, the diseased part is thrown off, and gives place to a deposite of new bone. Necrosis produces a discoloration in the tooth by which it may be easily detected, and frequently affects teeth presenting no external evidences of disease.

The causes that produce necrosis may be referred to sudden blows, the excessive use of mercury, and to most of the exciting causes that lead to an unhealthy state of the gums. When this disease becomes fixed, no remedies will act on it; the tooth is then an extraneous body, and liable to all the consequences of such; but in its earlier stages, lancing of the gums and the administration of tonic washes will exercise a healthy tendency. After a time, when the tooth becomes a source of irritation, it should be removed to prevent any bad effects arising from it.

## DISEASES OF THE GUMS.

THAT a strong sympathy between the teeth and gums exist, cannot be denied, and that a majority, if not all, of the diseases of the teeth originate in an unhealthy state of the gums, may be equally admissible; it is to an excited condition of the gums, that we can refer many of the pains felt in teeth perfectly sound, which go and return periodically. Nervous irritation is doubtless the cause, and may be induced by cold, derangement of the stomach, and other remote causes.

Waite says, "the affections of the stomach are perhaps more directly concerned with our subject than those of any other part of the human frame.

"Accompanying the nausea, headache, and constitutional derangement, we have sympathetic pain extending to the gums, and even to the teeth.

"Those sympathies furnish us with an explanation why, when the stomach is out of order, we have rheumatic affections of the jaws with disturbed nights; why toothache is under such circumstances so liable to occur, and is so terrible; why that gum, which before was firm and hard, becomes extremely sensitive, swells and suppurates; why the constitutional languor and dejection are so excessive; why palpitations of the heart, on motion, syncope and delirium, are also accompanying characteristics produced by swellings of the gum."

Violent emotions of the mind have been supposed to exercise an effect on the teeth and gums. Mr. Waite, in his essay upon the gums, cites the case of a lady, "who

was afflicted with great grief and anxiety ; the digestive organs became deranged to a very considerable extent, and great nervous excitement was roused in her constitution ; pain became suddenly fixed in the gums corresponding to two front teeth ; they dropped and became extremely loose.”

Another was that of “ an English officer detained prisoner of war at Verdun, and who possessed very strong teeth and healthy gums, labored under all the symptoms of Nostalgia.\* Although permitted to go out, he took his imprisonment so much to heart, that he never stirred from his room ; pain, in a similar manner to the case above named, centered itself in the gums ; the teeth loosened and were extracted. It was an inordinate action of the vessels of the gums, caused, in both instances, by the mind and body sympathizing, which hastened the loss of these teeth.”

The diseases of the gums may be regarded as constitutional in some cases, and in others as arising from some immediate or exciting causes.

Those diseases which are referred to constitutional causes, may be produced by some remote affections of the general system, or may be traced to hereditary predisposition. In inflammatory fever the tongue, mouth and throat, exhibit characteristics of its particular stages, while the gum presents a debilitated condition, with a swollen and vascular appearance, and an increased arterial circulation. It has been asserted that the gum remains in a swollen condition during the prevalence of intermittent fever.

Scurvy is remarkably apparent by the effects it produces

\* A vehement desire to visit ones native country.

on the gums ; they contract and expose the neck of the teeth, and deepen into a morbidly unhealthy color, bleed easily, and discharge a very disagreeable matter. The disease continuing, the alveolar soon becomes destroyed by absorption, and the teeth eventually drop out.

Those diseases arising from more immediate and exciting causes, depend principally upon the condition of the teeth. The sympathy between the gums and teeth require a healthy tone in the one to produce a corresponding action in the other ; if the gums labor under a scorbutic taint, the inflammation, extending to the investing membrane of the tooth, soon destroys its connection in the socket, and makes it sensitive to every touch, thus not only depriving it of its usefulness, but adding pain to the inefficiency of the organ.

Abscesses in the alveolar cavity are frequent forms of disease. Matter collects in the cell of the socket, from some unhealthy action of the parts, and penetrating through the gum, discharges itself in that way, but leaves the socket a prey to the absorbents, by which it is soon destroyed.

The most common character of disease in the gums is a flaccid and spongy appearance ; they become swollen, and bleed upon the slightest puncture ; “ the apices, or points between the teeth, become congested with blood, and an exudation of a viscid fluid takes place, which, if allowed to remain for any time in contact with the teeth, corrodes the enamel, and they become black and unseemly.” This form of disease is the result of decayed fangs or teeth allowed to remain in a state of irritation, by accumulations of calcareous matter, and by a disordered state of the

stomach. Neglect in a proper regard to cleanliness of the mouth, and the use of certain kinds of dentifrice and solutions, are also exciting causes to it.

In treating this disease of the gums we must be governed by the causes that have produced it ; if any decayed roots still remain in the mouth, they should at once be extracted, and any amount of tartar that may be deposited upon the necks of the teeth it is necessary to remove. It cannot be expected, if much absorption of the alveolar has taken place, and the teeth are loose, that they will ever regain their firmness, but a healthy tone may be acquired by which they can be retained longer in the mouth than if allowed to remain unrelieved.

As the existence of irregular teeth will frequently be found attended with the condition of the gums alluded to, in order to assist in the removal of any disadvantage they may occasion, proper remedies should be resorted to for correcting their irregularity. Mr. Koecker recommends the removal of any remaining molar in the upper jaw that has no antagonist. Such a course I regard as altogether needless ; it is very seldom that any disadvantage will arise from it to any of the remaining teeth, and the tooth may some time subsequently prove valuable as an auxiliary in another operation.

A free bleeding of the gums is attended with benefit, and should be promoted by the application of warm water after scaling the teeth, and by frequent brushings, at least three times a day, which should be continued until the gums begin to assume a healthy condition. The application of leeches, when the gums are much swollen, have been very generally used to great advantage.

The following wash for the mouth will be found very serviceable to give tone and vigor to the gums, and should be used from three to six times per day, according to the necessities of the case.

R. Alumen, Pulv.	-	-	-	-	-	℥ij.
Tinct Opii,	-	-	-	-	-	℥ss.
Tinct Myrrhi,	-	-	-	-	-	℥ss.
Aqua,	-	-	-	-	-	℥vj.
Misce.						

A decoction of Spanish oak bark will assist in imparting health to the gums; or a tincture of Krameria; this may also be used in the form of a decoction. Either of these preparations may be substituted for the alum and water in the first prescription, or they may be used entirely alone. If the gums continue sore, and bleed easily, the compound preparation should be preferred; but if only tender to the touch, the simple decoctions will suffice. Sometimes a little pulverized orris root is added to give flavor to any particular wash. Mr. Fox recommends, upon the failure of the usual remedies, and the gums continue to bleed, to touch their edges with lunar caustic. The most effectual mode of applying it, is, when practicable, by touching the parts with the roll. When this plan is inconvenient, a solution may be made by dissolving two drachms in one ounce of water. This treatment is calculated to change the character of the disease, from which a new and healthy action may be produced.

I was recently consulted by a young lady, who had been

afflicted for sometime with a "preternatural prurient growth of the gums," to such an extent as to completely invest to the cutting edges, all the teeth of both jaws; the gum was slit longitudinally with the spaces between the teeth, and lay as flaps upon the surface. After excising the gums even with the margin of the crowns of her teeth, I directed the wash prescribed on the foregoing page. Upon her second visit I extracted the right eye-tooth, which was crowded from its place, and with the enamel decayed off entirely from the front surface. I also removed the tartar from her teeth, which was in large quantities, and gave her a solution of nine grains of lunar caustic dissolved in one ounce of water. This treatment had a beneficial effect; and by subsequently using the brush and dentifrice, a healthy condition was soon obtained and preserved. I had forgotten to mention that I placed her on a low diet, and kept the bowels open with gentle cathartics.



## CHAPTER VII.

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### PREPARATION OF THE MOUTH PREVIOUS TO THE INSERTION OF ARTIFICIAL TEETH.

THE importance of an entire health in the gums, preparatory to the adjustment of an artificial process to the mouth, must be evident to every dental surgeon.

If disease exist, the remedies already recommended should be resorted to, and persisted in, until a healthy tone is produced, for without it, nothing less than future bad consequences are to be apprehended; the presence of decayed fangs, with their attending results, should be avoided; and teeth that may be in any way susceptible of dental skill should receive such attention and care as they need, and if past relief, they should be at once removed.

Such is our advice, as a general maxim, but it is most frequently the case, that the labors of the dentist are limited to the circumstances or parsimony of his patients, and he is required to perform only a specific duty; one rule, however, should be invariable with him, and from which no persuasions should induce him to depart.

I refer to the insertion of teeth on plates over a number of diseased fangs; the retention of three or four in a sound, healthy state may not be objectionable, provided their natural cavities are filled as in caries; but it is often that the patient insists upon keeping a regiment of worthless stumps, to defend the gum from falling in, or to avoid a little pain, heedless of the greater amount contracted in preparing those fangs for the proper fitting of the teeth. A case occurred to me of such a character a short time since. A gentleman called on me to furnish him with an upper set, with the exception of two teeth that were perfectly sound. I at once recommended the extraction of a number of roots remaining in the jaw, he declined having them out; I refused to make his teeth; he returned to me a few days subsequently, and insisted with much warmth, urging, as an objection, that his nerves were in a diseased state, and he could not possibly bear their extraction; I reluctantly consented, and made the teeth for him: he wore them about six weeks without much inconvenience; at the end of that time, the gum, already in an excited state, began to swell and envelope the whole exposed surface of the roots, so that the plate and teeth, by their pressure, gave him a great deal of pain and inconvenience, and finally obliged him to lay them aside for a while, until the inflammation should subside; a repetition of the cause may bring on a return of the difficulty, and it is quite probable he will be unable to receive any benefit from them, or even be able to wear them with any degree of comfort.

After the extraction of roots of teeth, it is necessary to delay a sufficient length of time, for the recession of the

gums by the absorption of the alveolar, before the artificial process is inserted, to be determined according to the number and position of the roots extracted; if, for example, the fangs of the incisores have been removed, leaving the eye-teeth in the mouth, a delay of about six or eight weeks is necessary; if only two contiguous teeth are taken out, from two to three weeks are sufficient, and a single tooth may be replaced as soon as the gum closes. The loss of the entire denture of either jaw will require from ten to twelve months to complete the process of absorption.

When only one or two roots are extracted, the absorption of the alveolar is not as complete as when a greater number are taken out, and hence the cause why they may be sooner replaced.

If necessity exists for a greater haste than the occasion would justify for the insertion of the artificial teeth, some allowance may be made by causing the base of the teeth to press hard against the gum.

I have known teeth inserted when even the contiguous ones were unworthy of retention, and so dilapidated as to require extraction in a few months; in many such cases the dentist has promised to accurately fit teeth to supply the deficiencies as they occur, heedless of the impracticability of doing justice to the patient; as the plate, to be complete, should accurately fit the remaining teeth, and as the absorption of the gum is not circumscribed by the limits of the tooth only, but covering two or three times its area, so when a tooth is extracted after the adjustment of the artificial apparatus, it is impossible to fully supply the deficiencies of the gums, and a large cavity is frequently left under the

plate, as a place of deposite for extraneous matter, noxious to the patient and hurtful to the gums.

After the extraction of a number of roots, and the gums have entirely healed, I sometimes make a temporary set of teeth to be worn until the jaws are fit for the reception of permanent ones; this plan is somewhat prejudicial to the interests of the operator, but less so than the too hasty insertion of a permanent set.

The objections to temporary teeth, consist in the disadvantage existing against their proper and comfortable application to the gums; and with the fact that they are designed for only a temporary purpose, the dentist is not warranted in bestowing labor sufficient to make them as neat and natural in their appearance as might be desired; therefore, if he can avoid it, his own reputation would be enhanced by omitting them altogether.

## ENGRAFTING TEETH.

THIS mode of inserting artificial teeth is of all others the most simple, and, under proper circumstances, the most desirable. The propriety of its adoption should be determined by the condition of the fang, both as regards its health and permanency. If the root is in a state of inflammation, a proper remedial course should be resorted to, and every indication removed before the operation is attempted; after which, if the root is sufficiently firm and solid, by an accurate mechanical adaptation, the artificial crown may be inserted with some prospect of usefulness and durability; but, on the other hand, if, as is frequently the case, no regard is paid to the condition of the fang or the gums, failure of success will be the inevitable result.

Teeth inserted in this way, vary in their duration from two or three to ten, twelve, or even fifteen years, depending upon the health of the gums, and the manner of insertion.

The *incisores* and *cuspidati* are the only teeth capable of being engrafted upon, as the fangs of those teeth have their natural cavities in the centre, and but a single fang; whereas the other teeth have two or more fangs, frequently diverging, and, independent of other objections, are so situated in the mouth as to render the inconvenience of access to them a difficulty in the accurate insertion of artificial crowns.

To avoid any danger of inflammation from the pressure of a pivot, upon the the first insertion of a tooth, a tempo-

rary one should be used, to be supplanted by a larger one two or three weeks subsequently; by this means it can be easily removed upon the first symptoms.

Sometimes, to avoid a swelling of the gums consequent upon inflammation of the fang; I have inserted a fine tube through the pivot and posterior side of the tooth, by which an egress is formed for suppurating matter. Another method, I believe also recommended by some one antecedent,\* is to cut a groove or gutter in the pivot, and a transverse one on the tooth leading from it, or upon the exposed surface of the fang.

The importance of a constitutional treatment, before adjusting an artificial tooth on a pivot, is seldom duly considered, and hence the evil consequences that so frequently arise from the insertion of teeth in this way. The mode of treatment suggested by Mr. Waite may seem rather prolix, but when the constitutional sympathy with the gums, and their influence upon the teeth, are understood, the importance of a thorough treatment will be more fully appreciated. He says :

“It is a matter of the highest importance, when the gums assume tints indicative of an irritable habit of body, that, previously to teeth being pivoted, the constitution should be well prepared for the operation; that, at the time of performing it, all sensibility in the root should be deadened, and the gum corresponding to the extremity of the root freely lanced. This acts with a double effect; it first produces a discharge of blood, and, secondly, forms a counter irritation.

\* Dr. Harris.

“ When inflammation is much to be apprehended, the following prescription ought to be had recourse to :

R. Pil. Hyd. Subm. Comp.	- - -	gr. iij.
Ext. Col. Comp.	- - - -	gr. vii.
M. Pil.	- - - -	ij.

Hora. Somni Sumendæ.

R. Magn. Sulphat,	- - - -	$\bar{3}$ ss.
Inf. Sennæ,	- - - -	$\bar{3}$ iss.

M.

To be taken in the morning.

“ On the following day, continuing spare diet, let a Seidlitz powder be taken, and at night take the following pill :

R. Pil. Hyd. Subm. Comp.	- - -	gr. j.
Ext. Col. Comp.	- - -	gr. iv.

M. Pil. i.

In the morning let a Seidlitz be taken, and the operation may then be performed.”

## PROCESS OF ENGRAFTING TEETH.

To prepare a fang for the reception of an artificial crown, it should be cut in the form of a semi-circular groove, even with the posterior and anterior margins of the gum. If a portion of the crown of the original tooth remains, it should be partly separated with a thin file, and then excised with a pair of cutting forceps; if only small spiculas, or a very much decayed portion, is in the way, the semi-severing with the file will be unnecessary, the object of which is to avoid the sudden jar apt to be occasioned by cutting away solid portions with the nippers. The neglect of this preparatory process, when necessary, may be productive of inflammation in the excision of a solid fang, or may endanger a splitting of it. To complete the external preparation of the root, a file should be used, of a half-round shape, regular (not tapering) and finely cut.

Upon the opening of the natural cavity, the sensibility of the nerve will frequently interfere with the operation, to obviate which, as also to prevent future pain from it, the destruction of that portion of the nerve remaining in the fang becomes necessary.

Some operators recommend the insertion of a fine needle in the cavity, twisted round, and suddenly withdrawn. This process, I think, must require frequent applications to accomplish the object, whereas the employment of a heated instrument generally succeeds the first time. The objections to a hot needle, arises more from the dread



excited by a blazing lamp than the actual pain of the operation. This may be obviated by using a lamp\* similar to one I have constructed for the purpose.

The insertion of a fine probe will determine if all sensibility is removed, after which, the root is ready for boring; which is to be done by enlarging the opening with a brooch, and drilling to the depth of two or three eighths of an inch with a small size drill for sound roots; decayed ones require larger holes, in order to remove as much as possible of the carious portion, obtaining a healthy part for the walls of the cavity.

Many operators use the "drill and bow," and others the "hand-drill;" the latter I consider altogether to be preferred; it is less formidable, and with little practice, may be used to a better advantage than the former; there is also less danger in the use of it. The direction given to the hole should be in accordance with the natural cavity. Sometimes a little deviation becomes necessary to correct a previous irregularity of the tooth; in doing which, care should be exercised to avoid crossing the fang, and

\* This lamp may be made of brass or tin; the former is preferable, both as regards finish and convenience of arrangement. A cylindrical box, of about three inches high and one and a half in diameter, should be furnished with a small spirit-lamp upon the lower part of the inside. A tube is inserted about midway and soldered to the box or cylinder; this tube is separated upon the inside of the case, immediately over the blaze of the lamp, so as to heat the needle, which is secured to an instrument accurately fitting the tube. A spring is attached, by which the needle, when heated, can be thrown through the tube into the nervous cavity. The end of the tube is made very small, to fit the orifice of the cavity, and a check given to the needle, to prevent too deep an entrance.

penetrating it through the side to the alveoli. Some allowance can be given in the form of the pivot.

A temporary pivot of soft wood should be used in fitting the tooth, and when finished, ready for insertion, a permanent one may be made from well-seasoned hickory. The length of the pivot can be ascertained by wrapping raw cotton on the end of a drill and entering it into the cavity.

Before finally securing the tooth, it will be necessary to cut away any portion that may strike the opposite teeth upon the occlusion of the jaws, so that the bearing may be upon the natural and not the artificial teeth, otherwise they will be liable to be loosened or knocked out.

In the fastening of the tooth, no more force should be applied than just sufficient to allow the entrance of the pivot by the pressure of the hand, with a forked instrument (made of ivory) resting upon the cutting edge of the tooth. A hammer should never be used, for by it the tooth or fang may be broken, and the sudden concussion is likely to produce inflammation of the root or alveoli.

In the choice of a material for pivoting, some practitioners recommend gold, silver, and platina, but wood is unquestionably preferable to any metal; it will fit more accurately the holes in the fang and tooth, and by its swelling becomes very firm and solid. When gold or silver are used, they should be made of half-round wire, with the flat sides doubled together, and soldered into the tooth at the bite. A sliver of wood should be placed between the legs of the pivot, to separate them by its swelling.

I have been surprised, in reading the works of celebrated operators, to observe the extremes into which they have fallen, in the different materials recommended by them for fastening pivot-teeth. Mr. Koecker opposes the use of pivots of wood, and directs that they be made of fine gold or platina. He says that wood "remains perfectly firm in the roots for many years," and that the root finally "is either split by the great swelling of the wood in the cavity, or nearly destroyed by its rapid decay." The fact that teeth inserted on pivots of wood, remain firm for such a length of time, is no objection; the swelling of the pivot takes place immediately after its insertion, when the fang is able to bear the pressure; any subsequent decay of the root is attended with a like condition of the pivot, which becomes, in consequence, unable to exert any pressure upon the walls of the cavity; further, he says, that he "inserts a tooth in such a manner, that the patient should be capable, after receiving the necessary instructions, to remove it and replace it at pleasure." The objections to this practice are manifold; the constant attrition upon the sides of the pivot hole, I have found, when such a plan has been pursued, has worn the cavity to two or three times its original size, and as no possible advantage can arise from it, is certainly to be deprecated.

Dr. Harris recommends "a delay of from four to eight days after the root is prepared before inserting the tooth;" as an objection would be generally made to remain so long a time without a tooth, I usually, when inflammation is to be apprehended, fasten the tooth loosely, renewing the pivot in two or three weeks.

## TOOTH POWDERS.

The following formulas of dentifrice will afford agreeable and useful compositions, without producing any injury to the teeth upon which they may be employed; the application of paste made with honey or sugar is objectionable, but, notwithstanding, many persons insist upon using it; I have therefore given a recipe to make it by.\*

## DENTIFRICE, NO. 1.

R. Prepared Chalk, - - - 6 ounces.  
 Pulv. Orris Root, - - - 2 "  
 Pulv. Gum Myrrh, - - -  $\frac{1}{2}$  "  
 Color with rose pink.

## DENTIFRICE, NO. 2.

R. Cuttle Fish Bone, - - - 10 ounces.  
 Prepared Chalk, - - - 12 "  
 Color with rose pink.

Flavor with a few drops of rose and bergamot.

## DENTIFRICE, NO. 3.

R. Prepared Chalk, - - - 8 ounces.  
 " Charcoal, - - - 2 "  
 " Myrrh, - - -  $\frac{1}{4}$  "

\* The writer has reserved for his private use, only, from among all the different receipts belonging to the profession, that of making the dentifrice which he generally uses.

## DENTIFRICE, NO. 4.

R. Pulv. Charcoal,	-	-	-	1 ounce.
“ Red Bark,	-	-	-	1 “
“ Gum Myrrh,	-	-	-	1 “

And perfume.

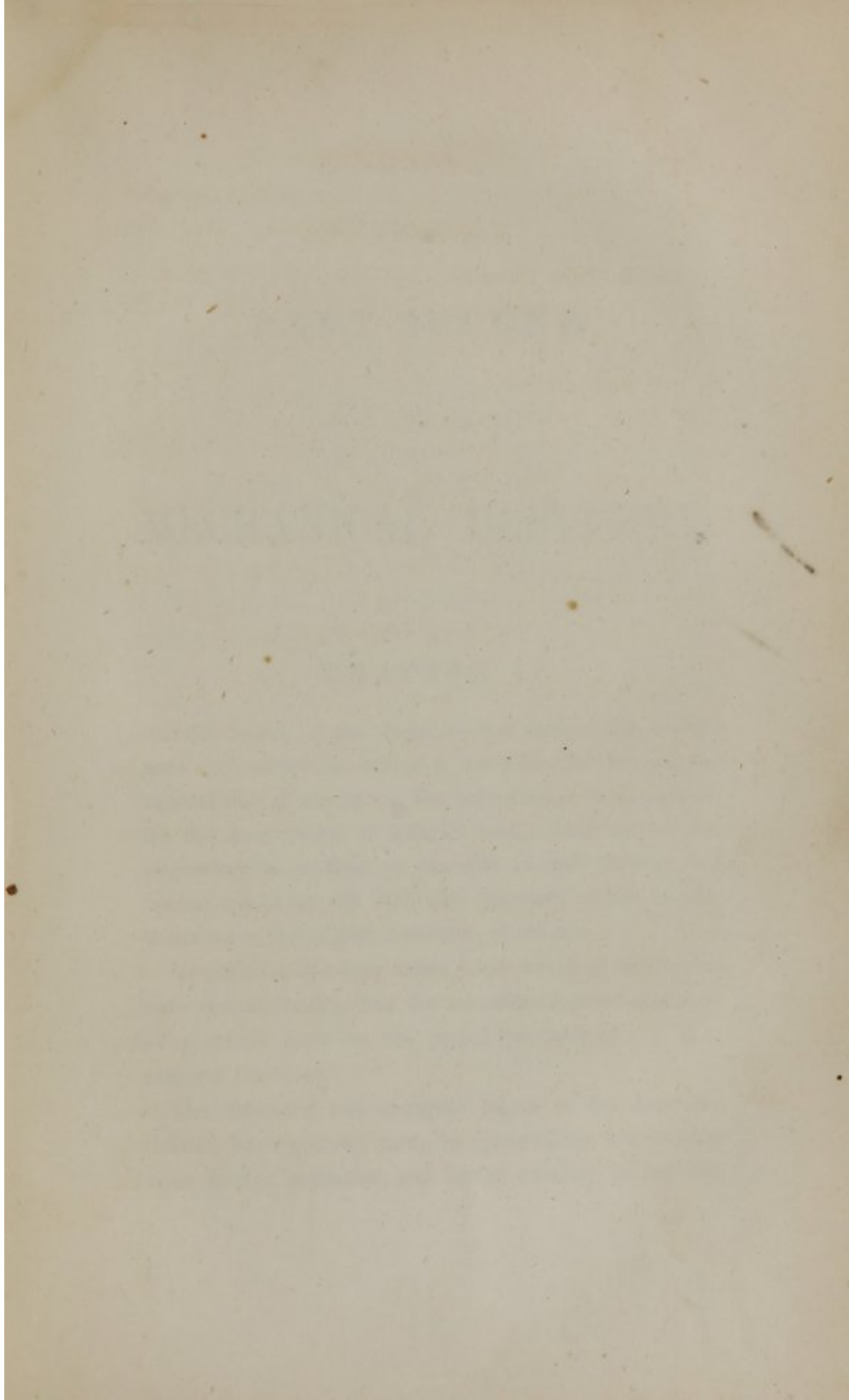
Tooth powders should be passed through a fine bolting-cloth sieve, after being thoroughly incorporated.

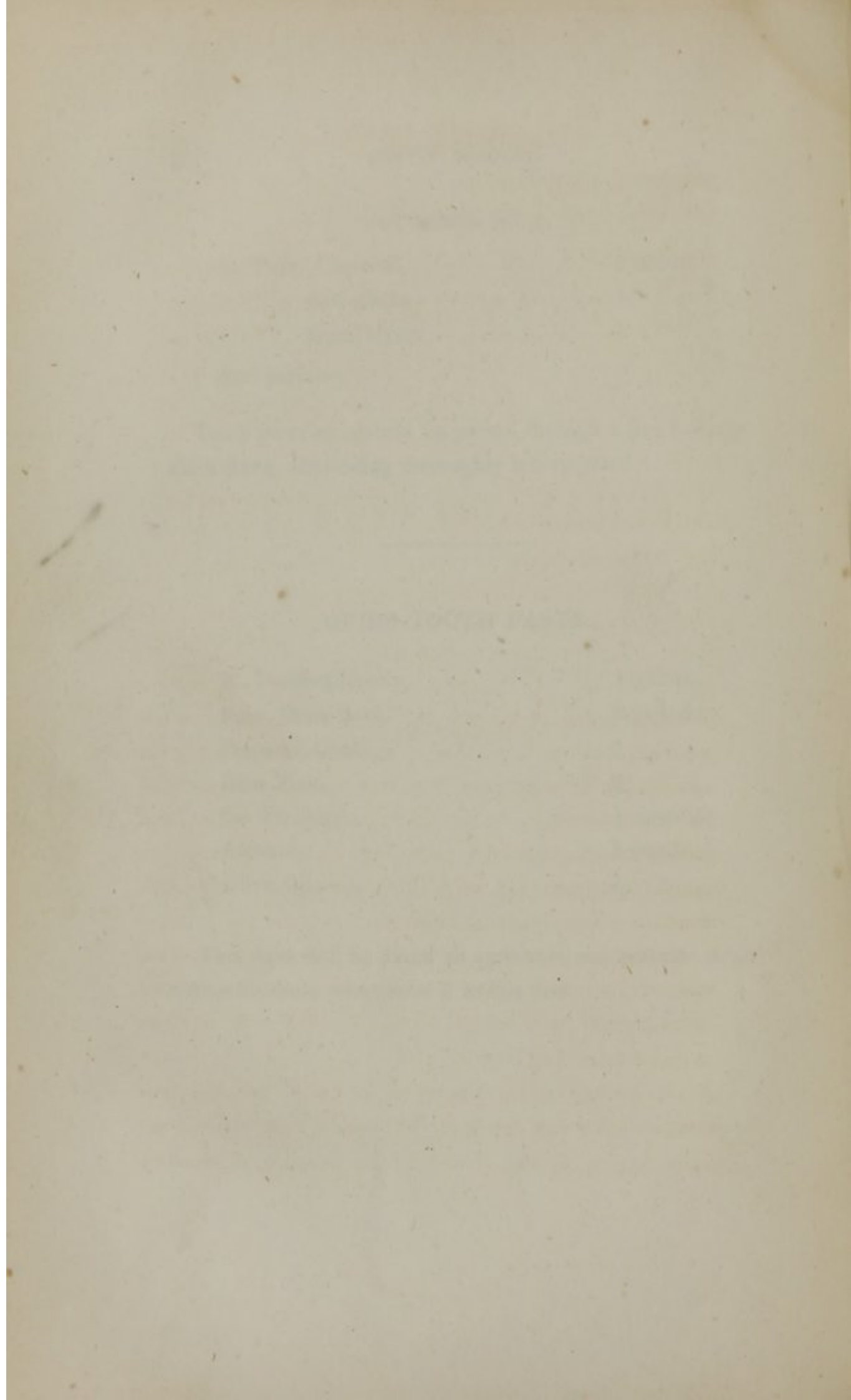
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 ORRIS TOOTH PASTE.

R. Purified Honey,	-	-	-	1 gallon.
Pulv. Orris Root.	-	-	-	2 pounds.
Prepared Chalk,	-	-	-	2 “
Rose Pink,	-	-	-	2 “
Oil Teaberry,	-	-	-	$\frac{1}{2}$ drachm.
Alcohol,	-	-	-	1 ounce.
Olive Oil,	-	-	-	1 “

This paste will be found an agreeable and pleasant dentifrice for those who prefer it in this form.





## PART SECOND.

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# MECHANICAL DENTISTRY.

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## CHAPTER I.

THIS branch of the dental art has increased in importance and usefulness, within a few years, far beyond the expectations of any one. The introduction of a material for the composition of artificial teeth, incorruptible, and possessing the qualities so essential to their purpose, has opened a field for the skill and ingenuity of the artizan, unknown in the primary condition of the art.

No opportunity better exists for an effort of mechanical taste and ingenuity, than the manufacture and adjustment of porcelain teeth to the proper performance of their required functions.

The unceasing and energetic labors of the American dentist, have enabled him, by persevering experiments upon foreign invention, and by the exercise of his own



skill, to bring the production of artificial teeth to that perfection, which thirty years ago would have been denounced as impossible.

To rival nature itself, in point of symmetry and beauty, with a set of artificial organs, subservient to all the purposes of the natural ones, and comfortable to the wearer, would have seemed, to any one, the supremacy of folly and romance, but which is, in reality, now almost the daily performance of the skilful operator.

The French dentists were the first to introduce minerals as a component of artificial teeth ; but, although every encouragement was offered to them by the medical societies of France, their progress to perfection was with a tardy pace. Their teeth being composed almost entirely of clay, were very opaque, too highly and unnaturally colored, and destitute of any natural form. In those now made in this country, a strict regard to color, form and translucency is observed, and with a success unerring, they may be justly entitled the "ne plus ultra" of artificial teeth.

The material used before the introduction of minerals, was to be found in the teeth of the Hippopotamus, or the tusks of the Elephant ; teeth of cows, sheep, and human teeth, inserted artificially, or transplanted from one to another mouth. The latter practice has long become obsolete, and probably never was carried to any great extent. Mr. Hunter has advocated it with more confidence than any other writer on the subject. He has asserted that he has known "dead teeth to grow when placed in a foreign socket."

Without wishing to impugn the candor of the respectable gentleman, and, to say the best of it, his credibility must have been easily operated on, or his judgment blinded to the real consequences of the operation.

A possibility of reunion could only exist in the extraction of a tooth, and its immediate replacement in the socket from which it was taken, while the mouths of the circumjacent vessels are open, and before a sufficient time should transpire to allow them to heal; even then the prospect of success is very doubtful.

The transposition of a tooth, from one socket to another, would be attended with a thousand chances to one against any assimilation of size or shape, subjecting the patient to much suffering and inconvenience, for a mere phantom or speculative hope. The practice is, under every circumstance, an unsafe one, and not based upon any principle of nature or art; it is the application of an extraneous body, with a design of resuscitation and union with living parts, and no certainty of its proper adaptation to be ascertained.

As occasional preferences may be found for animal teeth, or some circumstances may require their use, I have thought proper to casually refer to the mode of setting teeth of such selections.

### TEETH MADE OF THE TUSKS OF THE ELEPHANT, OR TEETH OF THE HIPPOPOTAMUS.

THIS material possesses more objection than any other animal matter used for the purpose; it is porous, readily absorbs the saliva, and becomes decomposed in a very short time, by which it is discolored, and rendered highly offensive to the patient. It has been used chiefly for sets of teeth to be sustained by atmospheric pressure. In some cases the front teeth have been supplied by natural ones, the bicuspidati and molares being carved in the ivory.

In selecting for the purpose, a piece should be chosen with a curve corresponding with the arch of the jaw, and with an enamelled exterior; it is then to be sawed out, in length and size, according to the mouth for which it is intended; and the base excavated with small gouges, chisels, &c., until it fits the gum accurately. In order to ascertain the prominences of the gums, the surface of the plaster mould should be coated with chrome yellow, or other coloring matter, put on with a hair pencil, from which a corresponding impress may be obtained, serving as a guide to excavate by. Care is necessary, to avoid making the excavation too large; unless it bind a little upon the exterior of the gum, the suction will not be adequate to sustain it in the mouth. After the block is properly fitted, the teeth should be laid out and separated with a saw, and finally carved into a natural form. The enamel should be polished with fine sand on coarse muslin.

If there are teeth in the mouth capable of supporting the artificial ones, clasps may be riveted upon the process and fitted to them.

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### TEETH MADE FROM THOSE OF COWS AND SHEEP.

THE teeth of old cattle only are fit for dental purposes, as by age, the natural cavity becomes filled up with a deposit of bone; the great disproportion between them and the human tooth, sometimes require more than one half of the crown to be cut away, to make it of the necessary size and shape; and, therefore, in the teeth of young cows, where the nervous cavity is large, the tooth would be left a mere shell, without sufficient substance to support it in fastening it to the plate, or on the pivot.

In the selection of them, they should be held to the sun, and if a red appearance, indicating blood, is apparent about the natural cavity of the crown of the tooth, they should be discarded as unfit for use; a more certain method is to saw off the crowns from the fang. These teeth are of ephemeral durability, generally lasting not more than two or three years, though sometimes they may remain in tolerable condition double that length of time; their milky whiteness is a great objection, and would

be insurmountable, were it not the case, that they are so readily acted upon by the salivary secretions, and soon change their color, generally approximating to that of the contiguous natural teeth, and gradually deepening by the process of decomposition that commences with their insertion, until they become so much decayed as to be no longer capable of being retained in the mouth.

These teeth may be secured by pivots, or placed on metallic plates. When they are to be engrafted, they should be cut with a file to the necessary width, taking an equal amount from each side, the edges rounded smoothly, and the crown sawed off according to the required length; it is then fitted to the fang in the mouth. When the hole is bored in the root, the artificial tooth is pressed into its assigned position with a small piece of wax placed on the base, by which a protuberance is obtained, serving as a guide to centre the hole by, to be bored in the tooth. The pivot should be inserted before any portion of the posterior part is cut away, in order to retain the strength of it, necessary in the forcing in of the pivot; afterwards, it may be filed away to clear the opposite teeth, and to correspond in length with the adjoining ones.

To plate these teeth, the mode described in setting human teeth should be pursued, after reducing them to the proper form and size.

Sheep teeth are used to supply the deficiencies of lateral incisors of the upper jaw, and the incisors of the lower jaw, their size corresponding better with the natural ones.

## HUMAN TEETH.

HUMAN teeth, artificially inserted, maintain a preference to all other animal substitutes, being less liable to decay, and corresponding better in form and color ; some objection exists among persons unacquainted with their physiological character, believing them frequently to be a source of contagion ; the process they undergo in cleaning will effectually obviate any difficulty on that score ; besides, being a dead body, they cannot be capable of retaining in the slightest degree any noxious principle.

These teeth may be inserted upon a root, by means of the pivot, or on metallic plates with clasps to support them. The usual method of making the plates, is to bend a piece of half-round wire to fit the inequalities of the mouth, continuing the ends around the teeth that are intended to hold them ; a notch is to be filed, of the width of the space or spaces to be supplied, half-way into the wire, to receive the edge of a strip of flat plate, about the eighth of an inch wide, which is then soldered to it, being held together by fine iron wire or clamps.

The teeth are cut about half-way through from the posterior side with a thin saw, and thus secured on the plate, two small holes are bored through the teeth and plate, through which rivets are fastened.

This mode of inserting teeth requires considerable practice, to be able to give them the proper position in making the saw curf, as that determines, particularly when there are more than one tooth upon the same plate, the position of the tooth in every respect.

When a human tooth is to be engrafted on the root, the natural cavity should be taken as the direction for the pivot-hole, and the process continued as described in the insertion of animal teeth.

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### PORCELAIN TEETH.

PORCELAIN is, without exception, in every respect preferable to any thing ever used in the construction of artificial teeth; being composed chiefly of minerals, it will withstand all action from the saliva, and is not affected by any thing received in the mouth; it therefore may be kept clean and of a healthy tendency; the color is permanent, and its flinty hardness enables it to sustain any amount of wear without injury.

Porcelain, when prepared and fit for use, is plastic and capable of being moulded or carved into any required form. Originally, teeth made of this material were colored with the baser metals, such as lead, iron and copper, in the form of an oxide; but the finer metals have superseded them to a better purpose.

Clay formerly entered largely in the composition of porcelain teeth; but owing to the opacity it gives, is now used in very minute proportions. Flint glass was a principle ingredient in the enamel, combined with silex; generally,

from a want of proper assimilation, teeth so enamelled were constantly liable to being crazed or broken in the process of soldering; now glass is employed only as a flux to fellspar in very small quantities.

A composition, for the manufacturing of porcelain teeth, is made, possessing all the natural and important qualifications, translucent, and capable of withstanding any required amount of heat, and sudden transitions of heat and cold; in color and form to suit every demand, and with a proper regard to the characteristics of nature, are moulded or carved of every desirable shape and size.



## CHAPTER II.

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### THE HISTORY AND COMPOSITION OF PORCELAIN.

THE art of making porcelain, appears by history to have been known first in Egypt, from thence it was carried into Greece, and then to Rome. In Persia, also, there was a species of porcelain made.

In China it was carried to some perfection ; from the earliest historical knowledge of that country, porcelain was made probably equal to what it has been since. “ And to have acquired such skill, evidences that long anterior to the era whence we obtain the earliest information, the Chinese must have practised and been engaged in the improvement of the art.”

For a length of time, the art, as practised in China, was considered a great mystery ; but the secret was discovered by F. D. Entricolles, who visited the manufactories, and made himself acquainted, not only with the materials used, but with the whole process, and communicated the information in a letter which was addressed to T. Orry, and published by him in France.

Etruria was the first place where the Romans attained any eminence in the manufacturing of porcelain.

In the latter part of the seventeenth century, this ware was first introduced in England; but it was not until the year 1760, that any material improvements took place. At that time, Mr. Josias Wedgwood, so famed for the composition, of which mortars are used, still bearing his name, added, by his inventions and discoveries, much valuable information in the formation of this and other similar wares.

“Continuing his experiments, he afterwards invented several other species of porcelain; among which were, first, Terra Cota, resembling porphyry, granite, Egyptian marble, and other beautiful stones of this silicious or crystalline order; second, Basaltes, or black ware; third, white porcelain biscuit; fourth, Jasper, a white porcelain of exquisite beauty; fifth, Bamboo, or cane-colored porcelain; sixth, porcelain biscuit, remarkable for great hardness, little inferior to agate.”

From England porcelain was introduced into France, where the idea of making teeth of this substance first originated. “M. Audibran, says,\* that Fauchard, as early as the year 1728, recommended the manufacture of incorruptible teeth. And in 1776 they were made by Duchateau, an apothecary of St. Germain.” They continued to be made from that time by the French, with occasional improvements, until their introduction in the United States, where they were speedily brought to the perfection of the present day, notwithstanding the superior advantages possessed by the French dentist.

\* Harris's Dental Surgery, p. 18.

The composition of which porcelain is made is of two distinct characters, the translucent and the opaque; the former is composed entirely of minerals, and the latter chiefly of earths.

The translucent material is best adapted to teeth which can be moulded, and the opaque to blocks or sections that require to be carved.

The porcelain tooth is composed of a paste, which constitutes the body of the teeth, corresponding with the bone of the natural teeth, and the enamel or glazing covering the whole surface of the tooth except the posterior side and the base: that part which rests upon the metal, in plate teeth, and upon the fang in pivot teeth.

A proper degree of assimilation of colors in the body and enamel is essential, particularly in translucent teeth, in order to produce distinct shades and tints. Some manufacturers make the body yellow, in imitation of the natural bone, which has a tendency to present a dead white appearance in the mouth, plainly visible by an artificial light. I prefer the darker grades of color. The blue gives a much better effect, by its absorption of light, and also produces a more lively appearance, in character with the human tooth.

The enamel requires a great many varieties of color to match the various teeth met with in the mouth. Each tooth should possess at least two different colors on its exterior surface, a yellow, covering from a half to one-third of the front, from the base of the tooth, and the blue, intermingled with the yellow, to the cutting edges.

In preparing the material for the body of the tooth, after

carefully selecting and mixing, it should be ground in a hard Wedgewood mortar, occupying about twelve hours to each pound of the material. It should be kept covered and free from dust, and, to facilitate the operation, may be assisted by means of a lever resting on the shaft of the pestle, a simple upright stick, halved into the handle of the pestle on one end and placed in a socket on the under side of the lever. The shaft may be about three feet long and the beam six feet; not more than five pounds can be ground with ease in a twelve-inch mortar. I seldom grind more than three.

To fully understand the various effects of the components of porcelain, it is necessary for the student to study their peculiar characteristics—their formation and analytical results—by which he may be governed in the compounding of them with a certainty and effect, so essential in the successful prosecution of the art.

The following are the principle ingredients now used in the making of porcelain :

Fell-spar,	}	Forming the paste or composition of the body.
Kaolin,		
Silex,		

Fell-spar,	}	Forming the enamel of the tooth.
Silex,		
Flint glass,		

## FELL-SPAR.

FEW minerals are more widely diffused than this. It forms a necessary part of most primitive and many secondary rocks. Its colors are various, but it has a peculiar lustre, and a foliated structure, by which it is easy to distinguish it from other minerals.

It has several varieties, which all agree in respect to structure and peculiarity of lustre.

Fell-spar, intermixed with small quantities of other minerals, forms entire mountains in several parts of the globe.

Fell-spar, with garnets, forms a mountain in the west of Scotland. In Liberia the common foliated spar forms entire mountains. In the north of Scotland there are mountains and large strata of the same mineral.

\* The common fell-spar, or that species which abounds most plentifully, is of an opaque, white color, sometimes freely intermixed with quartz, of a foliated structure, capable of being split in two different directions, and of a shining lustre, is very hard, and will scratch glass. When fused, it forms a transparent glass or enamel.

The greater part of fell-spar used in the middle states, is obtained from the neighborhood of Wilmington, Del. The quarry known as "Cook's quarry," has furnished considerable, and of a superior quality.

In the preparation of this mineral for dental purposes, it should be carefully selected from the impurity with which it abounds, which is done by breaking it to pieces with a

hammer, and calcining, (by heating red hot and suddenly immersing in water;) it may then easily be reduced to powder. To further reduce it as fine as necessary, it should be ground with water, and the floating particles decanted, until the whole is finished, after which the water should be evaporated off.

Fell-spar may be procured, already ground, from the potteries, but as it is prepared in large quantities at those places, the proper care necessary in its selection cannot be depended on. To grind it in quantity, a mill may be made of flint stone, fitted in a tub, with a flat surface, and a rubber passing over it attached to an upright shaft and arm; but for individual use, an ordinary Wedgewood mortar, with a leverage pestle, will be sufficient to grind, in a short time, a plentiful supply.

## KAOLIN, OR PORCELAIN CLAY.

KAOLIN is of a slightly yellowish color, inclining to white; it is friable between the fingers, unctuous to the touch, and slightly adheres to the tongue; absorbs water, and crumbles to powder; but does not form a ductile paste. It is infusible, except with the addition of a flux. Kaolin is found in primitive rocks, where it occurs in beds more or less extensive. It is produced by the decomposition of feldspar. Large quantities of this clay is found at Monkton, Vt., near Wilmington, Del., and near Philadelphia, Pa., in several places.

Kaolin is frequently obtained, *en masse*, with silex. In order to prepare it for use, it should be washed in six or eight times its bulk of water, and broken with the fingers until the clay is entirely dissolved; then decant the liquid and evaporate it.

Kaolin, from its extreme opacity, is used only in the body of the porcelain teeth, and in translucent teeth, is omitted almost entirely, reserving sufficient to keep the mass together while moulding it. This ingredient enters largely into the composition of Wedgewood mortars.

## SILEX, OR QUARTZ.

THERE are many varieties of quartz, differing in their external characters, but when subjected to the furnace, yielding the same results; being perfectly white and infusible, except with potash, with which it forms a translucent glass. In the composition of porcelain it unites with fellspar, and forms a hard, semi-vitreous, translucent body. In the moist state it is inadhesive, and consequently is carved with difficulty. The addition of kaolin clay gives it plasticity, but renders it opaque in proportion to the amount used.

Many of the varieties of quartz are found, uncrystallized, in a massive state. The crystallized specimens are to be preferred in making porcelain; being generally more pure, and free from iron, they give a clearer translucency.

Quartz abounds in almost every part of the globe. Fine specimens are found on the borders of Lake George, N. Y., and in Frederick County, Md. In the latter place, according to Dr. Hayden, "the crystals are scattered on the surface of the ground, and are perfectly transparent." In Vermont, South Carolina, Massachusetts, and many other places in the United States, rock crystals of exceeding beauty are found. In the absence of crystallized quartz, the massive species subserves a very excellent purpose.

In preparing this mineral, it should be carefully selected from others that may be found with it, and calcined to render it the more easily reduced to that minuteness of division so essential, owing to its infusibility, in its use.

Quartz combines in the proportion of two parts to five of fellspar, to form a translucent paste for porcelain.



### CHAPTER III.

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#### THE COLORING PRINCIPLES OF PORCELAIN.

It is a great desideratum, in the manufacture of teeth from this composition, to give them a color suited to the different shades of the natural teeth. Porcelain, in its simple state, is of a milky whiteness, except some portion of the ingredients contain iron, which is often found combined with quartz; when such is the case, maceration in diluted sulphuric acid will take up the iron, and it may in that way be washed out. The materials used for coloring, consists entirely of metallic oxides and granulated metals.

Before incorporating the coloring matter with the mass of the composition, it should be finely ground with a small portion of it. I prefer keeping it in that way, proportioned in given quantities, than by weighing each time of its use, the amount required; a greater certainty is had of exact proportions, and the coloring more generally diffused.

## OXIDE OF GOLD.

THIS preparation is invaluable in the coloring of porcelain ; to the teeth, in minute proportions, it gives a reddish lively appearance so apparent in the natural tooth, and in the imitation of the gums is indispensable.

It is made by dissolving pure gold, either in oxy-muriatic or nitro-muriatic acids. Oberkampf prefers the former, because a purer solution is obtained, and one which can more easily be had free from an excess of acid.

Nitro-muriatic acid is prepared, by mixing two parts by weight of nitric acid with one of muriatic. Vauquelin reverses these proportions, and says, "three parts of an aqua regia, so composed, I find are equivalent, to four made with the usual proportions."

Muriate of gold prepared by either of these solutions, is decomposed by solutions of fixed alkalies or by the oxides of other metals.

A solution of pure ammonia, with the muriate of gold, forms a precipitate of the oxide of gold united with a small portion of the ammonia. This compound is known by chemists as a very dangerous fulminating powder.

The preparation of the oxide of gold in this manner has been recommended by some, who, ignorant of the actual result, have endangered the lives of those that prepare it.

Some years ago, a variety of oxides which I had obtained from different chemists, proved useless for the purpose I had bought them ; I therefore determined to fuse them together, and for that object, placed them in a crucible to be

subjected to the heat of a smelting furnace. Scarcely had the crucible grown hot, before an explosion took place, scattering the whole apparatus in every direction, to my then surprise and horror, for I could not imagine at first the cause that had produced it.

The result of oxides of gold vary according to the tests employed in their decomposition: some give to porcelain a purple, some a red, and others a brown color; a union of the two first approaches nearest to a gum tint. Tin appears to be the most used to obtain what is called the purple powder of cassius. The protoxide of tin, made by exposing it in a fluid state to the action of the atmosphere, and collecting the oxide which forms as a crust on the surface. The same metal dissolved in nitric or muriated acids, produce the same result.

Strips of copper, rolled thin and suspended in the muriate of gold, will give an oxide yielding a very fine tint for a gum color.

An ethereal solution of gold will be found useful and convenient, sometimes producing a very natural tint of red—it is prepared by adding the either to a solution of gold in nitro-muriatic acid; the gold is precipitated, but is again soon re-dissolved by the either; the acid can be poured off and the solution evaporated to dryness.

The following process\* of obtaining the oxide of gold is by Thenard, it is rather tedious, but if carefully made, will produce a very desirable oxide.

“ Make an aqua regia of muriatic acid one part, and

“ \* Goddard on the teeth.”

nitric acid two parts, to dissolve the gold ; when it is dissolved dilute it with water and filter ; then make it very dilute with an addition of water ; then dissolve pure tin in a mixture of nitric acid one part, and water two parts, to which add one hundred and thirty grains of common salt to each pint of the diluted nitric acid ; the tin should be added a small piece at a time, until a sufficiency to make the solution of a yellow color ; the operation should be conducted in a cool place ; when it is finished, filter and add about one hundred times its volume of water. Place the diluted solution of gold in a glass vessel and add the tin, drop by drop, stirring with a glass rod incessantly, until the liquid takes the color of port wine ; let it stand, and large flakes of the gold will be precipitated of a purple color ; decant the solution ; wash and dry the precipitate."

"The best process for obtaining oxide of gold, according to Pelletier, is to precipitate chloride of gold by magnesia. Muriate of magnesia is formed, which may be removed by washing, and the excess of magnesia may be dissolved by diluted nitric acid. In this case, the magnesia is doubtless first converted into a chloride, and parts with its oxygen to the gold. The oxide must be dried at a low heat."

## PLATINA.

PLATINA is the least fusible of all metals, but when reduced to an oxide, and incorporated with a fusible substance, is capable of extreme divisibility, and imparts a greyish blue color of a murky appearance. It has been found highly useful in the coloring of porcelain for the purposes of artificial teeth, giving the most natural blue color. It is used in the form of filings, sponge, and oxides.

“The sponge of platina is prepared by dissolving the metal in nitro-muriatic acid; that is, a mixture of nitric acid, one part, to two of muriatic. Ammonia, or muriate of ammonia, and common sal ammoniac, is added to this solution, which produces a yellow precipitate. When this precipitate is exposed to a red heat, in a crucible, the acids and ammonia are driven off, and there remains pure platinum, in the form of a delicate spongy mass. Another method of obtaining the sponge, is to throw the yellow precipitate on filtering paper, and when the liquid has passed through, to dry the paper and introduce it, with the adhering precipitate, into the crucible.”

Platinum may be advantageously used by fusion with five times its weight of pure gold, and reduced to particles with a very fine file; or by dissolving it in aqua regia, to evaporate and wash off the acid.

The oxide of platinum is obtained by dissolving the metal in nitro-muriatic acid, decomposing with lime water, and the precipitate re-dissolved in nitric acid.

## TITANIUM.

TITANIUM is found, in large quantities, in Bucks and Montgomery Counties, in Pennsylvania. It is always obtained in the form of an oxide, but, by analysis, the existence of a metal is evident. "The native oxides of this metal sometimes occur in long, striated, acicular crystals, of a reddish brown color and shining metallic lustre. Such crystals are sometimes contained in transparent pieces of quartz, forming specimens of singular beauty."

Titanium gives a bright yellow, when used alone in the composition of teeth. It is improved by the addition of the blue oxide of cobalt, in proportions of ten to one, and may also be used to advantage, by small quantities, in the oxide of gold, to form a gum color.

As titanium is often found combined with the ores of iron, it should be selected with care, and the strength and nature of the color made from it, tested before it is embodied in the composition of the teeth. The color produced from iron is analagous, but not capable of withstanding much heat, therefore useless as an ingredient in the coloring principle of porcelain.

Titanium is infusible by a common blow-pipe, but with the addition of a flux readily unites with it.

## BLUE OXIDE OF COBALT, OR ZAFFRE.

THIS oxide, in conjunction with the sponge of platinum, yields a very natural blue tint; if used alone, the color is too bright and conspicuous, unless in very small quantities. If an enamel of a light shade is required, cobalt, in minute proportions, with titanium, will give the desired tint. It is seldom used separate, and combines with a better effect with other preparations. With the oxide of gold, a very excellent shade of blue, with red spots or veins of a delicate hue, is obtained, well adapted for the surfaces of teeth next to the cutting edges. A more beautiful effect is exhibited in using them separately, by previously coating the tooth with gold upon the whole exterior surface, and then applying the yellow and blue enamels as directed in the process for enamelling.

Cobalt, as a coloring principle, was discovered in the year 1640. The name is derived from the German, Cobalus, given by the miners to an evil spirit supposed to haunt them in their labors, by raising their expectations when nothing was to be realized, the uses of cobalt being then unknown. It was once a custom to introduce into the church service a prayer, "that God would protect miners and their works from *Kobalts* and spirits."

Cobalt is found, in this country, in a mine in Chatham, Conn., now abandoned from the poverty of the mine. The principal part now used comes from Saxony, where the cobalt mines have been long wrought with great profit.

## URANIUM.

THIS metal is reduced to its pure state with great difficulty, even in the laboratory of the chemist.

According to Klaproth, uranium is of a dark grey color, with a metallic lustre and granular texture. It is soluble in nitric acid, fuses with great difficulty, and affords a deep orange color to porcelain enamel.

The article sold by chemists as the oxide of uranium, is composed of two parts of the metal and three of the oxide, forming a yellow powder. In the use of it, it combines well with titanium in equal proportions, but for the most natural tints of yellow, should be used in smaller proportions, about one to four. The addition of platina, finely reduced, to the two ingredients, according to the depth of color required, form a very natural shade.

## NICKEL.

THIS metal is of a greyish white color, rather scarce, is malleable and fusible. The oxide, made by dissolving the nickel in nitric acid, produces a delicate tinge of grey; the color is not permanent, being dispelled by a high heat. It may be used in the composition of porcelain that is easily fused.



## CHAPTER IV.

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### FORMULAS.

#### OPAQUE PASTE, NO. I.

R. Fell-spar,	-	-	-	-	12 ounces.
Kaolin Clay,	-	-	-	-	4 $\frac{1}{3}$ "
Silex,	-	-	-	-	4 $\frac{1}{3}$ "

#### OPAQUE PASTE, NO. II.

R. Fell-Spar,	-	-	-	-	6 ounces.
Kaolin Clay,	-	-	-	-	2 "
Silex,	-	-	-	-	2 "

NOTE.—No. 2 is more easily fused than No. 1, and less opaque.

#### TRANSLUCENT PASTE, NO. I.

R. Fell-spar,	-	-	-	-	4 ounces.
Silex,	-	-	-	-	6 pennyweight.
Kaolin Clay,	-	-	-	-	4 "

TRANSLUCENT PASTE, NO. II.

R. Fell-spar,	-	-	-	-	10 ounces.
Silex,	-	-	-	-	4 "
Kaolin,	-	-	-	-	$\frac{1}{2}$ "

TRANSLUCENT PASTE, NO. III.\*

R. Fell-spar,	-	-	-	-	10 ounces.
Silex,	-	-	-	-	4 "
Kaolin Clay,	-	-	-	-	1 "

ENAMELS. ]

FOR OPAQUE PASTE, NO. I.

R. Fell-spar,	-	-	-	-	6 ounces.
O. Paste, No. 1. (dry,)	-	-	-	-	1 "
Flint Glass,	-	-	-	-	$\frac{1}{4}$ "

FOR OPAQUE PASTE, NO. II.

R. Fell-spar,	-	-	-	-	6 ounces.
O. Paste, No. 2. (dry,)	-	-	-	-	1 "
Flint Glass,	-	-	-	-	$\frac{1}{4}$ "

FOR TRANSLUCENT PASTE, NO. I.

R. Fell-spar,	-	-	-	-	$8\frac{3}{4}$ ounces.
Flint Glass,	-	-	-	-	$4\frac{2}{3}$ "

\* This composition I use for making blocks, or sections of teeth, for permanent sets; and the opaque for temporary ones.

## FOR TRANSLUCENT PASTE, NO. I.

R. Fell-spar,	-	-	-	-	3 dwt.
Flint Glass,	-	-	-	-	3 "
Kaolin Clay,	-	-	-	-	2 "
Silex,	-	-	-	-	2 "

## FOR TRANSLUCENT PASTE, NO. II.

R. Fell-spar,	-	-	-	-	11 ounces.
Flint Glass,	-	-	-	-	7 dwt. 10 grs.

## FOR TRANSLUCENT PASTE, NO. III.

R. Fell-spar,	-	-	-	-	11 ounces.
Flint Glass,	-	-	-	-	7 dwt. 6 grs.

## ENAMEL FOR GUMS.

R. Fell-spar,	-	-	-	-	6 dwt.
Paste, (dry,)	-	-	-	-	4 "
F. Glass,	-	-	-	-	6 grs.

Color with oxides of gold and titanium.

NOTE.—In making enamel for the gum, it may be varied to suit the different compositions by substituting the same paste as a component part.

As the process of coloring chiefly depends upon the purity of the material used, and to suit a great variety of cases, it would seem almost supererogatory to specify quantities, I

will, however, add a list of a few of the proportions according to my oxides, which may serve as an assistance in the first compounds. More or less may be used, as required.

For translucent paste, to color fifteen ounces of the composition yellow.

R. Ox. Titanium,	-	-	-	-	32 grains.
Platina Sponge,	-	-	-	-	4 "

For the same, to make a murkey, dull blue.

R. Platina Filings,	-	-	-	-	20 grains.
Ox. Titanium,	-	-	-	-	6 "

For translucent enamel, to produce a yellow tint in eight ounces.

R. Ox. Titanium,	-	-	-	-	40 grains.
Platina Sponge,	-	-	-	-	5 "

For the same, to make a dull blue.

R. Platina Sponge,	-	-	-	-	12 grains.
Ox. Titanium,	-	-	-	-	6 "

For the same, to obtain a brighter blue.

R. Ox. of Cobalt,	-	-	-	-	20 grains.
Platina Sponge,	-	-	-	-	5 "

The opaque compositions require about one-fifth more coloring than the translucent.

## CHAPTER V.

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### MOULDING OF PORCELAIN TEETH.

IN the moulding of porcelain teeth, the incisores and cuspidati only are completed by the process; the bicuspidates and molares require their grinding surfaces to be indented after they are taken from the moulds.

To prevent the composition from adhering to the moulds, they should be slightly coated with sweet oil; the platinas may then be inserted in the holes made to receive them, and a sufficient portion of the material placed in each of the cavities for a tooth. The halves are then clamped together and gently warmed. When the teeth are sufficiently dried, the division of the mould may be separated, and slightly tapped on the reverse side to remove any of the adhering teeth.

The same process is adopted in moulding pivot-teeth; in boring the holes of which, a running screw is inserted to remove the redundant paste, followed by a plain piece of wire, square at the ends, to finish with.

## ARTICULATORY GUIDES.

IN order to obtain a proper prominence, curvature, and length to the artificial teeth, corresponding with antagonist teeth, and in conformity with the articulation of the jaws, a guide of wax, or other plastic substance, will be found necessary. Some operators depend entirely upon a double cast, but experience has convinced me of the superior advantages of the guides, especially in making sets for an entire jaw, over the articulating model.

They may be made of wax or plaster of Paris, cemented to plates accurately fitted to the mouth, and then trimmed of the form required by the artificial process. The centre of the mouth, designated by the froenum, the dividing line of the dental arch, should be marked upon them. When necessary for whole sets, spiral springs may be attached to render more convenient the management of them.

## CARVING OF PORCELAIN.

AFTER obtaining the "guides," the spiral spring should be removed, and each jaw placed upon its respective mould, which is laid out as represented in *fig. 2, plate 2*. Letter *a* describes the centre of the mouth, *b c* the lines between the cuspidati and first bicuspidate, *d e* the extreme limit of the molar teeth. The dotted horizontal line is drawn parallel with the edge of the wax, describing the intended length of the teeth. Cards or pieces of tin are then to be cut, (see *fig. 3*,) corresponding with the base of the model and the protuberance of the guide, to suit each line on the model; and the distance from the horizontal line to the guide is taken with a pair of dividers. The cards should be marked, to designate their particular reference.

A portion of paste is taken upon the tile and worked with a spatula, and afterwards with the hand, until it is rendered as solid as possible; it is then divided in three parts, for the three different sections required. One is placed upon the model, and when dry removed, and the other two, one on each side, pressed on their respective parts. The paste should not be quite dry or it will not carve as smoothly as it otherwise would. The pieces that are not in process of carving should be placed under cover to keep them moist. The front block is to be carved first, by trimming it to the required shape and height, with the assistance of the cards, *a b c*, and the dividers. The exterior surface should present an even front, with a

gradual curve, corresponding with the guide. The teeth are laid out according to *fig. 1, plate 3*; the central incisores and cuspidati of the same width, and the lateral incisores from one-third to one-fourth narrower. The teeth, when carved, should extend about the one-sixteenth of an inch back of the lines *b* and *c*, and the back sections the same distance front, as the combined shrinkage is equivalent to one-eighth of an inch, and should be equally divided between the blocks. The difference between the height of the block made on the model and transferred to the plate, will be sufficient for the shrinking in length.

The teeth are cut at the base next the gum very nearly describing a letter *V*; the prominence on the cuspidati is added after they are carved. The inside is to be cut out, to clear the opposite teeth and tongue, as described in *fig. 2*, with holes bored, one for each tooth, and countersunk to receive the rivet heads. The teeth may then be separated with a thread, fastened as a bow to a piece of whalebone, and finally finished in shape.

The back blocks comprise the bicuspidati and two molars, and are regulated in their shape and size in the same manner as the front blocks, using the cards *b, c, d, e*.

A hole is bored through the second bicuspidate, to receive the wire for the spiral spring to rotate on; the other teeth each are perforated from the centre of the grinding surface to the base, and, finally, the three sections are mitred together as accurately as possible.

No man can expect to enter at once upon the process of carving teeth with the most explicit rules before him; perfection must be the result of experience and constant



practice. The student should keep before him the characteristics of nature, and in carving, allow for the enamel and subsequent change in the baking of the teeth.

The foregoing rules relate to the making of whole sets, but will equally apply, in the general principles, to parts of sets. The dentist possesses a facility in making his own teeth that he cannot have if he buys them. Frequently he is required to supply deficiencies in teeth and gums, or to make teeth of a peculiar construction, which he might not be able to select from a large stock of ready-made teeth, and can only furnish to his own, and the satisfaction of his patient, by having the means at home of making them.

*Figures 3 and 4, plate 3, exhibit specimens of some of the deviations from the ordinary forms of carving teeth.*

*Fig. 3* is a case of the two central and left lateral incisors, the roots of the central teeth having been out some time, and the alveolar become entirely absorbed, while the fang of the lateral incisor remains in the mouth. They are supported as described in the figure, but may be mounted on a plate, fastened by rivets, or soldered to platina points. Frequently the operator is called on to supply large cavities in the gum, occasioned by fractures of the alveolar, which can only be done satisfactorily by carving them for the occasion.

*Fig. 5* is a style of single teeth, with gum parts attached. They are made so that they will fit together and present a regular form, but as they depend upon the platinas for support, cannot be as strong as blocks riveted on. Where a

particular object exists in having the teeth light and roomy, they will answer an excellent purpose.

I sometimes make single molar teeth, perforated from cutting edge to base, with a square indent on the grinding surface to rivet or solder on.

Whole sets may be made very light by inserting platinas in the posterior surfaces, and soldering them on the plates. Teeth made in this way need not be heavier than a similar combination of single teeth.

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## ENAMELLING.

THE enamelling of porcelain gives to it the finish, and is the final process before baking. It is very essential that the enamels be kept free from dust, a small portion of extraneous matter may fall upon the front surface of a tooth, and destroy entirely the beauty of its appearance.

Before coating teeth made from the translucent material, it should be bisketed hard enough to be scraped with a knife, otherwise it will be very likely to crumble in the hand. Opaque teeth may be enamelled without it.

The composition of which the teeth are made should be slightly saturated with water from a hair pencil before placing on it the enamel, without which, the enamel will settle in lumps and not spread upon the surface.

After having thoroughly stirred the enamel, so as to mix any settled portions of it, commence at the base of the tooth with the yellow, bringing it down about half way, then with a knife trim it off to a feathered edge, and put on the blue enamel from the cutting edge nearly to the base of the tooth. When dry, carefully trim away the inequalities and brush off the surface.

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#### BAKING OF PORCELAIN TEETH.

THIS process may be divided into two characters, that commonly called biscuiting, which is understood by baking the teeth sufficiently to allow them to be enamelled without danger of breaking; and fusing them to a certain point by which they are finished ready for insertion. In the first process, only a moderate degree of heat is necessary, but the latter frequently requires the maximum point to be obtained, and with an exactness that may determine its durability and depth of color; too much heat destroys the tenacity of porcelain, and also the coloring matter, while too little leaves the surface rough and the composition brittle.

In the painting of porcelain, less heat is required than in the fusion of the first enamel, and the depths of tint are determined by more or less heat.

Furnaces of different sizes and shapes may be obtained from the manufactories, or they may be made of fire brick to suit the fancy. In the construction of a furnace, the muffle should not be too near the grate, plenty of room should be allowed for the main body of the coal under the muffle, as that portion remains a longer time ignited than the rest, and is liable to burn out before the whole mass becomes thoroughly ignited.

For ordinary use, a furnace having a muffle ten inches long by three in width will be large enough ; with it, one whole set and fifteen or twenty single teeth may be baked at a time, with the opportunity, sometimes, of repeating the process by one fire.

By practice, the dentist will be able to judge when the teeth have received sufficient heat ; but until he can do that with certainty, recourse may be had to trials, placed on the slide in front of the teeth to be baked, withdrawing one from time to time, until they indicate the desired point ; the draught should then be instantly closed, the slide drawn out gently, and not exposed to any sudden blast of wind until entirely cold. To prevent teeth from adhering to the slide, it may be sprinkled over with fine silex. It has been a common, though useless practice, to place blocks of teeth upon pedestals of Kaolin clay to preserve their form on the base ; with the composition I have recommended, no necessity of such an arrangement is required ; the material will retain its shape as long as it remains uninjured by the heat in other respects.

## CHAPTER VI.

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### PLATES FOR MOUNTING PORCELAIN TEETH.

THE original manner of securing these teeth in the mouth was by attachments of wire to a small plate resting on the gums ; this practice has almost altogether grown into disuse, and is now only resorted to by a few individuals, who, advertising at low rates, are regardless of the instability of, or evil consequences arising from their operations.

The objections to the insertion of teeth in this manner are numerous. The wire is oftentimes forced into the gum, producing an inflammation of the parts and subsequent loss of the adjoining teeth. And the constant action of the wire upon the supporting teeth soon wears a deep cavity in the enamel, frequently occasioning the entire destruction of those teeth ; besides, they are never worn with comfort, and are seldom as firmly fixed as they should be.

Plates, to be worn comfortably and without injury to the gums or remaining teeth, should cover as great an area of surface as compatible with the circumstances of the case ; by that means the pressure is diffused more generally and

equally, than if confined to a slender strip of plate or wire ; the adhesion to the gums is also greater, and less strain is exerted upon the supporting teeth.

Clasps of broad plate should be soldered on, extending around a molar or bicuspid ; the incisores and cuspidati should on no occasion be used for such a purpose. It is sometimes expedient to attach to more than one tooth on each side, by soldering on a piece pressing against the inner side of such teeth, thus constituting a lateral pressure, which is frequently sufficient without extending the clasp entirely around either tooth. Clasps embracing teeth should not be soldered upon their entire rim ; a sufficient space should be left open to allow them to be tightened or relaxed, as the occasion may require.

In order to insure a correct adaptation of the plate, a faithful model in plaster of Paris is necessary, showing all the prominencies and cavities of the gum. From it, a corresponding one of brass or spelter is made, with a female counterpart of lead, to be used as a die for swedging the plates.

The form of the plate should be marked upon the model with a pencil, and a piece of sheet lead or paper cut to suit it ; from this the dimensions of the gold or silver may be obtained. If there are teeth in the mouth, the plate should be cut out in semi-circular notches to fit such teeth as it passes, having the points rounded off in the apices of the gums, to prevent any injury to the mouth from them.

Gold or silver plate should weigh about two and a half pennyweight to the square inch ; for brackets it should be at least one-fourth heavier.

In the mounting of single teeth, the plate should extend under the base, in order to give them a bearing upon it, without depending upon the platinas for support. In blocks or sections, the plates ought to extend out at least even with the anterior edges of the block, and if not interfering with the soft parts of the mouth, they should be continued on the gum as far as possible. It is also necessary that the molar and bicuspides have their entire bearing upon the plate, as they are thus stronger and more comfortable to the wearer.

When the jaw is entirely destitute of teeth, and the fangs have all been removed, a plate covering the whole alveolar ridge will be necessary. On the palatine side a portion may be cut out, leaving more or less, according to the extent of surface covered by the plate on the anterior part of the gums. The plate on the lower jaw should extend on either side of the summit of the alveolar ridge about half an inch, or as deep as the soft parts will allow. This plate should be at least of one-third heavier metal than the upper one.

In making large plates for the attachment of teeth, the intervention of one or more teeth require an additional piece fastened to the plate opposite those teeth to strengthen it.

Teeth supported without the aid of clasps, is understood as retained by atmospheric pressure; the principle is oftentimes imposed upon the ignorant without the practice. Some individuals, by means of attachments of small points of wire or plate pressing against the natural teeth, impose the idea upon those who know no better, that they are supported by atmospheric pressure, the least injurious of

any manner, while, in reality, they deceive them with the most pernicious practice to be chosen.

The proper insertion of plates, upon the principle of a vacuum, is generally attended with successful results. The adhesion is, according to scientific experiments, equivalent to fifteen pounds to the square inch ; therefore, in a plate of ordinary dimensions, covering an area of from four to six square inches, the sustaining power is equivalent to from sixty to ninety pounds. This pressure, of course, is not attained at once. Notwithstanding how accurately the plate may fit the gums, it is an impossibility to obtain a perfect adhesion of surface ; the gum will gradually yield to any unequal pressure, and adapt itself, ultimately, to any slight discrepancies of the plate.

Some writers have denied the practicable application of teeth inserted in this manner, but twelve years experience, with almost universal success, has convinced me of its utility and general practicability, notwithstanding all that may be urged against it.

When both jaws are furnished with entire circles of teeth, they may be attached together with spiral springs, resting upon hinges secured in the second bicuspid, having the inner end riveted to an upright strap of plate soldered to the main one, and lying close against the posterior side of the section.

A full set of teeth should not exceed fourteen in number ; the contraction of the jaw, occasioned by the absorption of the alveolar, precludes the possibility of inserting more without injury to their symmetry and natural appearance.



When it becomes necessary, as is often the case, to insert the inferior bicuspides and molares, the six front teeth remaining sound, in their natural condition, two plans are suggested. The first is by carving a section for each side of the jaw, to rest upon the gums, and connected together by a bar of metal, with the ends embedded in the posterior surface of the block, and flush with it. This bar may be fastened with rivets, soldered or riveted to it. The bar should be very stout, weighing from five to six pennyweight.

The other plan, is by swedging a plate to fit the gum, with the bar soldered to it, the section being riveted on the grinding surface.

As no more strength or accuracy of fit is obtained by the latter practice, no preference of its adoption can exist; the porcelain will present as smooth a surface as the metal would.

During the process of swedging, the plate should be frequently annealed.

If, as it is sometimes necessary, a hole is required in the metal to admit the passage of a natural tooth, the one upon the die may be cut off nearly level with the gum; the edge of the protuberance will generally excise a piece of the size and shape required, by the swedging of the plate.

When it is desirable to attach a pivot for the support of a combination of teeth, the spring pivot, heretofore recommended, will answer an excellent purpose.

## LIGATURES.

As the mode of inserting teeth by means of ligatures is still practised by the uninitiated, a mere sketch of some of the objections may not be inadmissible. Teeth inserted in this manner depend wholly for support upon the contiguous teeth, to which they are attached, and either, by the excessive lateral power they exercise, eventually draw the tooth from its socket, or pressing it against the artificial one, by the constant attrition which is kept up, produce decay in the sound tooth. Another objection is the wear upon the natural tooth. I have seen teeth cut deeply into the bone by such fastenings. The practice of some professing to be dentists, and securing porcelain teeth by means of slender wires, is no improvement on the old practice of insertion by ligatures.

The folly and ignorance of this custom, in the present advanced state of the art, affords a sufficient plea for not pursuing the subject further, as I am satisfied that it is practised by no one ignorant of the effects, though they may be incapable of a more judicious method. To such persons advice would only be "as chaff thrown before the wind."

## SELECTION OF PORCELAIN TEETH.

THE dentist, in his selection of teeth to particular cases, should choose an assortment corresponding in size and shape with the remaining ones. If there are no teeth of the same description in the mouth, he should be governed by the general circumstances.

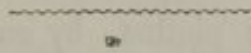
Persons of small stature usually have small teeth; if the deficiencies of the gum require them to be long, it should be supplied with gum teeth, or in case of the absence of several contiguous teeth, they may be made in sections of not more than six each.

In determining the color of the artificial teeth, the operator should first remove any extraneous matter that may be deposited upon the natural teeth, and then select by a careful comparison. It is not uncommon to see teeth of a very light shade placed alongside of one that is much discolored and blackened, thus, by the contrast, at once exhibiting the intervention of art. We are often desired by patients "to make their teeth white." No dentist with a proper estimation of his own judgment should allow any dictation; he alone should be the umpire, and decide, according to his own taste and skill, the form and color to be given to artificial teeth.

When there are no front teeth remaining in the upper jaw, the incisores of the lower jaw must afford the requisite guide; and in cases of entire destitution, the age and complexion of the patient should be taken into consideration.

With young persons light shades may be chosen with propriety; in individuals of advanced ages, a predominance of yellow is better suited. Light complexions require light colors of teeth, and dark complexions vice versa.

The peculiar temperaments may assist in the selection of shades of color of artificial teeth. In the sanguine we find very light blue shades, and in the bilious the yellow predominating.



#### FITTING OF PORCELAIN TEETH TO PLATES.

As porcelain teeth are differently inserted, according to the number and peculiarities of the case, it will be necessary to classify them, and consider the different varieties in practice as they occur.

The mounting of any number of single teeth, is performed according to the same general principles; we will, therefore, suppose the artist to have made his selection, which, under the circumstances, require some preparatory alteration. If, for example, they are too wide for the space to be filled, he commences by reducing them in width, proportionate with their character, allowing spaces between them; that between the central incisores and the laterals and cuspidati should be equivalent to each other, and the space between the central and lateral incisores

about half as much. The same rule should be followed with contiguous natural teeth as is observed with the artificial ones, in order to present a uniformity in the mouth. It is always preferable to select teeth suiting as near as possible, in point of width, to avoid the necessity of cutting them on the lateral edges, as the acute corners necessarily produced give them an artificial appearance.

The length of the teeth is the next consideration. Generally a necessary amount may be taken from the base ; in doing which, however, enough should be allowed for the shoulder resting on the plate, without impairing the strength of the lower platina, by cutting away the substance necessary for its support. Any surplus length may be taken from the cutting edges. This can be done when finished, and after they have been tried in the mouth.

The model may be trimmed away a little under the base of each tooth to allow for its pressure on the gum ; this is generally only necessary with the six front teeth.

The plate may now be placed on the model, and the teeth fitted to it on their base. Straps are then riveted to the platinas on the teeth, and extending to the gum plate, forming a neat joint to be soldered. The platinas should be scraped free from oxide before fastening the straps on them ; the straps and plate should also undergo the same treatment.

When the teeth are plated and fitted ready for soldering, they should be adjusted on the model, according to the articulator or guides, whichever may be used, and retained in position by means of beeswax ; they may then be transferred to a large piece of charcoal having a cavity

excavated in it, and luted with plaster of Paris, which, when dry, will admit of the removal of the wax, exposing the surfaces to be soldered.

The charcoal should be coated on the outside with plaster of Paris, to give it strength and cleanliness.

In the mounting of sections of teeth, they should be fitted on their base, as closely as possible, and mitred together at the ends. Any excess of length in the front section should be taken from the cutting edge, and, in the back ones, from the base.

When sections are secured to the plates by soldering, a continuous strap, passing the entire extent of the block, is preferable over single straps; it not only strengthens the apparatus, but excludes the secretions of the mouth from interposing between the teeth and plate.

If they are fastened by rivets, after the fitting of them they are to be cemented\* upon the plates, to hold them in their places whilst drilling the holes. Straps should be soldered upon the inside of the bicuspid to fasten the hinge to, on which the spiral spring vibrates.

Rivets should be made of soft wire, one head being made previous to insertion, and, by resting it upon an instrument small enough to enter easily into the countersunk cavity, and held in a bench vice by means of a small hammer, the other end may be riveted on the under side of the plate, which should also be countersunk.

\* The cement may be made of gum mastich one part, with two of beeswax.

## FINISHING OF PLATES.

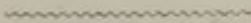
THIS is a part of the mechanical dentist's labors that is "more honored in the breach than in the observance," generally from an opinion that it is labor lost. Such is a mistake, for he receives ample compensation from the filings and trimmings, especially of gold, without impairing the strength of the apparatus, and certainly contributing to the comfort of the patient, and his own reputation as an artist. The excess is generally in prominencies and upon the edges, that add nothing to the strength.

The edge of the plate should be filed round and smooth, also the straps that support the teeth, and all redundancy of solder cut away with edge tools adapted to the purpose. The brackets intended to surround the natural teeth can be rendered elastic by hardening with a hammer.

When the prominencies and edges are dressed off, the scratches and roughness of the surface may be rubbed smooth with a species of grit, known as Scotch stone, and a smoother surface obtained by finishing with slate pencil.

When this process is completed, the plate should be well scoured with fine white sand and water, by which the coating produced by stoning is removed; it is then ready for the burnisher.

## CHAPTER VII.



### SOLDERING.

MUCH depends upon the nicety of this process, in finishing with neatness an apparatus to be worn in the mouth, and indeed the strength of it may be very much impaired by carelessness in the performance of it.

To be able to properly unite two pieces of metal by soldering, it is essential to keep in view the principle by which it is done, viz: the adhesion of polished or clean surfaces by the interfusion of a softer metal. As a metal in a state of fusion inclines to a heated body in preference to another less hot, notwithstanding it may stand contiguous, we find the necessity of applying the heat more particularly where it is designed to attract the solder. In every case, to insure a smooth flow of the solder, the metals to be united should be in contact, and if any vacancy occur it may be filled by small pieces, accurately fitted in, and the surface scraped or filed clean. If a large body is to be soldered, the blaze should be full and general, so as to heat every part, and if there are teeth to be attached, very gradual and slow, to avoid the danger of breaking them.



When the entire mass is well heated the blaze may be brought to a focus, centering at the point to be soldered, always taking care to keep up the heat on the largest pieces, or else the solder will all flow upon the smaller ones.

If the hydrostatic air pipe is used, the compass of the blaze may be regulated by gently moving the lamp to and fro, and by stopping off, as required, the supply of air by means of the cock in the branch pipe.

If the blow pipe filled by the mouth is used, much practice is necessary to manage it with ease and facility. The artist should practice himself to inspire and blow without taking the pipe from his mouth. It may be acquired by breathing through the nostrils and respiring through the mouth, alternately. Without this acquisition, the process of soldering is painful and injurious, but with it, it becomes easy and innoxious.

To facilitate the concentration of heat, the body to be soldered should be surrounded with charcoal, and no more plaster used than required to obviate the danger of it cracking and separating during the process.

Solder should be cut in strips, longitudinally about the twentieth part of an inch, and transversely of the same length. The addition of a little flux, (borax,) rubbed in water on a slate, will facilitate very much the flowing of solder; too much creates a glass, which, interposing between the surfaces, will exclude the solder, and sometimes deceive the artist in his labors.

To remove the crust of oxide and borax that accumulates in soldering, the metal should be boiled in a solution

of alumn and water, or placed for a short time in a diluted mixture of sulphuric acid. Immersion in water into which a small amount of the carbonate of soda is put, will neutralize the adhering acid, and destroy the objectionable acidulous taste left by the acid.

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## GOLD.

THIS metal is an indispensable one in its application to the purposes for which it is used in the dental art. In the surgical department it affords an excellent substitute for that portion of a tooth destroyed by caries, and in the mechanical serves to retain an artificial process in the mouth, free from the corruptibility of other metals.

When used as foil, it should be of twenty-four carat (pure). For plate purposes, the addition of alloy, to the amount of one-sixth, thus reducing it to what is called twenty carat, is necessary. In its pure state it is soft, and with alloy it is rendered harder and more elastic.

Of the two principal metals used for the adulteration of gold, silver is to be preferred; it is less disposed to tarnish in the mouth, which is the chief objection to the employment of copper.

The gold coin of the United States, of the late issue, is about twenty-two carats (fine).

The gold coin of most European nations contains silver or copper, or both of those metals.

The standard, or sterling gold of England, is composed of twenty-two carats or parts of pure gold, and two of copper.

“The mode of computation by carats, with reference to the alloys of metals, has long been employed in England. Every mass of alloyed gold is supposed to be divided into twenty-four carats, or standard coin. This method does not so conveniently admit of the appreciation of various quantities of alloy as that adopted in France, where the pure gold in alloys is estimated at one thousandth parts; thus, gold of eighteen carats, or containing one-fourth alloy, would, by the French, be said to be of the standard expressed by ‘750.’”

## MELTING AND REFINING GOLD.

IN refining the refuse of the gold drawer, it will be necessary to divide the filings from the clippings. Any iron that may remain in either may be extracted with a magnet; after which the filings should be placed in a crucible, and exposed to a white heat in a small cannon stove.\* When in a state of fusion add corrosive sublimate, in the proportion of four grains to the ounce; if too much copper is supposed to be in the metal, the addition of saltpetre will serve to destroy it. After the insertion of the cor. sub. or nitre, let the gold remain under a strong heat for ten or twenty minutes, then pour it off, and re-melt it with the clippings in a new crucible.

If during the process of milling, the gold is found to craze on its surface, it would be wiser to melt it over than to persevere in rolling it. If, by chance, the workman succeeds in extending it as much as necessary, it will be liable to break in swedging, or eventually in the mouth.

If much difficulty exist in working gold, by melting it in a crucible, with a smaller one, inverted and perforated through the top, luted on, and adding an equal bulk of nitre, the gold will acquire a tenacity and toughness. Without some care considerable loss will take place during this process.

The process of cupellation, is that of rendering pure either gold or silver, by fusion with the oxides of lead,

\* The stove, I have found, after using the forge for many years, more economical, convenient, and effective.

which possesses the necessary property of uniting with all the metals but the two above named. It is performed by mixing the lead with the metal to be purified, and keeping it for some time in a state of fusion, in what is called a *cupel*; by this means the lead becomes vitrified, and associating with all the base metals in the gold, falls to the bottom, carrying them with it, and leaving the gold or silver pure upon the surface.

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#### SEPARATION OF GOLD AND SILVER FROM IMPURITIES BY AMALGAMATION.

THE process of separating these metals from the fragments of crucibles and the refuse of the laboratory, is practised as a separate business by some, but the difficulty of access to them, and the entire dependence upon their honor, render it frequently necessary for the mechanical dentist to be able to operate for himself. The *modus operandi* herein suggested, may not be the most ready means of effecting the purpose, but it is given for what it is worth; it is the result of personal experiment, and has always proved to me an efficient method.

The crucibles and other matter should be finely ground,\*

\* This is done by what is termed chasers, constituting two large wheels of iron, revolving on a bed plate of the same metal, under a pressure of one or two tons. Messrs. C. W. Roberts, & Co., of N. Water Street, Philadelphia, have, at considerable expense, erected an apparatus for this purpose.

and then treated with quicksilver, by thoroughly stirring it through the mass; the mercury will become separated into thousands of globules, taking up the gold or silver with which it may come in contact. The sand or dirt should then be transferred to a dish, a little at a time, and placed in a large tub having a stream of water constantly running into it; by this process the mercury settles at the bottom, retaining the metals with it, and the dirt is washed out.\* When finished, place the mercury in a glass retort with a receiver attached, (I use a small retort, having an oil flask luted on for a receiver,) and subject it, in a sand bath, to the action of a strong heat, which disengages the mercury, and drives it into the receiver; you then have the quicksilver in one vessel and the gold and silver, en masse, in the retort. By subjecting these metals to nitric acid, the silver, and such portions of the mercury as may remain, is dissolved, leaving the gold in the state of an impure oxide in the bottom. It is necessary, as soon as the dissolution has taken place, to pour off the fluid, otherwise a reaction will occur, by which a portion of the silver is precipitated.

The gold, in powder, is then placed in a crucible and subjected to a white heat, throwing in a small quantity of borax to act as a flux. When melted, take out the crucible and suffer it to cool; it may then be broken, and a button of pure gold is obtained. To separate the silver in the solution from the mercury, add, drop by drop, of muriatic acid; this will produce a white precipitate,

\* Or it may be separated from the gold and silver by compression in a buckskin bag.

settling in flakes, which, if fused in a crucible, in the proportion of one part to three, of desiccated carb. of soda, will give a result of pure silver, which may be separated from the salt, when cold, by breaking with a hammer; yielding in the proportion of .75 per cent.

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#### TABLE OF ALLOYS.

THE following table of alloys, of foreign and domestic coin, will be found useful in the reduction of gold and silver.

- “ Alloy of gold coin, (Fr. standard,) Gold .900, Cop. .100.  
 “ “ (Eng. stand.) Gold .916.67, Cop. and  
 Silver, .83.33.  
 “ “ (U. S. standard,) Gold .899.22, Cop.  
 and Silver .109.78.  
 “ gold metals, (Fr. standard,) Gold .916, Cop. .84.  
 For ductile gold, of 18 carat or 750 milliemes, Cop. .990,  
 Gold .10.

(The previous combination of the alloy is found to produce ductile gold, when the same metals would prove the contrary if mixed directly.)

Jewelry, (Fr. standard,) Gold .750, Cop. .250

## SILVER.

- Alloy of silver coin, (Fr. stand.) Silver .900, Cop. .100.  
 " " (U. S. stand.) Sil. .892.43, Cop. .107.57.  
 " " (Eng. stand.) Silver, .925, Cop. .75.  
 " silver plate, (Fr. stand.) Silver .950, cop. .50.

The following compositions are recommended by Mr. P. N. Johnson, of London :

Platina, .500,	} For pivots for artificial teeth.
Silver, .500.	

## FOR SPIRAL SPRINGS.

Palladium,	-	-	-	-	-	.312.5
Silver,	-	-	-	-	-	.312.5
Copper,	-	-	-	-	-	.312.5
Iron,	-	-	-	-	-	.62.5

This alloy produces a degree of elasticity not excelled by steel, with the advantage of superior lightness and hardness over platinum."



## SOLDER.

SOLDER should be made as pure as will admit of its flowing smoothly under the action of the blow-pipe.

Gold of 18 carat may be soldered with 13 carat solder, in making springs, but for the purpose of uniting teeth to the plate twelve carat should be used.

## FOR GOLD OF THE VALUE OF .750, OR 18 CARATS.

R.° Gold of .750,	-	-	-	-	.666.67
Copper, (watch dials,)	-	-	-	-	.166.66
Silver,	-	-	-	-	.166.66

## GOLD SOLDER, OF 13 C.

					oz.	dwt.	grs
Gold, (of 18 c.)	-	-	-	-	1	7	12
Silver,	-	-	-	-		1	12
Spelter,	-	-	-	-		1	00
Copper,	-	-	-	-		3	00

Melt together the gold and silver, then add the copper and spelter, pouring off at a white heat.

GOLD SOLDER, OF 12 $\frac{2}{17}$  C.

						dwt.	grs.
Gold, (18 c.)	-	-	-	-	-	13	20
Silver,	-	-	-	-	-	1	8
Spelter,	-	-	-	-	-	1	0
Copper,	-	-	-	-	-		12

## GOLD SOLDER.

R. Gold, (pure,)	-	-	-	-	23 dwts.
Silver,	-	-	-	-	6 "
Spelter,	-	-	-	-	1 "
Copper,	-	-	-	-	3 "

## SILVER SOLDER, NO. 1.

Pure Silver,	-	-	-	-	1 ounce.
Brass, -	-	-	-	-	1 "

## SILVER SOLDER, NO. 2

Pure silver,	-	-	-	-	3 ounces.
Copper,	-	-	-	-	18 $\frac{3}{4}$ dwt.
Brass,	-	-	-	-	5 $\frac{1}{2}$ "

## SOLDER FOR PALLADIUM.

Palladium,	-	-	-	-	4 ounces.
Silver,	-	-	-	-	2 "

## MILLING OF GOLD AND SILVER.

MUCH depends upon the uniformity of size of gold and silver for dental purposes. In order to insure a plate of even thickness the dentist should be provided with a set of true and well-tempered rollers, of at least three and a half inches in length.

Until within a few years, the best rolling mills were imported from Europe, at a very heavy expense, but recently, Mr. Lodge, of Dock street, Phila., has succeeded in hardening and finishing them fully equal to those of foreign manufacture.

During the process of milling gold or silver, the metal should be frequently annealed, to obviate the liability of cracking.

Rollers made of cast iron have been sold for steel; they may be detected with a file; as they are useless for general service, some caution should be observed to avoid imposition.

A rolling mill should be firmly secured to the floor to keep it steady while using it; the set screws should be brought to bear equally, and let down but a little at each passage of the metal. A hard draught is both liable of injury to the rollers, and calculated to break the metal.

Gold or silver may be immediately thrown in water after annealing, as no sensible hardening is caused by it. Copper is hardened by immersing in water while hot; so also, any metal alloyed with it.

## TO MAKE SPIRAL SPRINGS.

THESE springs are attached to upper and lower sets of teeth, and to upper sets only where there is not sufficient adhesion to retain them in their place. This necessity but seldom exists, and even in entire sets I frequently remove the springs after they have been worn two or three months. When spiral springs are designed to support an upper set, without a corresponding artificial set of teeth on the lower jaw, they should be fastened by clasps, embracing opposite molars, with a bearing on their grinding surface to prevent the band from pressing into the gum.

Spiral springs should be made of eighteen carat gold, alloyed with copper, and drawn through plates from about the sixteenth of an inch in diameter to the size of a fine needle, without annealing. The ends of the wire should be passed through alternately to equalize the temper of it.

The wire is then coiled closely on a small-sized knitting needle, by making a block of soft wood for the wire to pass through, and screwing it into a bench vice, the needle being secured with one end of the wire in a hand vice, and carefully wound on until completed.

Eyelets for securing the springs to the teeth are variously constructed. The most durable and convenient to make, may be made by inserting one end of a piece of wire, large enough to admit of being screwed tightly in the spring, and bending the other end around the button.\*

\* See plate IV., fig 2.

Another is to take a piece of plate about the width of the spiral, and file a shoulder on it sufficient to allow it to be fastened as above, having a hole pierced near the end, opening externally with a slit, which is to be pinched together in securing it.

The length of spiral springs, independent of the eyelets, should be about one and a half inches. Sometimes it is necessary to make them longer or shorter, depending generally upon the size of the mouth. They should never be short enough to straighten upon the opening of the mouth to its greatest extent, nor long enough to strike the cheek upon the occlusion of the jaws.

The eyelets should be about three-fourths of an inch from the point of rotation to the end, with about one-half inserted in the spring.

The diameter of the spring, when coiled, should not exceed the tenth of an inch, otherwise it will be clumsy and in the way of the cheek. Some dentists flatten them, but as it is calculated to impair their strength and durability is unadvisable.

As it is not always possible to obtain metal having sufficient elasticity, of eighteen carat gold, it may be made to an advantage of fourteen carat, in the following proportions:

Gold coin, (22 carat)	-	-	-	1 oz.
Silver, (pure)	-	-	-	3 dwt. 3 grs.
Copper, (pure)	-	-	-	3 dwt. 20 grs.

Gold alloyed with one-twelfth part of platina will make

a very elastic spring, possessing the properties of pure gold in the mouth. Gold of fourteen carat may be annealed prior to drawing it through the last hole in the draw plate, and for some cases even after it is drawn to the required size, as it will retain its elasticity to a considerable degree after being heated to redness.

## CHAPTER VIII.

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### TO MAKE A TRANSFER OF THE MOUTH.

It is very important for the correct adaptation of artificial teeth to the gums and remaining teeth, if there are any, that a faithful representation of the mouth be obtained, which will enable the artizan to work with as much accuracy as if he had the natural mouth before him.

Previous to taking an impression, all the preliminary changes should be made, if any roots are to be extracted, it should be done, so as to allow a sufficient time for the absorption of the alveolar.

When a dependance is required upon a root, the pivot hole should be bored, and a loose temporary one placed there, projecting about the eighth of an inch, so that it may adhere to the wax and make an impression in the mould corresponding with the situation and inclination of the cavity in the root.

The operator should be furnished with a number of frames made of tin, to suit the different size mouths; into which the wax is to be placed for receiving the impression,

these frames vary from two and a half inches in width to three and a half.

The wax (yellow is preferable to white, being more tenacious,) is to be softened before a gentle fire, avoiding to get it too soft, as it will be liable to spread, then it should be forced upon the gums until a fair and perfect impression is obtained; to accomplish this as it should be, it is necessary that the pressure be universal, and not alternating from side to side.

The gums should always be wiped dry with a soft napkin before taking the form with the wax.

To obtain a double cast of the gums, giving the articulation of the jaws, a frame similar to those described for a single cast should be made, with both sides alike; the wax is placed on each side, and the upper one pressed upon the gums, and holding it there the patient is directed to bring his jaw teeth together, which will give the precise position of the mouth in mastication. Sometimes it is necessary to restrain the mouth from closing to its full extent, when there are no opposing teeth.

It is also frequently necessary to take a transfer of one side at a time, to procure a correct representation of the gum, between molar teeth, when circumstances interfere to prevent a correct representation with a transfer of the entire jaw.



## TO MAKE A PLASTER MODEL.

WHEN a correct impression of the mouth is obtained, the frame in which it has been taken is to be surrounded with a strip of stiff paper, one inch or one and a half inches in width, and embedded in dry sand.

The plaster, which should be previously finely bolted, is to be mixed with a sufficiency of water and poured gradually upon the slope of the wax, and allowed to flow gently into the indentations formed by the teeth. If any air has entered in pouring the plaster, it may be expelled by piercing it with a small wire or straw. When the plaster has set, which will be in the course of an hour, the wax may be again softened and carefully picked from the model, the teeth of which should be cleared first to prevent breaking them.

If the model is wanted for immediate use, the drying may be hastened by mixing the plaster with hot water.

To make a double cast, or articulator, the same process is to be pursued as in the single one, and one half of a hinge, made so that it may be disjoined, inserted into the plaster. When dry, the impression is to be inverted and the other half of the hinge connected, and also fastened into the plaster.

The double cast will only answer the purpose of a guide for the relative position of the jaws, and cannot be depended on for fitting the plates.

I generally use guides made of wax, as described in the making of whole sets, instead of the articulator, the only

objection to which is the necessity for having the plates made before they can be taken, though I do not regard this as an objection, for generally it is desirable to try the plate to the gums before mounting the teeth on them, in order that any discrepancies may be remedied, which cannot so well be done after the plate is covered with the teeth.

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### TO MAKE METALLIC DIES AND CAST.

THE dies are made of either brass or zinc; the former is preferable, as it is less liable to injury in the process of swedging. If zinc is used, it will be necessary to have two castings, the first one being more or less flattened on its prominences during the swedging.

The model from which the die is to be made should be well dried in an oven (if a recent one) and trimmed regularly, with an incline from the base to the gum; any hollows on its side surfaces should be filled with wax, otherwise it will not draw from the sand.

A large tray or box to hold the sand, with a cover to exclude any dirt from getting into it; a small box or flask, six inches square and three deep, with the lid and bottom piece disconnected, constitute the necessary apparatus for moulding.

Brass should be melted in a black lead crucible. Zinc and lead may be fused in an iron ladle, having one for each metal.

To obtain the impression in the sand, place the plaster model in the flask, and fill it even with the top with fine sand; to prevent any adhesion, a little pulverized rosin and charcoal may be sieved over the model; press the sand as firm and solid as possible and invert the flask, exposing the base of the model, which may be drawn by inserting a gimlet into it.

The sand should be dried before pouring in the metal.

To make the counter, or female cast, place the die in sand, in an iron ring, and imbed it to the line on the cast that indicates the extent of the gum; then pour upon it molten lead.

## CHAPTER IX.

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### HAND LATHE.

THIS is a convenient apparatus for the office or itinerant practice. Of the different constructions, the operator will find none more suitable than one of the following description: consisting of an upright shaft, fastened to the table with a set screw, to which is also attached, from the centre, a pinion wheel of six inches in diameter, driving a smaller one of one inch, and secured by a screw on a mandril. At the head of the shaft to the end of the mandril, also retained by a screw, is fixed stones or emory wheels of any dimensions.

An increased velocity is obtained by this combination, and the machine is worked easily by a handle riveted to one arm of the driving wheel.

## PLATINA SHEARS.

FOR cutting platina points for plate teeth of any required length, and at the same time flattening one end, as is necessary to hold it in the tooth, these shears will be found very serviceable ; they are capable of cutting six ounces of wire in one hour's time.

*Fig. 1, plate IV.*, exhibits the form. *a* is a check plate, which may be altered to suit any length intended to be given to the wire, by means of the screw with which it is fastened. *b* is a chisel-shaped tool, secured with a set screw, to excise the platina with, the remaining edge being flattened by the same process between the edges of the shears.

This principle may be applied to a rotary engine fastened to the bench, by which a greater facility would be had in cutting the platina.

## HYDROSTATIC AIR PIPE.

THE hydrostatic principle has long been applied to many useful purposes in the arts, but as an auxiliary to the mechanical dentist, in his fatiguing and health-destroying duties of soldering, will be found almost inestimable. I have tried a number of different inventions for the purpose, and have found objections to all. With the hydrostatic the operator has full command of the blaze, in quantity, force, and compass.

*Plate II., fig. 6,* is a representation of one I have had constructed for my own use; having a tin box four feet high and sixteen inches square, divided diagonally, (as represented by the dotted line,) with a vacuum of half an inch at the bottom. This box is half filled with water, which, with the bellows, is driven into the air chamber on the right. The muzzle of the bellows is furnished with a valve, to prevent the return of the air upon the inspiration of the bellows. A branch with an elastic tube, to which is attached the blow pipe, is soldered into the box near the top; a small cock serves to admit the egression of the air as needed. A constant draught is maintained by working the bellows, which may be done with the hand or a treddle.

The upright bar sustaining the bellows, can have attached to it a shelf for holding the lamp, or it may rest on a table.

To prevent the tin from oxidating, it should be painted upon the outer and inner sides. The whole expense of the apparatus will not exceed fifteen dollars.

A spirit-lamp will be found preferable to oil; there is no smoke, and by the addition of one-tenth part of turpentine or pine oil to the alcohol, a very strong blaze of a good body is obtained. The tube containing the wick should be covered, when not in use, with a cap, to prevent evaporation, and the top of the lamp securely tight, to avoid combustion. The wick-tube should be of copper, or it will be likely to melt by the heat of the lamp.

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#### EMORY WHEELS.

THIS material has almost entirely superseded the ordinary grindstone for cutting porcelain teeth, being made with more facility and at less expense, besides it is more efficient for the purpose; to prepare it, take two parts of emory, the size to be determined by the grit required, and one part of gum shellac; melt the gum over a gentle fire, and while in a state of fusion add the emory, working it in with a stick; the addition of fine sand adds to the grit. Some care is necessary to avoid burning the gum, by which its tenacity is destroyed. A sand bath will be found a valuable auxiliary in the preparation of the composition.

Moulds may be made of brass or iron, of different sizes, and perforated through the centre, corresponding with the holes to be made in the wheels. After the composition

cools in the mould, a heated wire may be passed through the hole and emory wheel.

These wheels are secured upon small chucks adapted to a foot-lathe, and should be kept wet while in use, to prevent them from softening by the friction, and also to facilitate their cutting.

Another method of making composition wheels, is to dissolve the gum in alcohol, and add the emory or sand until it forms almost a solid mass; it is then transferred to the moulds and gently dried over a fire. The moulds should always be greased before using them, to prevent the material from adhering to them.

The ordinary grindstone can be made with much facility from a stone of a laminated character, which may be split with a knife and hammer; the stones are then laid out with a pair of compasses and chipped off with a chisel. They may be finished to a nicety in the lathe.



## MANNER OF MAKING MOULDS.

MOULDS for porcelain teeth are variously constructed, and of different materials, of which brass is the most durable and convenient to obtain. A pattern is generally made of plaster of Paris, from which a copy can be had in brass at any foundry.

The original form given to the teeth was that of two bevils, thus dividing the tooth equally between the two halves of the mould; the teeth, in consequence, were more liable to be broken in moulding, and the moulds were more difficult of construction. A much more natural form is now substituted, and one that admits of greater facility in making and finishing moulds, besides the teeth are recovered from the mould with less breakage; it is by making the bevil from the posterior surface.

To obtain a pattern, teeth are carved of bone, or of kaolin clay, and baked, with a flat bevilled base, agreeing in size and shape to those intended to be given by the moulds. A block is then made of mahogany or other hard wood, about five or six inches in length and one inch in width, finished perfectly smooth on one side, which is to represent the face of one half of the mould. A narrow strip, about the eighth of an inch, is to be sprigged on it even with the side of the block, and bevilled to correspond with the base of the tooth; the height of this strip must be equal to the thickness of the teeth. A box, or frame, is also made to enclose the block to hold the plaster, and resting on cletes fastened upon the side of the

block; this frame should be a little flaring, to give the pattern a form that will allow it to draw from the sand in making the impression for casting; a sliding lid on the frame completes it.

The teeth are now cemented on the block in proper order, and enclosed in the frame, which is to be filled with plaster of Paris mixed in water. When sufficiently dry, the frame is removed and the plaster taken from the block. By this process an impression of the front of the teeth is obtained. They are then taken from the block and placed in their relative positions in the plaster, which is again enclosed in a frame similar to the first, and the counter part made by the same process. Small indentations should be made in the plaster, by which the moulds may be brought properly together when the teeth are removed. The surfaces of the wood and plaster should be oiled to prevent them adhering.

After the brass moulds are finished, a piece of iron wire may be inserted in one end of each mould, and holes bored in the other ends to hold them in their proper places while moulding; clamps are also necessary to fasten together the moulds. Finally, small holes should be bored to receive the platinas, uniform and true.

Moulds for pivot teeth should be filed on the front surface, horizontal with the base or butt end of the tooth; holes are bored through of the same size as those to be made in the teeth, and wire fixed in a handle of a length that will admit it to penetrate far enough in the body of the tooth for the pivot. Two wires are necessary, one of a screw-shape to remove the extraneous body, and the other flat at the end to finish the cavity with.

## CONCLUDING REMARKS.

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### EMPIRICISM—THE LETHEON—REPRODUCTION OF OSSEOUS MATTER—THE LIGAMENTUM DENTIUM—CONCLUSION.

THIS is an age in which the purpose of man would seem to be to accomplish by deception and chicanery that which should only be the result of honest enterprise and industry. The influence exercised upon a credulous community by the myriads, in number and character, of reckless empirics, who pollute the moral and business atmosphere, has extended from one profession to another, until all have begun, alike, to feel its withering and destructive effects. None are exempt from it. The science of medicine, established as it is upon the only true basis, is constantly subject to the aggressions of men altogether ignorant of every principle that governs the human system, and consequently heedless of the result of their ministrations. By their colored and false misrepresentations they mislead their anxious subjects, until too late to retreat from the fatal snare. The dental profession has not escaped the blighting influence of such ; daily evi-

dences become manifest, not only of the deception practised, but of the ruin and irrecoverable destruction of those organs so necessary for the preservation of health, beauty, and comfort; it therefore becomes the duty of every man who enters upon the pursuit of a profession, by every means in his power to sustain it, in its dignity, its excellence, and in the practice of it according to scientific principles and candid revelations; by such a course, only, can a system, having for its purpose the advancement of general good, be sustained.

The too free adoption of every pretended discovery, plausible as it may at first seem to be, before it is subjected to the test of scientific investigation, savors of empiricism, and, as is unfortunately too often the case, is acknowledged and promulgated by those to whom subsequent inquiries prove the error and mistakes, that self-interest or pride forbid them to acknowledge.

It is by experiment, and the application of known principles to new purposes, that any art, mechanical or professional, receives the impulse that gradually leads it to perfection; to entire discountenance which, would be at variance with the duty and requirements of all, whether immediately or indirectly interested. Therefore, when a discovery has withstood the necessary tests of its truth and applicability, it should be entitled to, and receive the reward of its merits.

Public attention has been recently aroused by the announcement of a preparation procuring exemption from pain during the performance of severe surgical operations, the invention or discovery of Dr. Morton, a dentist of

Boston. It operates by producing stupefaction, or a temporary paralysis of the nervous system, by which the patient, though conscious of all surrounding objects, is destitute of any sense of feeling.

It is now generally conceded that this gas, to which has been given the name of "Letheon," is nothing else but sulphuric ether, highly volatilized, and inhaled from glass globes, furnished with valves to accommodate inspiration and respiration. The properties of sulphuric ether, according to "Wood and Bache," are, that it is a powerful diffusible stimulant, though transient in its operations, and also anti-spasmodic and narcotic. Its vapour, when breathed from a bladder in which a few teaspoonsful have been put, produces a transient intoxication, resembling the effects of inspiring nitrous oxide, *but very dangerous, if carried too far.*

It will at once be seen that the properties of this fluid is no new discovery, and it further appears that its use is highly dangerous. This fact is supported by the annexed statement, made by Dr. Hunt, of Washington City, D. C. He says: "Experience goes to prove that its use is far from being harmless. Some of those who have inhaled it were recently *still* suffering from its effects, after a lapse of *days* and *weeks*. I will cite a few cases, withholding, however, the names. One, of a lady who inhaled the gas in the latter part of December, was seized on the same day with a violent headache and irritation of the lungs; a week ago she was still suffering *very much* with the pain in her head, and on the slightest exposure, with a severe cough. Another lady, some ten or twelve days since,

inhaled the vapor, contrary to the advice of her physician (one of the first in the city). She went home that day quite unwell, that night had to call in her physician, was confined to her bed sometime afterwards, and on Saturday (January 30th,) had not recovered her usual health. Another lady was made 'deathly sick,' to use her own expression, and for three days was laboring under an aggravated attack of nervous headache, to which she was subject, suffering much more than usual. A gentleman, well known in this city, inhaled the gas, and suffered for three days with violent headache. These persons all say that they could not be induced again to inhale the vapor. One lady, while inhaling it, was thrown into *raving delirium*. The above are not mere rumors, but *facts which can be substantiated*. In addition, there is good reason to believe that the death of one, who promised to be an ornament to society, and a bright star in his profession, was hastened by the inhalation of the ethereal vapor, and that he went down to an early grave, one of its first victims in Washington.

"With these examples before us, we are driven to the conclusion that the use of this gas is at least of doubtful propriety, and in this we are supported by distinguished members of the medical profession, in this and other cities, some of whom go further, and say that it is dangerous."

It is not my purpose to condemn, untried, the use of this preparation, but as, by its adoption, it is calculated to hold a very important position in dental practice, I have considered it necessary to give some of the objections, and the authority, against its use. It will be proper to state

that many very respectable medical and dental practitioners have subscribed to its usefulness and entire harmlessness.

At page 20 of this work, reference is made to the assertion of John Wesley, that "the teeth, of all the bones, only grow in length during the whole life;" since writing which, an article, copied into a periodical as emanating from the pen of Mrs. Child, and appearing originally in the *New Adv.*, has occurred to me, wherein she says: "A friend of ours had, when about twenty years of age, a front tooth that turned black, gradually crumbled, and broke off piecemeal. By frequently chewing charcoal, the progress of decay was not only arrested, but nature was set vigorously to work to restore the breach, and the crumbled portion grew again, till the whole tooth was sound as before."

Not wishing to impute to the lady above quoted any intention of wilful misrepresentation, I can, nevertheless, believe she was either very much imposed on, or was deceived by circumstances unknown to her; for example, one or both of the central incisors may be much decayed, so as to be apparent at a glance; by a proper exercise of professional skill, in many cases, the carious portion may, in part, be filed away, and then filled so as to scarcely show any evidence of its former deficiency; but that a formation of new bone and enamel, upon a tooth destroyed by caries, should take place, is in opposition to all physiological rules, and of which, to my knowledge, no writer or operator has ever pretended to have known a single instance.

A few years since the dental profession was startled by

the pretended discovery of a "ligamentum dentium," by which the teeth were retained with all their firmness in the socket. It was only necessary to know the position of it, and the mode of severing it, to insure the extraction of a tooth "without pain." Of course there could exist no connection between the alveolar and the tooth, the periosteum was but a gossamer web, that vanished into thin air the instant that the surgeon's knife entered the ligament, and a large molar tooth with three diverging fangs fell from its position at the magic touch. Strange as it would now seem, there were some whose credulity led them to acknowledge the truth of a declaration coined for speculative purposes, but with the larger portion it only excited the ridicule and contempt justly belonging to such a futile imposition.

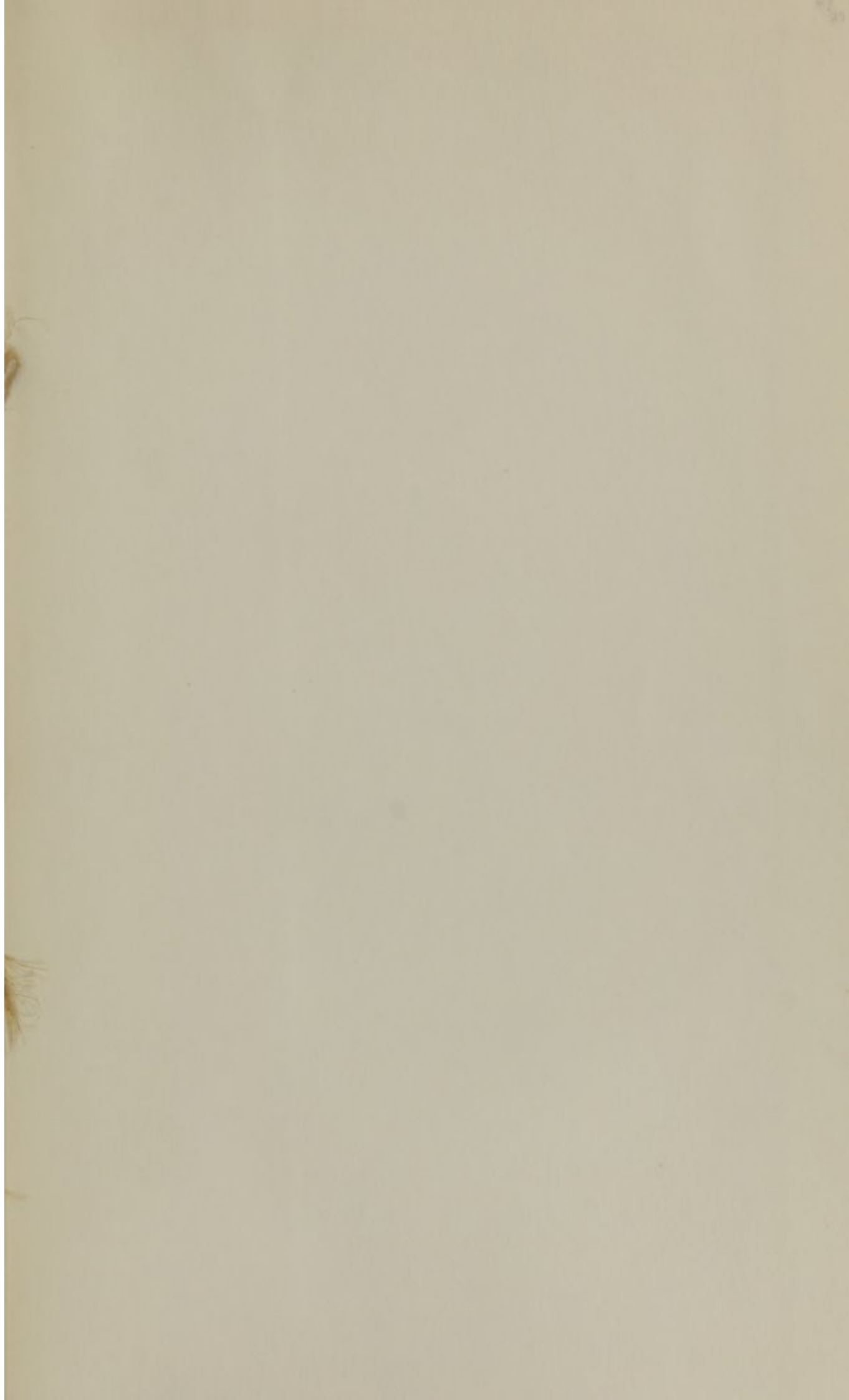
Before closing these remarks, it may be necessary to ask indulgence of the critical reader, for unintentional omissions, or errors, that may be found. The work was written during intervals between business hours, frequently after a day of fatiguing exercise; and the principal part of it while each preceding part was going through the press; a mere synopsis or sketch being prepared at the start, to systemize, in some measure, the order and arrangement of the matter.

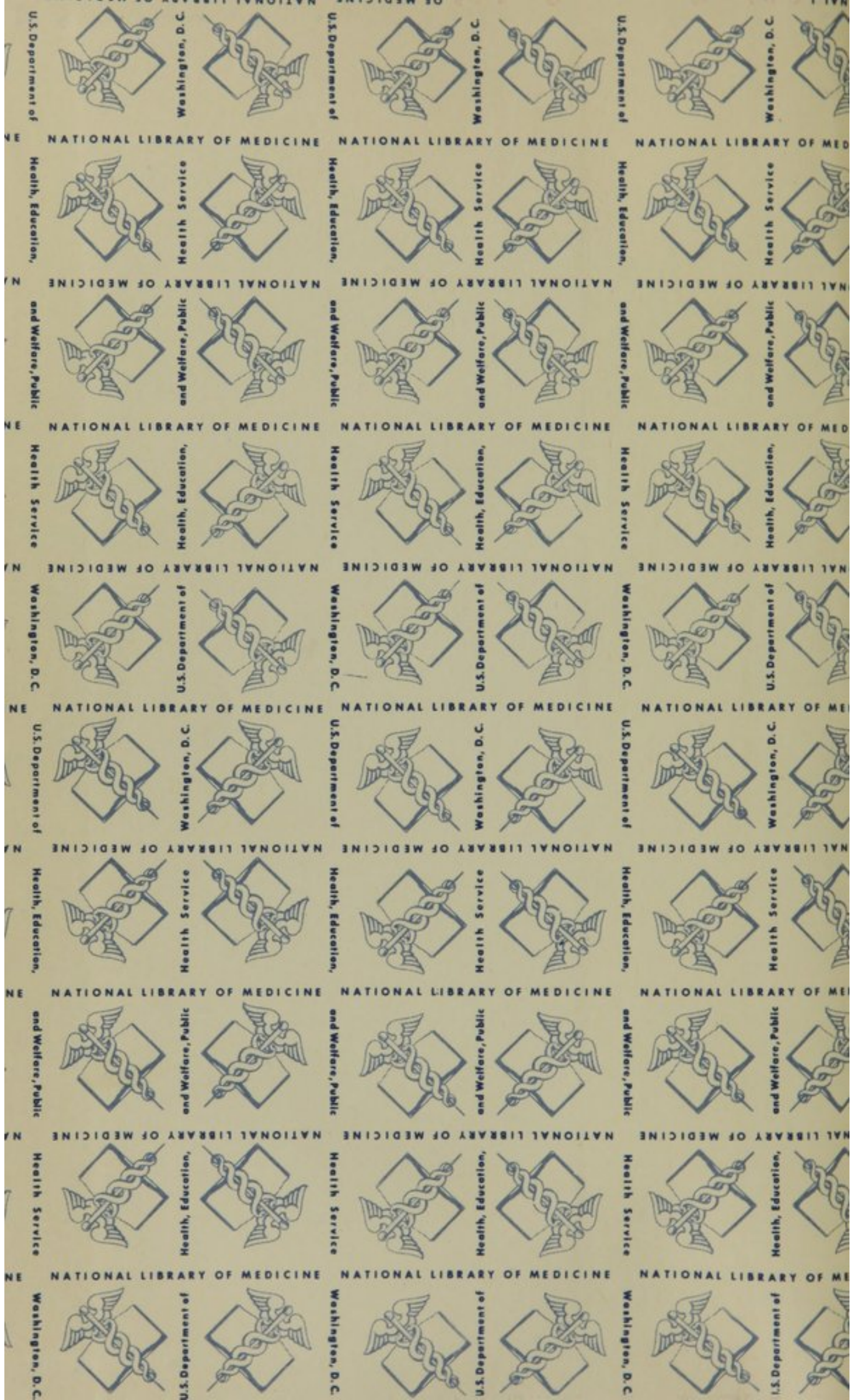
As occasional reference is made to "Harris' Dental Surgery," it will be necessary to state that it is the first edition of that work to which allusion is made.

It will also be observed, that for the convenience of those of the profession living remote from the cities, and frequently unacquainted with the location of artificers in



dental instruments and materials, an occasional individual is mentioned, though without any purpose derogatory to the reputation of others engaged in similar pursuits. Justice to an old and tried artizan in his branch, impels me to notice the name of Charles Abbey, of No. 24 Pear Street, Philadelphia, as a successful manufacturer of gold foil.





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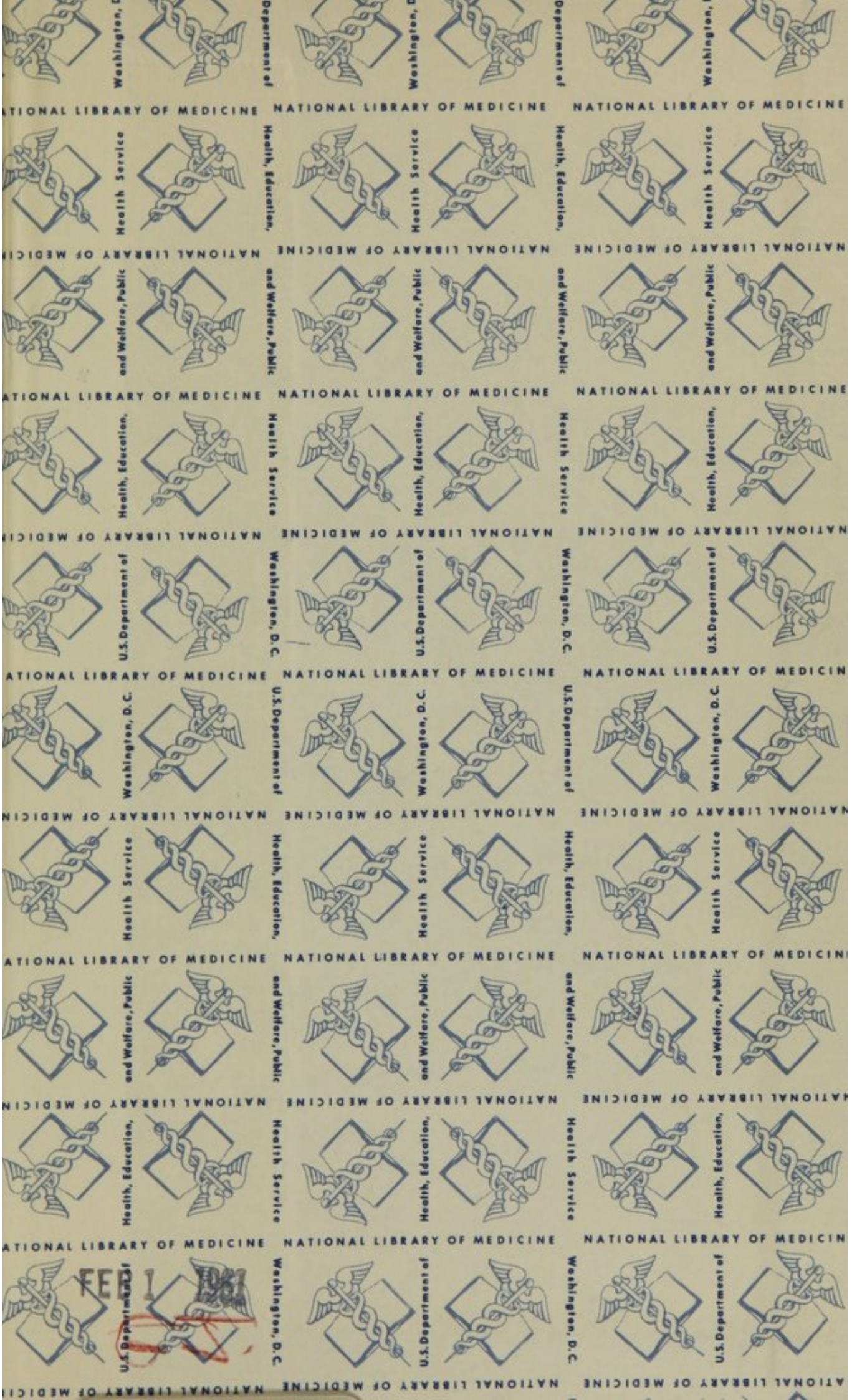
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