

**A popular essay on the structure, formation, and management of the teeth
... / by John Fuller.**

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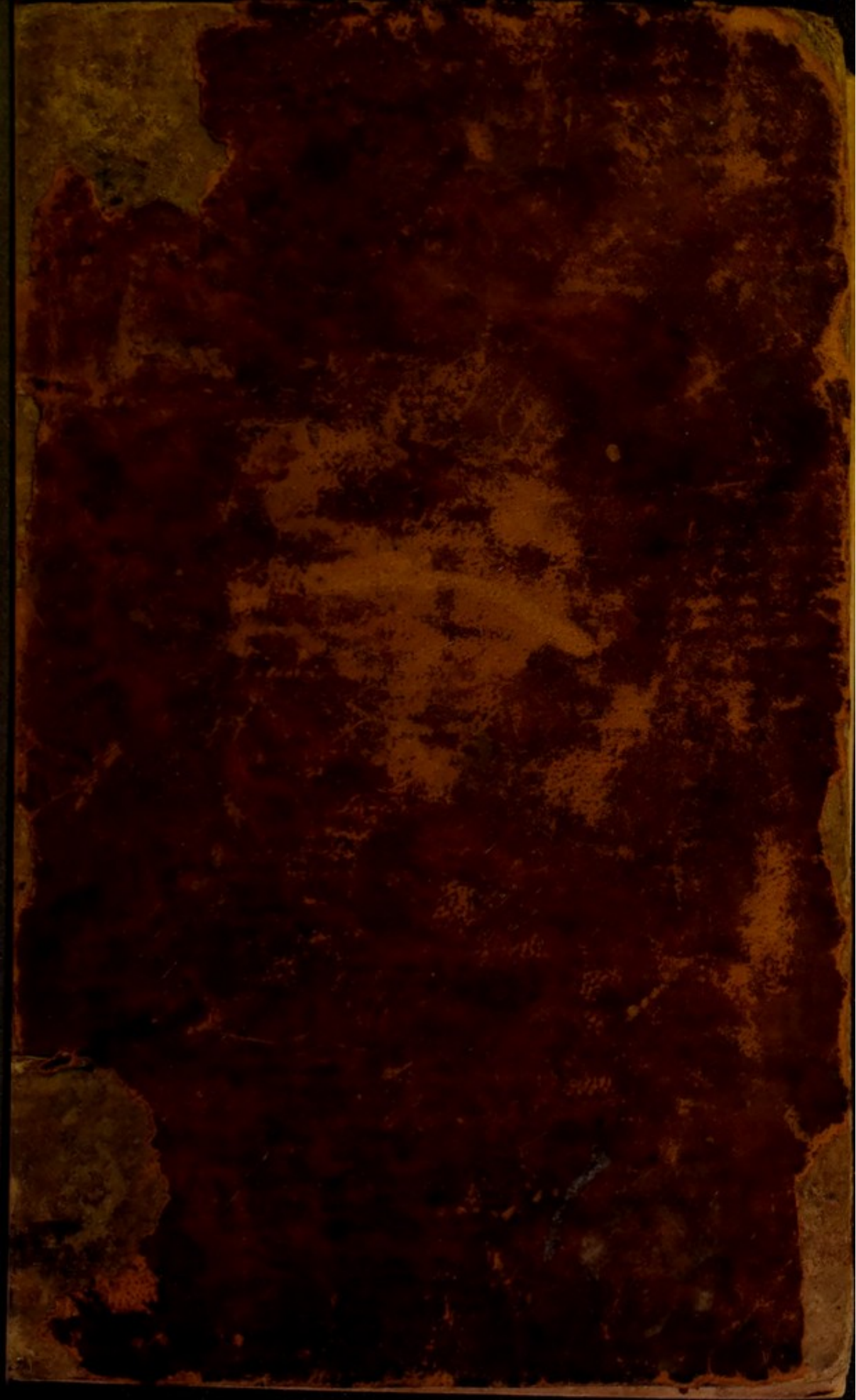
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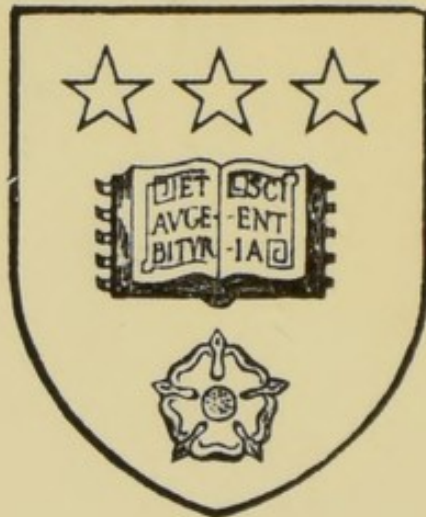
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POPULAR ESSAY

ON THE

STRUCTURE, FORMATION, & MANAGEMENT

OF THE

TEETH.

Illustrated by Engravings.

By JOHN FULLER, SURGEON-DENTIST.

LONDON:

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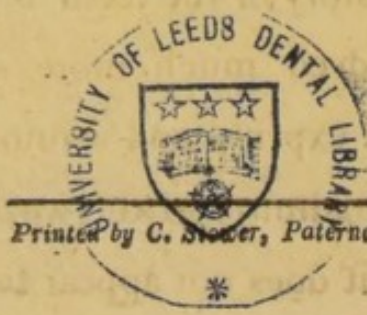
1810.

TOOTHACHE

INTRODUCTION

An attention to the teeth becoming daily more prevalent, and the frequency of toothache, has led to any perpetually recurring of a nature, which plainly indicates that they are generally but little understood; it was therefore that a treatise on this popular branch of the subject would not be an unnecessary addition to the many works already published on philosophical works already published.

The natural history of the teeth, a subject of great interest, should be more generally known, and it is interesting to find that, however, it has not been more generally known.



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INTRODUCTION.

AN attention to the teeth becoming daily more prevalent, and the inquiries of laudable curiosity perpetually recurring, of a nature which plainly indicate that they are generally but little understood, it was suggested, that a concise and popular Essay on that subject would not be an unacceptable addition to the many scientific and philosophical works already before the public.

The natural history of the teeth is a very curious subject, indeed much more so than we should previously expect, and cannot but be interesting to every admirer of the works of creation; however, it does not appear to have com-

manded any particular attention in this country, until the exertions of Mr. John Hunter, who published his "Natural History of the Human Teeth," in 1771; since which time they have obtained their share of notice in the usual lectures on physiology; and, indeed, courses of lectures have been instituted expressly on them, but even from these much remains undetermined and uncertain. Although the object of the following pages is of a more general and popular nature, yet, in the course of these observations, we shall see the most admirable marks of creative contrivance, accurately projected and long superintended.

The early and sedulous attention displayed in the formation and protection of the teeth must strike the most indifferent observer: nature seems to bestow some of her most anxious care, even from the embryo; for five months before the birth, the rudiments of twelve teeth, each composed of a minutely organized pulpy sub-

v

stance, and enveloped in its proper membrane, are lodged in a groove in each jaw, closely connected to, and protected by the *gums*. At the birth the temporary teeth are in considerable forwardness, then gradually make their appearance, and after continuing a proper time are as gradually removed, in order to make way for the second set of teeth, which are intended to remain through life, and which have been in preparation even from before the birth.

When combined with these facts we observe the excessive pain occasioned by their diseases, and which happens so frequently that few arrive to maturity without experiencing the tooth-ache and loss of teeth, and even to many they are a constant trouble through life; perhaps suggestions may occur that they are the most exceptionable parts of the human frame, and their admirable formation but an immense waste of creative wisdom; but these are soon corrected by considering that man was constructed by his

Creator for the circumstances he must inevitably endure while in a state of uncivilized nature, compelled to masticate the coarsest materials, in such a state teeth were absolutely necessary; and what places this observation in a still stronger light is, that those who have opened barrows and other places of ancient interment, have constantly observed the skulls to retain all their teeth, worn down indeed to the roots by use, but having no symptoms of disease or decay: from which facts some have inferred that the ancients possessed peculiar natural advantages in this respect, which is in reality saying, that the circumstances of the moderns are intentionally altered for the worse by their common Creator. This sentiment we cannot adopt, and would look for an explanation to the more probable influence of refinement and luxury; that these causes are capable of inducing great constitutional alterations, is evident, from the circumstance that at the present day in those uncultivated situations where man is only the su-

perior animal of the forest, a decayed tooth, or disease from them, is very seldom if ever known; that this is not any peculiar national formation is sufficiently clear, as teeth are daily extracted from natives of Africa and other countries, under the same circumstances of pain and decay as in Europeans. Indeed, the great constitutional changes produced by these causes is sufficiently evident and universally admitted, and we cannot but expect that the teeth will consequently suffer, and from being the hardy and indestructible organs they formerly were, are now the early victims of decay and sources of pain.

Their absolute necessity in mastication is likewise much diminished by the refinements in culinary arts; they have now never to pulverize the raw material, we, therefore, seldom see teeth worn down, except those of a soft structure; but in the proportion that we lose their necessity in laborious mastication, they become ornamental, for by continuing nearly their ori-

ginal length, the symmetry of the features is retained, and by exposing to view a larger surface of enamel, they form a more beautiful contrast to the lips and gums, and thus become the finished ornaments of elegance and beauty; nor should we omit to notice their importance in articulation.

A proper treatment of the teeth, and an artificial supply when lost, are the objects of the Dentist's art, and this evidently should be founded on an accurate knowledge of their physical construction. Where this is wanting perpetual injury will be done to patients, and discredit to the profession; indeed, no branch of practice has hitherto been more the subject of public opprobrium: this must have originated in ignorance at best, which a knowledge of the subject only will detect: with these views the following pages are submitted to the public, conceiving the diffusion of rational knowledge and of natural facts to be the most effectual preven-

tive of implicit sacrifices to ignorance and quackery.

The author's design being to form a *useful* book, he has intentionally avoided the minutiae of anatomical or physiological detail; but as far as either are necessary to practical information or general curiosity, he flatters himself it will not be found materially defective; and if, in so doing, an aim at familiarity and clearness of expression, has caused his style in many instances to appear unpolished, or his sentences not carefully correct, he will cheerfully submit to such criticism: his wish is not to shine as an *author*, but to be understood as a *friend*.

The engravings, likewise, it is hoped, will prove acceptable, as they are faithful transcripts of nature, being carefully executed from very accurate drawings, taken on purpose for this work, from actual preparations; this is also the only reply which can be made to their dissimi-

larity to those previously published on the same subject, other delineations not having been in the least consulted.

14, Hatton Garden.

ERRATA.

The reader is requested to make an important correction in page 95, line 3 from the bottom, insert *not*, the sentence will then read, "he will *not* see, &c." and in page 126, at the end of explanation of plate 3, for *i*, read *z*. Others of less consequence are submitted to his indulgence.

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A
POPULAR ESSAY,
&c.

CHAPTER I.

STRUCTURE OF A TOOTH, AND THE PROCESS OF ITS
FORMATION.

IT will be necessary first to observe, that a tooth is divided into *three* parts; viz. the *crown* or body, the *cervix* or neck, and the *root*. The body is all that part seen above the gums, the neck is the line all around the tooth to which the gum adheres, and is generally expressed by a slight depression where the enamel terminates, and the root commences. The root is all that part below the neck, and is inserted into its respective socket. It is almost unnecessary to say, that the parts in description are supposed to be in perfect health.

On inspecting a tooth, it is readily seen to consist of two distinct substances; viz. a very compact bony substance, and the enamel, or, as it is termed, by Dr. Blake, the *cortex striatus*; but as the term *enamel* is generally best understood, it will be preferred.

The BONY substance of a tooth does not materially differ from other bones of the body in its constituent principles, only in the proportion of them. Bones are principally composed of *gelatine*, or animal jelly, *fat*, or oil, and *phosphate of lime*, an earthy neutral salt, and probably water. The bony substance of the teeth is far more compact than any other bone, which seems to depend on its having a larger proportion of *phosphate of lime*, with a small addition of *carbonate of lime*, which adds greatly to its hardness, its *gelatin*, is rather more than one-fourth*. It is on a due proportion of the two ingredients, viz. *phosphate of lime*, and *gelatine*, that a proper texture of the bones principally depends. In the rickets, incident to children, the bones are soft and flexible, and, on analysis, appear deficient in the quantity of *phosphate of lime*. The teeth, likewise, which may happen to be forming at

* By the experiments of M. Berzelius, the teeth contain other substances; his analysis is as follows (see Nicholson's Journal, vol. viii. p. 75.):

THE ENAMEL.		THE BONE.	
Phosphate of lime	85,3	_____	61,95
Carbonate ditto	8,0	_____	5,50
Fluate ditto	3,2	_____	2,10
Phosphate of magnesia	1,5	_____	1,05
Soda, animal matter,	} 2,0	Soda, with a little mu-	} 1,40
and water		riate of soda,	
		Gelatine, water, &c.	28,00
	_____		_____
	100		100

that time, will, from the same cause, be early victims of decay. The same appearance may be produced in a tooth, or any bone, by immersing it in *muriatic acid* (the common spirit of salt) mixed with one-third water; the acid will dissolve all the phosphate of lime, and from a tooth it will *completely* remove the enamel; the substance remaining will be found of the same shape as the recent bone, and very little reduced in size, but at the same time flexible, so as to be easily bent in any direction without breaking. On the other hand, should teeth possess too much of the hardening matter, they will be very brittle; which accounts for the teeth of some persons breaking from a very slight accident or blow, though very sound and firm.

The ENAMEL is so called probably from its peculiar vitrious appearance, and from its being spread over the bony substance as enamels are on metals, &c. but it has no constituent similarity to them. It differs from the bony substance only in not possessing any gelatine, and having more phosphate and carbonate of lime, which renders it very brittle, and so extremely hard, that the best files are soon spoilt in filing it. It is semi-transparent, somewhat resembling fine porcelain; its colour varies in different individuals, and even in the same set of teeth, from a chalk white to a brown inclining to yellow. Although a *white* set of teeth are generally esteemed, and indeed are the most elegant while complete, yet it is observed that those tinged with yellow are most permanent; the white are brittle, apt to crack, and consequently decay;

the brown are generally too soft, and soon wear down. Its thickness is likewise very various; in some, the enamel forms the greatest part of the teeth; then the edges of the front teeth appear dark; this is owing to its transparency, and darkness of the mouth, and not any defect in the *enamel* itself. In others, the enamel is very thin, which, on using any gritty tooth powder, is soon rubbed off, and the bony substance exposed to decay.

THE FORMATION of a tooth is briefly thus; a small membranous *capsula* is first discovered lying in a groove on the jaw, where the subsequent tooth is intended to stand, and very closely attached to the internal substance of the gums. The vessels which enter the bottom of the *capsula* deposit in it a substance similar to jelly; this is termed the *pulp of the tooth*; and at first is very small; it however increases till it has attained the full size and shape of the body of the tooth that it is intended to form. When it has arrived at this stage, the internal gelatineous substance, which is extremely vascular, deposits, or rather, seems converted, on its most prominent points or edges, into an *osseous* matter, which is at first soft and elastic, but hardens by degrees into the bony substance described above; this bony deposit, or more properly *ossification*, extends till the whole external surface next to the *capsula*, or covering, is formed into a complete shell, possessing all the prominences and depressions of the body of the tooth. Layer within layer is successively added, till the whole is converted into a solid compact bony sub-

stance, except a small cavity in the centre, in which a part of the pulp still remains; it then contracts at the neck, and elongates, to form the root in the same manner as for the body. If the tooth is to have more than one root, the *pulp* branches off at the neck to form the number designed. It is to be noticed, that a communication with the central cavity is continued by a small passage, about the size of a hair, completely through the whole length of each root (*see plate 4;*) sometimes a root will have two or three of these openings. This central cavity will be more particularly noticed when treating on the diseases of the teeth, as when a tooth has attained maturity, the remains of the pulp become the organ of its sensibility, and is particularly affected in tooth-ach.

THE ENAMEL, as was observed, is the exterior covering of the bony substance, and is laid over the body of the tooth soon after its ossification is commenced. This substance is secreted and deposited on the *ossified* part by the internal surface of the *capsula*, or membranous sac, which envelopes the pulp. It is at first a soft earthy matter, but which hardens by a kind of cristallization, till it has attained perfection, which it does *before the tooth appears through the gums;* and as the *capsula*, which secreted it must necessarily be cut through in dentition, and, as far as relates to this purpose, destroyed, it is evident the enamel cannot increase or improve after its first formation, nor the teeth enlarge or grow, as is sometimes supposed.

From this brief history of the teeth, it is easy to see

that they will be much influenced by the state of health during their formation; and indeed many of their subsequent diseases may with more propriety be referred to this cause than any other, especially as no part of a tooth appears to undergo any alteration from the circulating fluids after it is once deposited. This is confirmed by anatomical facts, and is particularly illustrated in young animals whose food contains *madder*. Madder has the peculiar property of uniting with phosphate of lime, and communicating to it a beautiful red tinge. This may readily be shown by a few pleasing chemical experiments, easily performed by any one, though unacquainted with chemistry.

Experiment 1. Pour some boiling water on a few bits of madder root; let it stand till it acquires a deep red; about half a pint will be sufficient; take a common wine glass, put into it a few grains of *unslacked* lime, sprinkle drops of the infusion of madder on it till it falls to powder, then fill up the glass with the infusion, let it stand some time, when settled, pour off the clear liquor; this will look exactly like the clear infusion of madder; the lime will not appear to have produced any effect on it: if to this is now added two or three drops of *phosphoric acid*, the fluid will become of a clear yellow at the bottom, and red at the top; if permitted to settle for some minutes, a red precipitate will fall down to the bottom, leaving the water above of a clear yellow, without the least tinge of red. If this precipitate is again blended with the fluid by agitation,

the same appearance will take place by being left at rest.

Experiment 2. To shew that the phosphoric acid attaches itself to the lime, and not to the colouring matter of the madder, proceed exactly as in the last experiment, only using no madder, but dissolve the lime in clear water, the same appearances will take place, except that the colour of the precipitate will be chalk white, and the liquor clear and colourless. To procure lime for such small experiments, fill the bowl of a tobacco pipe with bits of chalk, or, what is better, white marble, and make it red-hot in a common fire, its carbonic acid, water, &c. is thus expelled, and the substance is left in its simple state of lime. This should be used while it is warm, or kept in close stopped bottles.

Experiment 3. Take two wine glasses, fill them about half full with the infusion of madder; in one dissolve a few grains of *phosphate of soda*, in the other as much *muriate of lime*, and no change will be produced in either; add one to the other, the mixture will at first be turbid, but soon a copious precipitate of a red colour will be formed, and the liquor above will be of a clear yellow, free from red. In this experiment the *phosphoric acid* quits the *phosphate of soda*, to unite with the *lime* of the *muriate of lime*, at the same time the *muriatic acid* of the *muriate of lime* unites with the *soda* of the *phosphate of soda*, so that we have two new substances formed, viz. *phosphate of lime*, and *muriate of soda*. The *phosphate of lime* at the mo-

ment of its formation combines with the colouring matter of the madder, and being *insoluble* in water, falls to the bottom with it, whilst the *muriate of soda*, which is common sea or table salt, being soluble in water, remains dissolved in it.

Experiment 4. To shew that other acids have not the same effect on lime as the phosphoric, fill three wine glasses with lime-water made with the infusion of madder, as used in *experiment 1*. In one glass let fall a drop or two of *sulphuric acid* (oil of vitriol); in the second a drop or two of *muriatic acid* (spirit of salt); and in the third a drop or two of *nitrous acid* (aqua-fortis): and although in each glass the same appearances will take place at first, as in *experiment 1*. viz. the fluid will be a clear yellow at bottom, and the red will collect at the top; yet on stirring, the red colour will be entirely removed, and the fluids exhibit uniformly a clear yellow, without the least precipitate or sediment.

Experiment 5. Immerse a tooth, or any piece of firm bone, in *muriatic acid*; let it stand till the acid produces no further effect; pour off the clear fluid into another glass, likewise dissolve a few grains of *lime* in *muriatic acid*, when settled, pour off the clear fluid, into another wine glass; these two solutions will have exactly the same appearance, and a chemical agent will produce the same effects on both; for if we now add to each a few drops of *sulphuric acid* (oil of vitriol), a copious white precipitate will be formed. If the *muriatic acid* has been fully saturated by the

bone and lime, and the addition of sulphuric acid happens to be exactly proportioned, *the whole of both fluids will almost instantaneously be converted into a solid white mass, nearly resembling hard curd.* These instances of converting two fluids into a solid are frequently termed chemical miracles.

From these experiments we may fairly infer, that the earth of bones is lime, possessing peculiar properties by union with the phosphoric acid, being a true *phosphate of lime*; and that phosphate of lime has peculiar affinity to the colouring particles of madder: and what renders madder particularly useful in such experiments, is, that its colouring particles appear to enter the animal circulation unchanged by the digestive organs; so that it produces the same effect in the system as in the hands of the chemist himself. In an animal, therefore, whose food contains madder, the colouring particles enter into the circulation, and meeting with phosphate of lime ready to be deposited, unites with it, and gives the bones a brilliant red. It appears likewise from anatomical examination, that this coloured deposit is absorbed after discontinuing the use of madder, and is restored again on using it; which shows, that even the substance of bones is in perpetual circulation, but much more rapidly in the young than in the old. Those of a young pigeon are tinged in a few hours after feeding with it. The teeth, however, appear to be an exception; for, in an animal which has been interruptedly fed with the madder, while forming its teeth, that part

of them formed during the influence of the madder will be red: when the madder is omitted, that part already tinged will not be altered; but the bony substance formed during its omission will be of its natural colour; and so alternately as madder is used or not. The *enamel* does not appear to acquire any tinge, or if it does, it is in a very slight degree. We may likewise remark, as a peculiarity of the teeth, that there is no instance of a re-production of any part that may be lost by decay or accident. In all other bones of the human body, in cases of fracture, or loss of bone by disease, there is always an effort of nature to produce a union, and to fill up the deficiency with *osseous* or bony matter; but this is never the case in teeth; a carious cavity, if stopped from proceeding, never is filled up; nor is a fractured tooth ever again united.

From all which, and many other circumstances, it has been inferred that the teeth are not vascular; but to enter minutely into this question would be foreign to the present design, and conduce to no practical good.

Seeing that a constant supply of this compound, viz. *phosphate of lime*, is so necessary to a proper texture of the bones, we cannot sufficiently admire the provident Creator in furnishing the usual aliments with it. The parent's milk, which is the usual food of the infant, possesses it in great abundance, and wheat, from which our bread is made, has it in sufficient quantities to supply the demands of nature. The rickets in children, as was observed, is a softness and flexibility of the bones, from a deficiency of phosphate of lime, and of which the teeth

that are then forming will consequently partake. In this disease *calcined hartshorn* has been administered, but with no very marked success: it was thought that calcined hartshorn, as it is almost entirely phosphate of lime, would furnish to the system what was required; but when the powers of nature are so disordered that they cannot take it from the milk, where it is already animalized, they cannot be expected to assimilate it from the crude substance.

CHAPTER II.

DESCRIPTION OF THE TEMPORARY AND PERMANENT TEETH, WITH THEIR CHARACTERISTIC DIFFERENCES.

IT is generally known that each individual has two sets of teeth successively ; those of the first set which make their appearance in infancy, and continue but a few years, are succeeded by a set more numerous, and which are intended to remain through life.

The first set of teeth have been distinguished by a variety of names, as juvenile teeth, milk teeth, shedding teeth, deciduous teeth, temporary teeth, &c. ; but, as they are designed only for a short service, and to be succeeded by others of a more lasting continuance, the term "*temporary teeth*," is completely appropriate, and by which, therefore, they will be distinguished ; and that of "*permanent teeth*" will be exclusively applied to those of the second set.

A complete set of temporary teeth are twenty in number—ten in each jaw. They are divided into *three* classes, from their difference, either in shape or in use, viz. *incisores*, *cuspidati* and *molares*. The permanent teeth

are thirty-two when complete, that is, sixteen in each jaw; and for the same reasons as those of the temporary, are divided into *four* classes, viz. *incisores*, *cuspidati*, *bicuspides*, and *molares*. In order to avoid repetition, as the classes of the temporary teeth are contained in those of the permanent, we shall describe the latter, which will render enlargement on the former unnecessary, taking care to remember that they have none answering to the permanent *bicuspides*.

The *incisores*, or cutting teeth, are so called from their thin cutting edges. The *cuspidati*, or one pointed, from their terminating almost in a sharp point; these are sometimes called *canini*, or dog-teeth, and frequently those in the upper jaw, eye-teeth, from an erroneous supposition of their being particularly connected with the eyes. The *bicuspides*, or two-pointed, from their having two points; these are frequently called the small grinders. The *molares*, or mill-stones, are the large grinders; their use being to grind the food, and reduce it to a pulpy state preparatory to digestion; these are frequently called double teeth, probably from their great size in proportion to the others. It will be proper particularly to observe, that the temporary teeth consist of *four* incisores, *two* cuspidati, and *four* molares in each jaw, and the permanent set of *four* incisores, *two* cuspidati, *four* bicuspides, and *six* molares, likewise in each jaw. The *incisores*, and *cuspidati*, which constitute the six front teeth, seldom have more than one root each, though I have an instance of a lower incisor with two roots, which is very

remarkable: of the *cuspidati* likewise several, but these are not so uncommon. The *bicuspides* have generally but one root; these, however, more frequently vary, in the upper jaw especially they often have two roots. The *molares* of the lower jaw have generally two roots, and the upper three; sometimes the lower have three, or even four roots, and the upper in the same proportion, these usually having one root more than the other.

If we begin the numeration of the teeth from the centre, viz. the space between the middle front teeth; they stand on each side in the following order: 1st. the centre *incisores*; 2d. second or lateral *incisores*; those in the upper jaw are sometimes called the *small incisores*, from their being much less than the central; 3d. *cuspidati*; 4th. and 5th. the first and second *bicuspides*; 6th. and 7th. first and second *molares*; the 8th. or third molares, completing the full number; but as these are not cut till long after the others, the set till then consists of only *twenty-eight* teeth. From the circumstance of the third *molares* not appearing until the person has attained to maturity, they are termed *dentes sapientie*, or teeth of wisdom, wise teeth, &c. The full number of these are four, making the complete set thirty-two; but these are often deficient, one, two, or three, only being cut; thus reducing the number of the set in proportion.

It is evident to the most cursory observer, that corresponding teeth in the upper and lower jaw, are not directly opposed to each other. This

principally proceeds from the great width of the upper central *incisores*, which so much exceeds those of the lower, as to occasion the upper *cuspidati* to shut in the angle between the lower *cuspidati* and first *bicuspides*; thus throwing the upper grinders backwards in the same proportion, so that the upper and lower teeth are reciprocally opposed to two others. This arrangement is of great utility; for if the upper and lower teeth were exactly opposed to each other, when one was lost its opposite would be entirely useless; but as it is, one half of it at least continues serviceable. A well formed set of teeth, however, always terminates evenly at the back of the mouth (*plate 1.*), by the upper third grinders, *dentes sapientiæ*, being proportionably smaller than the lower.

The difference of appearance between the temporary and permanent teeth cannot be accurately described; but by inspecting the plates (*plate 1. and 2.*), and comparing the figures of the temporary and permanent set together, a tolerably correct idea may be formed, as these are carefully delineated from nature; but should any doubt exist respecting what teeth have or have not been shed, by taking the child to a dentist, they will be easily detected; for though their difference cannot be adequately conveyed in words, or even by the best executed engravings, yet from the constant habit of observation, they are easily distinguished.

If it is found necessary to remove a firm temporary tooth, the parent must not be surprised at its having a root, as large in proportion as a permanent one; this

is really the case in all instances, though in the usual course of nature, when the permanent teeth begin to come forwards, the roots of the temporary teeth are, by some unknown process, obliterated, and, if *naturally* shed, have little or no roots to them, which has given rise to the erroneous opinion that they never had any.

CHAPTER III.

DESCRIPTION OF THE SOCKETS.

THE sockets of the teeth in which their roots are placed, are composed of a thin, elastic, very spongy, bony substance, placed on the jaws, and so completely united, that no anatomical dissection can clearly separate them, yet distinct from the substance of the jaws themselves; contrary to what is generally believed, that the teeth are fixed in the jaw. This opinion is completely erroneous; the sockets are dependent on the teeth for their existence: for whenever a tooth is extracted, the socket is soon absorbed and lost, and the jaw itself not in the least affected by the absorbing process. Thus we see in those who have unfortunately lost all their teeth, their nose and chin approach much nearer each other; this is from the cause just mentioned, where the teeth are gone, their sockets are absorbed; so that when the mouth is shut, the face is shortened by the whole length of the teeth and sockets, which is generally about two inches. After

the teeth are lost, and the gums healed, they often become so hard as to answer the purposes of mastication almost as well as teeth, except that the under jaw projects considerably beyond the upper which is occasioned by the necessary additional motion required, which brings the angles of the jaw forwards. In some instances, however, the absorption has been so extensive and complete, that the person cannot make his gums meet each other, even with his greatest exertion; they will sometimes be one or two inches a-part, and artificial teeth become necessary, or the food must be swallowed without any mastication whatever.

Each tooth has its own socket, and in those teeth which have more than one root, or fang, a distinct socket is formed for each, thin bony partitions shooting across, and uniting so as closely to embrace each root all round, and hold the tooth firm in its place. The sockets or holes in which the roots are inserted, are termed *alveoli*, from their resemblance to pigeon-holes, and the bone itself the *alveolar process*. It will be recollected that the rudiments of the teeth were said to lie in a slight groove on the jaw. Soon after the teeth increase in size, their sockets begin to form, and for some time out-grow them, so that they are almost completely inclosed, except a small opening at the top, through which the tooth passes; thus we see that the sockets grow with the teeth, not that the teeth grow into the jaw: when the body is through, the socket accommodates itself to the form of the root,

the gums adhere close round the neck of the tooth, and dentition is thus completed.

Although the sockets very closely surround the roots, yet they are not in actual contact with them. A thin membrane is interposed, termed *periosteum*, from its covering bone in general; this is extremely sensible and vascular, and appears to be universally employed as a medium for the transmission of blood-vessels, nerves, &c. to and from the bones. This membrane envelopes the outside of the alveolar process, is continued over their edges, and completely lines each socket, passing down between it and the root of the tooth, firmly adhering to both, and thus connecting them together. It is this membrane which allows of that little yielding which teeth in the most perfect health are observed to have, and is extremely useful in breaking the effect of sudden blows, jars, &c. which otherwise would often fracture the teeth or sockets, but which by this means are unhurt. Other very material advantages arise from this contrivance, for if the roots of the teeth were in actual contact with the sockets, that is *ossified together*, whenever there is a necessity to extract a tooth, the socket must be torn away with it; so that the operation, which is now perfectly safe, by this membrane easily giving way, could then never be performed without danger and incalculably more pain than at present.

It is remarkable there are no other bones of the human body, contiguous to each other, which have not been the subjects of a morbid union, termed *anchylosis*,

forming a perfectly stiff joint, or rather obliterating it wherever it happens, no such union has ever taken place between the teeth and sockets in any state of their diseases; sometimes, indeed, a small part of the socket will come away with a tooth in extracting it; but even this is never found ossified to it, but can readily be separated. This, however, is so trifling, at least in the hands of a careful dentist, as to be of no consequence, but rather an advantage, permitting the gum to fall more closely into the open socket, and exclude the air, &c.

Seeing then such serious evils are avoided by the teeth never becoming ossified to the sockets, the question naturally occurs to every thinking mind, how is it that this singular exception is so uniformly observed? This has never been demonstratively accounted for; but a probable solution may be given, if we admit (what there are many reasons to believe) that the teeth, when once formed, are completely inorganic bodies, possessing no other characteristic of bone but their chemical construction, and the power of uniting to the soft parts of living animals, which even a dry tooth will do in other animals as well as in man, and which is nothing more than is common to many other substances of nearly similar chemical formation, as the shells to an oyster, &c. If, then, this is a fact, viz. that the teeth are inorganic bodies, we can no more expect to find a tooth united to its socket and forming an anchylosis with it, than we can expect any other evident incongruity in nature.

The sockets and periosteum are often subjects of disease ; but as far as respects the operations of a dentist, they are so closely connected with diseases of the teeth, that to avoid unnecessary repetition, they will be treated of together with them.

CHAPTER IV.

OF THE FIRST DENTITION, AND ITS USUAL PRO-
GRESS,

IT would be foreign to the design of so small a work to enter into a minute detail of all the constitutional symptoms frequently attending infantile dentition, and indeed, they are often so combined, or are common with others, of so very different a nature, that it requires the greatest judgment, aided by personal attention, to discriminate; and to mistake would frequently be dangerous; we shall therefore only describe their usual progress, the time when, and the order in which they are generally expected to make their appearance, with a few practical observations.

Although a child at its birth, and for several months after, does not generally show any appearance of teeth, yet their formation has long commenced: even so early as five months, before the birth, the rudiments (that is, the pulps enveloped in their membraneous capsules, as already described) of all the temporary

teeth, and the four first large permanent *molars*, or grinders, are discoverable. These continue to enlarge and at the birth, all the temporary teeth are far advanced in ossification, and even the twelve front teeth, and four first grinders of the permanent set.

The process of nature still goes on; the teeth arrive at perfection, and at last make their appearance through the gums; at this time the child is said, but with little propriety, to be cutting its teeth; indeed it is more like the teeth cutting the child; for, as was observed, the teeth lie below the gums on the jaw, so that before they appear, they must necessarily pass through the investing membrane, and the whole substance of the gums. By what means nature facilitates the exit of the teeth, has not been satisfactorily explained; that it cannot be by their mere growth that they force their way, is evident, as they do not begin to rise till after the body is formed, and then only by elongation of the pulp in forming the root, which could never overcome the resistance the gums appear to present. However it is, the gums are obliterated by some unknown course of nature to afford them an easy passage; when unfortunately this is not the case, but by some derangement, the gums, &c. become a resisting medium, the diseases of dentition commence, and which appear to be in proportion to the difficulty of their rising through them.

Although an obstruction to the rising of the teeth can be at first only a local complaint, yet inflammation and pain being once implanted the sto-

mach and bowels are soon affected, the state of health is visibly altered, and, if proper means are not taken, the most alarming, and even fatal, symptoms, often ensue; for, from the great sympathy of parts in infancy, what was a few hours ago only a local affection, becomes a constitutional disease. As it appears, it is the confinement of the teeth which produces the distress, it must therefore strike every one, that liberating them is the most direct means of relief. Experience proves this to be the case; but, as the symptoms which attend dentition, such as drivelling at the mouth, great thirst, fever, obstinate costiveness, or sometimes on the contrary, looseness, or even alarming convulsions, may proceed from many other causes: and as the time at which the teeth appear is extremely uncertain, and which tooth will be first, almost equally so, no prudent dentist will apply the lancet at random; but when a tooth can be seen to elevate the gums, producing a whiteness and tension of them, so as to show it lies near the surface, to defer lancing the gums down to the tooth, if the symptoms continue, would be an unwarrantable protraction of disease; nor should the timidity of parents ever forbid it; to do so is only from excess of false tenderness. The operation gives little or no pain, a few drops of blood only is discharged, whilst the relief is almost certain and immediate. If the tooth advances very slow, and the gums heal before it has come through, so that disagreeable symptoms recur, it should be relieved again and again

till it has, but this is seldom required if the operation is properly done at first.

During the advancement of the teeth, the child generally expresses an uneasiness of its gums, and seems desirous of something to bite ; instead of indulging the palate by giving cakes, sweet-meats, &c. which only pall the stomach, weaken digestion, and increase the thirst, the nurse should frequently rub its gums with her finger dipped in sage tea, agreeably sharpened with a little vinegar ; this I have often found very serviceable. Costiveness should at all times be avoided ; the bowels may generally be relaxed, by giving a few grains of powdered rhubarb, or, to assume a popular measure, about as much as will lie on a sixpence, double the quantity of magnesia, two tea-spoonfuls of peppermint, or cinnamon water, mixed up with a table-spoonful of warm-water, and properly sweetened with sugar ; this is a safe and excellent remedy, and may be kept at all times prepared.

It has been suggested that the use of calomel during the formation of the teeth occasions them to be pitted with dark specks and ill-formed ; indeed I have generally found, on inquiry, that persons who have such teeth had been afflicted in infancy with complaints for which this or similar remedies are usually given ; should this observation be founded in fact, it will be a caution to dispense with the use of those medicines as often as possible, and an additional warning, among a thousand others, to parents not to fly to the produce of quacks, whose worm-cakes, nuts, lozenges,

&c. &c. are all composed of calomel, or stronger mercurial preparations*.

The time at which teeth appear is very various in different children; instances have been known of children at the birth having one or two teeth; in others, it is three or four years before any shew themselves; these variations probably arise from the different progress of

* As this little work may fall into the hands of heads of families, or those entrusted with the care of children, who are unacquainted with the dangerous tendency of medicines commonly recommended in the complaints of childhood, and which are generally resolved into that of WORMS; we hope to be excused the digression, in just observing, that the common direction given with worm-cakes, nuts, lozenges, &c. "to keep them in a dry place," is in fact saying there is calomel in them; but it is a very necessary caution, and should never be forgot, because the calomel and sugar in the nuts, cakes, &c. when *damp*, produce a chemical action on each other, which does not take place while *dry*. In a damp state, the calomel is really converted into the well known poison CORROSIVE SUBLIMATE. Drying then will be of no use; for if corrosive sublimate is once formed, drying or burning will not unform it; if, therefore, they have accidentally been in a damp situation, they should absolutely be thrown away, or there will be much risk of poisoning the patient; for we need scarcely say, that a quantity of calomel, which is perfectly safe, is, when converted into corrosive sublimate, a dangerous poison; it would be well if administering such medicines at random was entirely abandoned, as it is probable some of their many fatal effects have been caused merely by improper keeping, or some circumstance equally trivial.

ossification in different constitutions. Generally, however, between the sixth and eighth month, the first teeth may be expected; these are mostly the central *incisores* in the lower jaw, and soon after them those of the upper; in a few weeks more, the lateral *incisores* of the under, then those of the upper jaw; at about twelve months old, the first *molares*, or grinders, in the under and upper jaw, both about the same time. In two or three months after these, the *cuspidati* appear generally first in the lower jaw, and in a few months more, the posterior or large grinders, in the same order; so that at about two years, the whole of the temporary set of teeth is complete. This is the most usual course of nature, but it can by no means be depended on. The upper teeth will frequently appear before the under; and though generally in pairs, they will sometimes deviate in this respect also. This uncertainty however, is not much to be regretted, as we can at all times inspect the mouth and remove our doubts at once and when a child has begun to cut its teeth, this should frequently be done.

CHAPTER V.

DISEASES AND SHEDDING OF THE TEMPORARY
TEETH, AND THEIR TREATMENT, AS INTRODUCTORY
TO THE SECOND DENTITION.

THE diseases of the temporary teeth are very few, and, except *caries* or decay, none that need be noticed; and even this does not often happen, till the permanent teeth are coming forward, so that their removal is rendered necessary to give them room. The crowded state of teeth appears to be the principal cause of pain, even when the temporary teeth are carious, so that seldom any operation is performed on them but extraction.

Children, as soon as possible, should be accustomed to strict cleanness in the mouth; the teeth should be daily brushed carefully, with a proper tooth-brush and water, a little warm; at this age, no powder, or other application need be used. If the teeth are regularly

cleaned, it will generally preserve the gums in an healthy state; and should any thing be the matter with them, or the teeth, it is much more readily seen; besides, when children are *early* accustomed to cleaning their teeth, it becomes a habit; and if they go away from their parents, on a visit, or to school, they will naturally do it themselves, without so much looking after; and the offensive breath, so often complained of on their return at holidays, &c. would be frequently prevented, as it generally proceeds from neglect.

As was observed, there are few operations performed on the temporary teeth; they seldom stand irregular, and even where they do, they should not be meddled with, for by prematurely using violence, there is considerable risk of injuring the permanent teeth, which are nearly connected with them, and in great forwardness; the temporary teeth therefore, should be permitted quietly to continue, till nature removes them, or shows the necessity of its being done by art.

The temporary teeth, after they are fairly through the gums, generally remain till about seven years of age, when one or two of the lower *incisores* become loose, indicating that the permanent teeth under them are nearly approaching. As some children shed their teeth earlier than others, their mouths should frequently be inspected about this time; and when the temporary teeth begin to loosen, the attention ought never to be remitted; a daily examination of them is done in a minute; and in children, whose teeth come

forward very fast, if left to themselves for only a week, they will sometimes take such an irregular direction, as can scarcely be altered. The grand point, in order to insure a regular set of permanent teeth, being the timely removal of the temporary ones, which oppose their progress.

As the permanent teeth come forward, the roots of the temporary teeth are obliterated; not that the permanent teeth do by growing, *push the temporary teeth out*, as is often imagined, for if this was the case, the tooth that is loosening would stand much higher than the others, which it never does, but by what process of nature the roots of the temporary teeth are obliterated and absorbed, is not well understood, though it is indisputably the fact that they are; so that when the permanent teeth are ready to appear, the temporary adheres only by the edge of the gum; and as each tooth successively becomes loose, by tying a small piece of thread round its neck, it may by a smart twitch be brought away. This is the *usual* course of nature, and very little pain or inconvenience is experienced in the second dentition. But sometimes this is not the case; the roots of the temporary teeth remain unobliterated; and the permanent are turned out of their natural situation, sometimes attended with excessive pain, thus producing the most unsightly, and often lasting deformity.

As nothing assists more in procuring a regular set of permanent teeth (and which certainly is a most desirable object), than a timely removal of the op-

posing temporary, if it cannot be done by the simple method mentioned, the child should be placed under the care of an experienced dentist, by whom the proper teeth will be removed with the utmost facility.

It frequently happens, from the misplaced tenderness of parents, that the operation is too long delayed ; they hope from day to day, that the temporary tooth will loosen of itself, and thus they permit the advance of the permanent one to be so far deranged, as never can be rectified, and at last the operation must be performed. Such parents should consider, in extracting a temporary tooth, the child suffers only a trifling momentary pain, unattended with the least danger, for a lasting good, and which probably prevents many bad consequences. The instances are numerous of the most disagreeable ulcerated gums, and sometimes the inside of the lips, or cheek, which have been solely caused by the remains of temporary teeth ; these must be extracted, and that even under the most disadvantageous circumstances of inflammation, and tenderness of the gums, or no cure will be obtained. Such instances, properly considered, would induce every one to attend to a timely removal of the temporary teeth. For the advantages of the treatment recommended, are not only those of preventing subsequent disease, but it is also of the first importance in forming a regular set of permanent teeth, which it seldom fails to do, where sufficient *room* has been made for them to advance into their proper circles. It sometimes unfortunately happens,

that after all the temporary teeth are removed, there is not room for the permanent set, particularly the *cuspidati*; these being the latest of the front teeth, make their appearance through the outside of the gums, near the roots of the others. This deformity is most frequent and obvious in the upper jaw, for as they advance, they project their points towards the lips and cheek, often standing out like tusks. As soon as this is discovered, the child should be taken to a dentist, who will remove the first *bicuspid* or small grinder; and as the *cuspidati* grow, will gradually fall down into the place where the other was taken from, and in time occupy its proper situation, if the irregularity has not been too long standing. Parents should not insist on the *irregular* teeth being extracted; for the *bicuspid*, though they may be perfectly sound and regular, yet are teeth of much less value than the *cuspidati*; they are much weaker teeth, more frequently the early subjects of decay, and in all respects of less importance than the *cuspidati*, which are very strong, and seem placed by nature as main pins to support the four central *incisores*, and are generally the last to give way by disease, or otherwise. It is true, to remove a regular tooth for an irregular one, appears at first sight a rash operation; yet it is founded on the same principle on which we extract the temporary teeth, viz. *the tendency all teeth have, particularly while growing, to advance towards any space made near them.* If, however, the deformity is of long standing, as there is not the least danger in taking out the *cuspidati* them-

selves (for their supposed connection with the eyes is imaginary); it should be done to prevent those accidents which sometimes occur from falls, blows, &c. by which these teeth instantly cut through the lip or cheek. Sometimes the principal irregularity is in the *incisores* overlaying each other; none of these should be extracted, unless such as stand so far out of their proper circle, that we are certain will not leave a space to occasion lispings. On the whole it is better to let them alone, and trust to the growth of the jaw itself; which sometimes extends so much, that the teeth, which at first stood close together, in a few years are some distance apart.

In some children, where there is sufficient room, they have acquired the habit of projecting the under jaw forwards, and of course of shutting one or more of the under front teeth beyond the upper; this must be corrected, or the upper teeth will inevitably continue to grow within the under, and produce a deformity of the mouth; this is easily done, if early attended to: as soon as it is discovered, the child should be instructed to draw its under jaw rather inwards, so as to make the edges of the under teeth go *within the upper*. By carefully continuing this practice, the upper teeth will soon be pushed a little outwards, and grow in that direction till they fix in their proper situations.

To return to the removal of the temporary teeth. Much depends on the conduct of the parents; how often are children told "it will give you no pain; it will be done in an instant; it will be out and you

know nothing at all about it;" such falsities may deceive the child for once, but thereby all their confidence is destroyed, which is much to be regretted, as it generally happens, if one tooth requires extracting, many more will, from the same constitutional cause, whatever that may be, and a child once so imposed on will seldom submit to it again. It is very easy to apprise a child of its suffering a little pain without frightening it. Reason soon attains a sufficient influence over their minds, and they are equally sensible of imposition as adults; this is observed by every one acquainted with them. If they say nothing about it, nothing need be said to them; but if they ask any questions, just and correct answers, as far as is necessary, should be given. I have made this my constant practice and have never been disappointed on that account; whereas, when a child has been persuaded he will feel no pain, should the roots be not so far obliterated as to render the tooth very loose, he will become impatient, and will with difficulty believe that he is hurt no more than is necessary, for although the pain may be very trifling, yet being so contrary to what he was taught to expect, future reluctance and distrust will be the result of the disappointment; and should two teeth require to be removed at one time (which is generally the case, as they are mostly shed in pairs) we shall hardly ever succeed with the second; but by a contrary conduct, although the pain may a little exceed what was expected, yet it will never make so strong an impression

on the mind, and we shall very seldom be prevented doing what is proper. Another frequent impropriety is, when a child is brought to a dentist, and it is agreed to extract a tooth, the parent runs out of the room, perhaps stands outside of the door, repeatedly inquiring "Is it out?" This not only disturbs the dentist at the moment the greatest steadiness is required, but damps the courage of the child, and places it under the dominion of terror; for notwithstanding all the assurances have been given to the child that it will not hurt, he will naturally suppose the operation must be tremendous indeed, if you cannot bear even to look at it. I have seen many children frightened nearly to fainting from this single circumstance, who, when the parent has been persuaded to stand by, have cared very little about it. Such improprieties should be carefully avoided, and if parents doubt their own firmness, they should commit the charge to a friend. Perhaps these observations may be thought to descend to minuteness bordering on puerility, but I presume they need no apology, from a conviction founded on experience, that if these minutiae were more observed, dentists would have far less trouble, be more completely successful, and parents have much fewer disappointments. Upon the whole, the grand object is to inspire the child with courage and confidence founded on a proper basis, and at the same time to avoid stamping the operation with an unnecessary degree of importance and magnitude, by an excess of parade, agitation, or argument.

It will be necessary to observe, that some persons, persuaded of the propriety of removing the temporary teeth, have run into the contrary extreme, and at the time they are generally shed, will request them to be extracted, though not loose, nor any appearance of the permanent teeth. Such persons should recollect what was before observed, that the rudiments of the permanent teeth are very nearly connected with the temporary, and from the violence unavoidably used in extracting a firm temporary tooth, there is much danger of entirely destroying the adjacent permanent one, by breaking its socket, and deranging its vessels. Besides, sometimes the temporary teeth are not shed, nor the permanent appear till many years after the usual time. I have seen them remain entire after twenty years * ; had they been extracted, the person must have been entirely toothless many years of his life. It is, however, unnecessary to enlarge on this, as its impropriety must be seen in a moment, and as it cannot be done by the parents themselves, no dentist of respectability would do it, at least, not without strongly protesting against such an operation. Nor should children's teeth be prematurely extracted on

* It is probable that the opinion of some persons having a third set of teeth, had its origin from some such circumstance as this ; for not having an idea that the infantile teeth could remain so long, the teeth that succeeded them were supposed to be a third set, though, in fact, but the second. Indeed there has been no well authenticated instance of a third set ever appearing.

account of tooth-ach; the temporary grinders will sometimes become carious, and give great pain before there are any signs of permanent teeth to succeed them. I have particularly in view, at this time, a little girl who had a temporary grinder removed for tooth-ach, a year or two ago, and no permanent tooth is yet appearing; but a corresponding tooth on the other side, which I removed at its proper time, a few months since, is succeeded by a permanent tooth, in the usual manner. This and many other similar instances seem to prove, that in prematurely removing the temporary teeth, we at least retard, if not destroy, the permanent ones; when, therefore, a child is afflicted with tooth-ach, and it is not a proper time to remove the tooth, we would recommend the usual palliative remedies to be applied for a time, in order to obtain ease, and wait, if possible, till the proper period to remove it. If, however, the gums become swelled and inflamed, indicating a considerable extent of disease, the tooth must be extracted immediately, or its effects will be communicated to the permanent teeth that are forming near it, occasioning them to be the early victims of decay, and sometimes even totally destroying them.

CHAPTER VI.

OF THE SECOND DENTITION, AND ITS USUAL PROGRESS.

AS the second dentition is immediately preceded by the removal of the temporary teeth, in so particularly treating of them in the last chapter, as introductory to this, we have in a great measure anticipated the present, so that there remains little more than to describe the situation that the permanent teeth occupy during their progress, and consequently the order in which they generally appear.

At the birth, or indeed some time before, the rudiments of sixteen of the permanent teeth are discovered in considerable forwardness, viz. the eight *incisores*, and four *cuspidati*, which constitute all of the front teeth, and four first large *molaes*, or grinders.

The four *molaes* are placed in continuation of the same circle as the temporary teeth, only further back; the *incisores* and *cuspidati* are not, nor under them, as we should at first suppose; indeed the permanent teeth are not quite so deep below the gums as the temporary, but lie behind them in contact with their inner surface nearer the inside of the mouth. It will be recollected that the temporary grinders are succeeded

by the permanent *bicuspidæ*, or small grinders; the rudiments of these are situated directly under the temporary grinders, and commence at about six or seven months old, as do likewise the second permanent grinders. At six or seven years, and before any of the temporary teeth are shed, the rudiments of the third grinders, or *dentes sapientiæ*, commence. So that at the time just previous to the shedding of the temporary teeth, there are more teeth formed, or forming, than at any other period of life, viz. the twenty temporary teeth that are preparing to be shed, and the thirty-two permanent teeth which are coming forwards, in all fifty-two teeth, or twenty-six in each jaw.

It appears, as far back as anatomy can reach, that there are the rudiments of all the temporary teeth and four first permanent grinders situated on the jaw independent of each other, or connected only by the common investing substance, *the gum*. We can no more ascertain how the rudiments of the teeth are implanted, than we can account for the first formation of any other part of the body, or even the infant itself. In this instance, as in all others, we can only follow the progress of the Creator after his works have become evident to our senses; all before that, however convinced we may be of its previous existence in some form or other, is to us like the work of creation itself, hid in impenetrable obscurity, and we can only delineate the works of nature from the time we can see or feel them.

The time and order in which the permanent teeth appear is so very various, that no practical dependence

can be placed on the best observations of this kind; the following is perhaps the most usual. At six or seven years, the two central lower *incisores* may be expected; in a short time after, those of the upper, (though this order is very often reversed;) then the two side *incisores* of the under jaw, sometimes the first permanent grinders both in the upper and lower jaw, will appear about this time, and in some instances these teeth will come through the gums before any of the temporary teeth are shed, or even loose; the small *incisores* of the upper jaw are generally next, but at some time distance. The first *bicuspidés*, or small grinders, about the eighth or ninth year; from this time to about twelve or thirteen, we expect the *second bicuspidés*, or small grinders; the *cuspidati*, or eye-teeth; and the *second molares*, or large grinders, in the order mentioned: so that from twelve to fourteen, we expect the permanent dentition to be completed, except the *dentes sapientiæ*, consisting of twenty-eight teeth. The permanent, like the temporary teeth, generally appear in pairs, but they are subject to great variety in this respect also. I have seen the two small grinders on one side, and the upper *cuspidati* before the temporary grinders on the other side had been shed, yet in such a state as to indicate the near approach of the succeeding small grinders.

From their very crowded state, it is not at all surprising that the teeth should appear irregular, in the upper jaw especially, which is principally from the great width of the central *incisores*; for, as has been remarked, the *bodies* of the teeth are of their full size,

and in all respects as complete as ever they will be, some time before they pass through the gums : indeed in the upper jaw they are so crowded, that it is astonishing they should ever appear in a regular situation. Whilst the centre *incisores* are formed near the front, the small *incisores* are situated behind, between them and the first small grinder, and the *cuspidati*, or eye-teeth, are formed far above them in the angle between the corner of the eye and the nose (see plate 3.) ; hence it is, that when the jaws have not extended sufficiently to make room for them in their proper place, that these teeth appear through so high above the others ; indeed instances are known, where the *cuspidati*, from being so confined, and the root having taken a serpentine direction, never appeared through the gums at all, and yet the teeth completely formed.

Irregularities in the small grinders do not so frequently happen, they being formed directly under the temporary grinders, are situated much nearer the places they are afterwards to occupy, and commonly come through with very little derangement, except when the temporary grinders have remained in too long, these then turn them out of their way towards the cheek or tongue, the temporary teeth projecting to the opposite side, but on their being removed, the other will always advance in their proper direction. The first and second permanent grinders having no teeth to oppose their progress, and the jaws lengthening mostly backwards, irregularities in them are very seldom met with.

In the under jaw, irregularities of the teeth are not so frequent as in the upper, notwithstanding their situation in embryo is as dissimilar to their future places; this is owing to the six front teeth not being so much larger in proportion to the first set as the upper are; yet when the arch of the jaw does not sufficiently extend, these will come in a very irregular manner, so much so as sometimes to stand completely before each other, and appear like two rows of teeth; but on counting them, we shall find there are no more than there should be, and only want of room threw them into such unsightly situations. This deformity is the most unpleasant of any to which the mouth is subject, and can only be prevented or corrected, by sacrificing one or two of the permanent teeth which appear most proper for the purpose.

It will be necessary to remark, at the time the front permanent teeth are expected, that the four *incisores* both in the upper and lower jaw should be looked for on the *inside* of the temporary teeth, but the *cuspidati* appear in both jaws on the *outside* of their corresponding temporary teeth; these observations it is important particularly to recollect, as when the temporary teeth have not become loose, the permanent teeth, from ignorance of these circumstances, are often permitted to grow far out of their proper situation before they are discovered.

The appearance of the third grinders, or *dentes sapientia*, may not improperly be termed the third dentition; and is frequently attended with more disagreeable and painful circumstances than any other of the

permanent teeth, which seems to arise from the great thickness of the bony substance through which they have to pass, to which we may add, the compact structure it has attained at the age these teeth pass through it. Indeed the situation and whole progress of these teeth are so different from the others, and occasion such different symptoms, that a distinct but brief description will be necessary.

In the *upper jaw*, after the second molaris is cut through, immediately behind it will be discovered a rising or protuberance, termed the *tubercle* of the jaw : in this is lodged the embryo of the future *dentis sapientia*, and as the socket is thinnest next the cheek, and the second *molaris* prevents its advancing towards the front of the mouth, these teeth generally project against the cheek, and rather backwards ; indeed, when they have been very much pressed for room, their bodies have been so buried in the inside of the cheek, that their existence could scarcely be ascertained.

The situation of the *dentis sapientia*, in the *lower jaw*, is very different ; in this behind the second grinder, it rises almost at right angles, forming a thin plate of bone, the anterior edge of which is towards the teeth ; that is, its sides are in the same direction as the teeth and base of the jaw ; this plate of bone terminates at its highest back edge in a kind of knob or knuckle, and is received in a corresponding depression in the temporal bone, forming the joint or hinge on which all the motions of the jaw are performed. The *front* upper edge of this plate termi-

nates in a sharp point, leaving a space between it and the joint; it is to the point and sides of this plate of bone that the temporal muscle, and other moving powers of the jaw are fixed; and in its root, next to the second *molaris*, on the side nearer the inside of the mouth, the rudiments of the lower *dentes sapientiæ* are lodged, and in consequence of the bone being thickest on the outside, these teeth generally come through in a direction towards the tongue.

It will be recollected, that the rudiments of these teeth commence between five and seven years old, the time they make their appearance is very various, seldom earlier than eighteen, nor often later than thirty years; but generally at about 23 or 25 years of age. In the greater number of instances these teeth are cut, and the person knows nothing of it; but in many it is attended with the most excessive pain, sometimes even for two or three years; and as they are placed out of the reach of any direct operation, we can only wait patiently till they occasion a rising of the gum so as to indicate their near approach; the gum should then be freely lanced, dividing it completely down to the tooth, which will remove all the inconveniences, almost immediately: indeed, lancing the gums over these teeth has often been attended with similar astonishing effects as in children's first dentition, relieving fever, spasms, convulsions, and other alarming and distressing symptoms, the cause of which the patient was totally ignorant. If, after the gum has been lanced, it heals before the teeth come through, it should be repeated till the dentition is complete, but after all the pain

and trouble frequently experienced in obtaining these teeth, they unfortunately are generally the earliest decayed.

Besides the teeth already described, there are sometimes additional or supernumerary teeth (plate 4); these are generally small round teeth, about the size of a crow-quill; their situation is various, seldom in the proper circle, most commonly behind the front teeth in the upper jaw; these are of no use, but often a great inconvenience; and as their roots are short, are readily removed, which should be done whenever they are discovered.

For many years after dentition is complete, and often during life, the teeth continue to be supplied with blood vessels and nerves; these are transmitted to the central cavity of the tooth through the capillary opening of the root; this passage, though not larger than a hair (see plate 4.), conveys an artery, a vein, and a nerve, which are expanded in the remaining pulp of the cavity, but does not appear to penetrate the bony substance.

As the teeth as well as all other parts of the human body, are supplied with blood primarily from the heart, it may perhaps not be unacceptable to those who are not acquainted with the subject, briefly to notice the important and curious circumstance of the circulation. The situation of this important *viscus*, the heart, is generally known to be under the left breast, where its motion may be distinctly felt. It is the action of this wonderful organ that propels the blood to the remotest extremity, through the *aorta*, or great artery, which proceeds

from its left side, and all the various arteries of the body, except the pulmonary artery, are but branches of this; the arteries of the teeth are ramifications of the external *carotid* arteries placed on each side of the neck, and which spring from the *aorta*. The blood, after it has performed its office, is conveyed back to the right side of the heart by the *veins*; it is now unfit for the purposes of life, and is of a *dark red*; it is therefore propelled from this side of the heart through the pulmonary arteries to the lungs. In these organs it appears to undergo a grand chemical change; for it is returned from the lungs to the left side of the heart, of a bright vermilion, thus completing the circulation, and is again propelled into the *aorta* for the service of the animal. The circumstance of the blood going into the lungs a dark red, and returning a bright vermilion; is a curious phenomenon, and was utterly unaccountable till chemistry rose and explained it. Venous blood, or the blood which *enters* the lungs, in circulating through them is brought in contact with the atmospheric air which we inhale, and which is known to contain nearly one-third part of oxygen, therefore, at every breath we draw, a play of chemical affinities takes place, a part of the oxygen unites with the carbon, and forms carbonic acid, which the emitted breath contains in much larger quantities than the atmospheric air, and another part of the oxygen unites with the blood, giving it its vermilion colour; likewise the phenomenon of animal heat is generally referred to the process of respiration in the lungs as its principal, if not only source, for we are informed that ar-

terial blood has a greater capacity for heat than the venous, so that in converting venous into arterial blood, it not only parts with its useless carbon, and becomes oxygenized, but it also absorbs a large proportion of heat from the decomposed atmospheric air; and as the arterial blood is converted in its circulation into venous, it of course parts with its superabundant heat to every extremity of the body. It is thus accounted for why the human body uniformly exhibits the same temperature, whether in the frigid or torrid zone; for if the bulb of a thermometer is placed in the mouth under the tongue, or exposed to a stream of blood, it constantly indicates about 97 or 98 degrees of heat, whether the external air at that time may be 20 or 110. Some idea of the rapid motion of the blood may be formed from the following calculation: the heart propels at each pulsation about one ounce of blood and when it makes eighty pulsations in a minute, of course three hundred pounds of blood must pass through it in an hour, which is about twelve times the whole mass of blood in the body, and this rapid action is incessantly going on night and day through life. That the teeth are supplied with nerves is sufficiently evident, from their great sensibility, they are branches of the fifth pair; and which, like all other nerves, primarily proceed from the brain.

CHAPTER VII.

DISEASES OF THE TEETH, GUMS, SOCKETS, &c.

CARIES, or decay, appears to be the only disease to which the teeth themselves, strictly speaking, are subject: by *caries* is understood a rotting, or mouldering away, of the substance of a tooth.

The commencement and progress of decay is so insensible, that it may exist many years, and even the person himself is often not aware of it till it has penetrated to the very centre of the tooth; having reached the cavity, it there commands attention, on account of the severe tooth-ach it occasions.

It will be recollected, in describing the formation of a tooth, a cavity was said to be left in the centre of it, the vessels and nerves, in which are the organs of its sensibility. This cavity (see plate 4), does not appear to answer any valuable purpose; and as we have in no other instance any good reason to suppose that organization is created merely for the purpose of causing

pain, without any benefit to the individual, or that misery is the sole object; so on a little reflection we shall find it to be the case in this instance also; this central hollow does not appear to be a finished state of a tooth; nature seems to design a tooth, when *complete*, to be a compact, solid, insensible body; this is evident, from their vessels being the remains of the pulp which formed the bony substance. When the pulp was large, and its surface proportionally extensive, ossification advanced very fast; but as it becomes less, ossification goes on slower, so much so that it is generally late in life before the pulp is completely ossified, and the cavity obliterated. When it has arrived to this state, no pain is produced by caries, which is the reason why some person's teeth will entirely decay without occasioning any uneasiness. It likewise accounts for the difference in various constitutions; while some, early in life, feel no pain from caries in their teeth, those of a more advanced age feel very sensibly; in the former, ossification advanced rapidly, and the cavity was soon obliterated; in the latter, ossification proceeded slowly, and therefore it remained open much longer. In some few it never is quite filled up, and therefore they are always subject to tooth-ach; but it gives a reason why old persons *in general* are not so troubled with this pain as young ones; those cavities in them being for the most part filled up; it likewise accounts for children, who, when caries attack any of their permanent teeth, feel tooth-ach much earlier, and more severely, than

adults; for in them the cavity is larger, consequently the decay sooner penetrates to it, and the surface exposed is much more extensive, and therefore produces more severe symptoms; the gradual filling up of this cavity likewise shews why some teeth are worn down nearly to the gums without occasioning any pain. I once saw an old man whose teeth were of a soft structure, and the upper front teeth shut directly on the under; in this instance, all the teeth were worn down nearly to the gums, quite flat, without any of the usual points or depressions on them, from one end of the row to the other; he had never experienced any tooth-ach; an absorption had attacked the sockets and I removed one or two teeth on that account.

Numerous causes have been assigned as the origin of decay in teeth, such as scurvy, heat of the stomach, heat of the mouth, nervous fever, acidity of the saliva, &c. none of which appear sufficiently to account for caries. If *scurvy* had so far pervaded the system as to destroy the teeth, there could not be a sound bone in the body; besides, if this was the case, the sockets must equally partake of it, which they do not; for the instances are numerous where the bodies of the teeth are completely decayed, without the sockets being in the least injured, and the person at the same time possessing a good state of health, perfectly free from scurvy; besides, if scurvy decayed the teeth, their *roots* would generally be first attacked; so far from this being the fact, a decayed root, or, at least, caries originating in the root, is seldom or never met

with, but the caries constantly commences in the body, or in parts not covered by the gums.

Heat of the stomach or mouth is likewise completely inefficient; for a tooth to be even blackened by heat, it must be made nearly red hot, which is a degree of heat the human frame never evolves, nor is there any reason to suppose that nervous fever, or a fever of any kind, produces an effect so as to occasion caries; fevers indeed are frequently attended with a large deposit of extraneous matter on the teeth, as tartar, &c. but this is distinct from decay, and never a necessary cause or consequence of it.

Acidity of the saliva has by some been considered as the cause of caries; this will by no means account for it, and can only have arisen from ignorance of the nature of the saliva. We are not sensible of the saliva ever possessing acidity; indeed its characteristic appears to be an entire absence of it, and a strong attraction for the acidifying principle, oxygen, uniting with it with eagerness whenever they come in contact. Saliva is indeed a very universal solvent, capable of combining with almost every animal, vegetable, or mineral substance, metals themselves not excepted; yet it does not appear to affect the *enamel* of the teeth, which several circumstances tend to prove; however, supposing for a moment that it possesses strong acid properties, what effect should we reasonably expect? Nothing short of the whole of the enamel being dissolved and removed, particularly of the bottom teeth and this must always take place before

The bony substance can be touched; this is the well known constant action of all acid solvents; but we never see any thing of this kind take place in the mouth from natural or vitiated secretions. When a decay first appears, it is only a discoloured speck in one part of the tooth, and the enamel is generally entire; if this discoloured part of the enamel is removed, we often find a large cavity filled only with a very fœtid powdery substance; this confined commencement of decay would never be the effect of an acid or any solvent, which may be supposed to exist, or be diffused over the mouth. Besides, in an acid state of the juices of the mouth, the lower row of teeth must be the first to suffer, from their being almost constantly immersed in it: so far from this being the fact, although we often see decayed upper front teeth, a decayed lower one is very seldom found, which, with the confined first appearance, certainly proves that caries does not arise from any acid secretions of the system; indeed the saliva does not appear to have the least effect on the *enamel*, though in conjunction with the air, and other adventitious matters, it seems to act on the *bony substance*, excavating the tooth sometimes very rapidly; but the enamel is left standing like a shell, and breaks away by degrees as it loses the internal support of the bony substance, but is never decomposed like it, and even its discoloured state appears only extraneous, for if we have a piece of enamel sufficiently large to permit the black matter to be cleaned off, it becomes of its natural colour;

therefore we must conclude that the saliva has no effect on the structure of the teeth while in their natural healthy state.

Our formation in this, as in every other instance, is truly admirable; nature has covered the teeth with a substance, the enamel, which resists the attacks of a strong solvent, to which they are constantly exposed, and her arrangements likewise are peculiarly subservient to each other; for from the strong action of the teeth during mastication, they produce an effect on the salivary glands, so as to induce them to give out a larger proportion of the saliva; this, during the mastication, is thoroughly blended with the food, and it is thus conveyed into the stomach, properly moistened and assimilated for digestion; and it appears that digestion is not properly nor readily performed, unless the food is mixed with a sufficient quantity of the saliva; indeed there is reason to believe it absolutely necessary to the digestive process, not only from its acting as moisture, but likewise from its affinity for the acidifying principles before mentioned, which it may imbibe from the atmospheric air during its agitation in the mouth, thus becoming a true chemical agent.

Nothing can set in a more clear light the necessity of thoroughly masticating the food before it is taken into the stomach, and those who possess a good set of teeth, but from negligence or inattention, have acquired the idle habit of swallowing the food almost whole,

cannot with reason complain of the pains of indigestion which frequently follow a hearty meal. Those who have unfortunately lost many of their teeth, or have them decayed, so as to prevent proper mastication, should cut their food as small as propriety will admit, and then by a little mastication it will be reduced to a proper state; this method has often been known to prevent very distressing pains in the stomach, which were solely caused by that organ having too much to do.

To return to the origin of caries. From the various causes assigned for it, we may suppose it is not properly or generally understood, not from want of ability in those who have treated on the subject, but probably from an idea that it does not deserve so particular an investigation; this however may readily be seen to be a mistake, for as caries frequently terminates only by extraction of the offending tooth, and as this is at all times a painful operation, persons on whose minds reason has its proper influence, will more readily submit to a severe remedy, when they know it is the best the nature of the case will possibly admit; nor indeed can a rational or satisfactory practice be established in any instance, without a complete knowledge of the subject, both in its natural history and present state; and so far as we are defective in either, so far we must submit to the dictates of chance, or perhaps be the humble dupes of empiricism.

From the careful attention to circumstances, caries

will be found not so much the effect of chance as is generally imagined; it appears almost universally to be an organic mischief, implanted during the formation of the teeth. We have shewn that each tooth is at first a soft, gelatinous mass, very vascular, and of course partakes of all the diseases under which the constitution may at that time labour; so that it is reasonable to suppose, if the functions of the vessels should be deranged or impeded during the progress of ossification, such teeth will prove carious; the formation of the bony substance may likewise be deranged by pressure, from their very crowded state; for we have seen, that just before any of the temporary teeth are shed, there are no less than from forty-eight to fifty-two teeth formed, or forming.

By admitting what possesses so high a degree of probability, next to demonstration, viz. *that the foundation of caries is generally laid during the formation of the teeth*, we can account for all the various appearances of them for which no other satisfactory reason can be assigned; thus we seldom see the temporary teeth carious or irregular; these were principally formed before the birth, or very early in infancy, when the child is generally in best health, and supported by the most simple and wholesome aliment, and the parts soft, so as readily to yield them their proper situation. When we perceive a decay on a permanent tooth, for instance, a first grinder, the first grinder on the other side, in the same jaw, is almost always de-

cayed likewise, or proves to be so in a short time; we have shewn that the teeth are formed in *pairs*, and whatever constitutional injury one may sustain, the other will most probably partake of. Sometimes one pair of teeth will be completely decayed, whilst the next are perfectly sound; during the forming of the decayed teeth, some disease might have existed in the system which the constitution had recovered before forming the others, or *vice versa*. We often see the four front upper teeth decayed, but seldom meet with a decayed front lower tooth; we observe the upper teeth are much larger in proportion to those they succeed than the lower, and are therefore more closely pressed together, and, from their size, cannot pass behind one-another, which the under teeth, by being small and narrow, more readily do, so as sometimes to stand directly behind each other, forming a double row. The upper *cuspidati*, or eye-teeth, are not so often decayed as the other front teeth; these are formed high above the roots of the others, and if they have occupied the room so that the *cuspidati* cannot descend into their proper place, they shoot out directly forwards, so that they are never exposed to much pressure. The *dentes sapientiæ* are observed to be very early subjects of decay; these are formed in very confined situations, both in the upper and lower jaw, and much pressed for room; and as a further proof that early pressure has a considerable influence in producing caries, we do not so frequently

meet with it where the teeth naturally stand at some little distance a-part, as in those whose teeth are quite close together.

From all these circumstances we may likewise infer, that the popular notion of one decayed tooth decaying others is false, and unsupported by experience; for as the *enamel* is not acted upon by any natural or vitiated secretion of the system, and while this continues unimpaired, the sound teeth cannot be influenced by the effluvia of caries; and notwithstanding, when one tooth decays, others do so too, which seems at first sight to countenance the idea, we have shewn, that however this may appear the result of chance, or some adventitious circumstance, yet caries of teeth is much more regular and uniform than is generally supposed, and is referable to more reasonable and efficient causes than is usually assigned, of which, among others equally erroneous, we may mention contagion, or one tooth rotting another as the most common: we do not mean to deny that one carious tooth has no influence on other teeth *already decayed*; on the contrary, they appear by the disagreeable and fœtid effluvia they emit, mutually to accelerate each other.

That the effluvia, fluid, or whatever it may be, which is generated by decaying teeth, has a power to decompose bony substances within its vicinity, is abundantly proved by the appearances of artificial teeth, which if they are placed contiguous to a decay

in a natural tooth, will become blackened, and soon a carious excavation will take place in them, corresponding to the carious cavity with which they are in contact; this will go on till the teeth are entirely rotten and unfit for use; yet in these the *enamel* is never decomposed, but only blackened; and as it loses the support of the bony substance, breaks away exactly like the natural teeth. So likewise the natural teeth which are artificially fixed to a root; if this root is decayed, a corresponding decay soon takes place in the ingrafted tooth, which proceeds gradually excavating the bony substance exactly as a decay does in a tooth which is firm in the head.

We have only treated of caries as arising from an improper state of the internal bony substance, and this is by far most generally the case; the enamel, however, is sometimes very imperfect; this may be traced to the same source as caries of the bony substance, viz. an improper deposit of it during its formation. If the membrane which secretes it become diseased, it will be proportionally injured; hence we have instances of the enamel being so defective and soft as to be worn off in a short time after the teeth come into use; when it is secreted in an irregular manner, we find furrows, or grooves, ragged edges and all the varieties of risings or depressions; in some points it is not deposited at all, this occasions small pits or pin-holes which often reach quite down to the bony substance, and in time a decay of such

teeth may be expected: we can also readily see the reason why the enamel is not so often defective in its quality as the bony substance; the enamel is a kind of chrysalization without any gelatinous or soft matter interposed amongst it; so that, however irregularly it may be deposited, if it is at rest only while it hardens, its structure will not be in the least affected; nor can it suffer from pressure, as the body of the tooth, on which only the enamel is laid, has attained its full size before it begins to be deposited, and which, as we have observed, is some time before the tooth appears through the gums.

In addition to the natural causes of decay, we may mention those of accident. These are generally blows, or inadvertently biting hard substances, which fracturing the enamel, exposes the bony substance of the tooth to the action of the air, saliva, &c. likewise by a blow or contusion, a tooth may be only loosened, but not broke; this will generally fasten again with proper care, but if the vessels are ruptured, blood will be effused into the cavity, and coagulating there, will render the tooth of a darker colour, which it will ever retain, as there is no means of removing the stagnant matter; this in time may produce a decomposition or decay of the internal substance of the tooth. I have extracted teeth in this state, for which no other probable cause could be assigned.

Many carious teeth date their decay from cracking nuts, or wantonly exposing them to great exertions; the

front teeth, particularly with ladies, suffer much from biting thread, &c. If the enamel is thin and brittle, the edges chip off, and become ragged and uneven, it will sometimes even crack through the whole length of the tooth, and a piece of the enamel is liable to come off on the slightest accident. If it is rather of a soft texture, such circumstances will not occur, but they will be worn in notches, and the handsome appearance of them entirely destroyed; when this is the case, they may be rendered even again by a proper application of a file, and care should be taken to avoid such accidents in future.

We shall now proceed to treat of caries in its effects, and the various remedies. The usual consequence of decay in teeth is the too well known pain of *tooth-ach*, and which frequently is only cured by extracting the offending tooth; as this is always an operation to which every one submits with reluctance, various palliative remedies have been proposed, but with so little success, that their inefficiency is universally regretted.

In making application to a decayed tooth, we should be careful to use nothing that will injure the others; the hollow, if possible, must be kept filled with cotton or lint, so as to exclude the air, which may be moistened with laudanum, oil of thyme, brandy, or any ardent spirits, or, which generally answers better, equal parts of brandy and laudanum. Pain in a tooth is mostly attended with inflammation

of the gums, and parts surrounding it; for this the patient may hold in the mouth a little æther, or camphorated spirit of wine; this will produce a considerable flow of saliva, or running of water from the mouth, and give considerable ease. If the gums are much swelled or tumified, discharging a little blood from them by a lancet will often give relief. Figs toasted, or boiled in milk, or boiled bread and milk, applied warm to the gums is very serviceable, especially if there is an appearance of a gum-boil, this method will hasten its maturity, when, if it does not break of itself, it may be easily opened, and the contents discharged, till which little cessation of pain will be obtained; but for this purpose, whichever of these applications is adopted, it should be constantly applied; as fast as it dissolves more should be taken. The figs toasted, and applied to the gums as warm as convenient, appears the best; indeed the effect of these, in either reducing inflammation, or bringing to maturity swelling and tumours of the gums, has often far exceeded expectation. The mouth, during the use of such remedies, should be kept perfectly clean, by frequently rinsing it with warm milk and water, or very weak brandy and water, as is most convenient.

Blisters behind the ears are often of great service in reducing the inflammation and pain, if attended with swelling of the face, &c.; but in the simple tooth-ach they do very little good, and though a safe application, are very sore and troublesome. If the pain is particularly violent in the night, the affected

side of the head should be fomented for about twenty minutes, previous to going to bed, with hot flannels wrung out of a decoction of chamomile flowers, with which a poppy head may be boiled; it must likewise be kept warm; but no application of plaisters or poultices to the *outside* of the cheek should be permitted; for if there is a disposition to form a gum-boil, or abscess, such methods will induce it to break externally; these external openings are long in healing, and when they do, they leave very unsightly scars which, in the face particularly, is an object of considerable attention. By some or other of these remedies, a fit of the tooth-ach may generally be overcome; but till the sensibility of the nerve in the cavity is entirely destroyed, either by patiently bearing long protracted pain, or progress of the decay, a perpetual recurrence of tooth-ach will be experienced upon any little exciting cause; such persons must be particular not to take cold or be wet in the feet, the head likewise should be kept moderately warm, and never exposed to a draft or current of air; a damp state of the atmosphere, and the prevalence of keen north-east winds, seem particularly unfriendly to the teeth.

Though caries or decay is the most frequent source of tooth-ach, pains in the teeth may be produced by other causes, particularly by sudden heat or cold; for from the compact structure of the teeth they are quick conductors of changes of temperature; and from their situation, are necessarily exposed to the extremes of heat and cold, conveying these sensations

suddenly to the vessels in the central cavity: cold water, air, &c. produce what is commonly termed a jar of the teeth, this generally soon passes off; but should peculiar irritability, or other circumstances concur, inflammation and pain will be implanted, which will extend to the *periosteum*, or membrane, that lines the socket, and the most diffusive kind of tooth-ach will be experienced, although the tooth itself is perfectly sound; in order to relieve this, the gum should be lanced in its *early* stage, which generally removes the symptoms; but should it have been neglected, matter, or an abscess will be formed at the root of the tooth, which will destroy the socket, and the tooth become loose; extracting it will then be the only remedy, which never fails to obtain a cure, for we thus discharge the offending matter, and the part soon heals.

From the teeth so keenly conveying the sensations of heat and cold, those who have carious teeth, or whose feelings are particularly delicate and liable to be affected in this way, should expose them as little as possible to such extremes; they should never use water quite cold in rinsing the mouth, but a little warm, which will answer every purpose better in cleaning the teeth, without its inconveniences; and on the other hand, liquids, such as tea, broth, soup, &c. should be taken moderately cool; by these simple methods, many severe fits of tooth-ach may be avoided, which otherwise are often induced to the great uneasiness of the patient.

Sometimes tooth-ach is only symptomatic of other complaints, it often proceeds from an improper state of the stomach or bowels, and when these are attended to, the tooth-ach generally subsides.

It is observed that ladies during pregnancy are particularly subject to the tooth-ach, if the tooth complained of appears sound, it should not be removed till every method has been tried to alleviate the pain; for under such circumstances, extracting the tooth often does but little good, as the pain shifts to another; if it is unsound, there can be no hesitation, but it should be removed immediately, as the pain of such teeth seldom subsides, and even should the tooth appear quite sound, if every other remedy has been ineffectually tried, and the pain is obstinately confined to one tooth; extracting of it may be recommended as a last resource, as it sometimes succeeds in obtaining ease. The principal objection to losing teeth during pregnancy is, that such tooth-ach often arises from a general irritable state of the system, and as soon as one tooth is removed, it fixes on another.

The very distressing and impatient nature of tooth-ach has given opportunity for the practice of the most glaring impositions, and not unfrequently attended by serious consequences. Notwithstanding the high encomiums bestowed on every remedy, which teems in our nostrum shops, and medicine warehouses, the most innocent of them are composed of similar ingredients to those we have mentioned, but these so frequently failing, have induced some unprincipled persons, and aban-

doned to every thing but avarice, to vend the most mischievous articles, among these the mineral acids hold a distinguished rank, in many of these nostrums, which, with the most unblushing effrontery, are protested to be *completely innocent*, the oil of vitriol, or spirit of salt, are so predominant as even to rot the cork in a short time; such *embrocations*, as they are termed, the patient is not only to introduce into the cavity of the tooth, but also to rub the gums and outside of the face with. It is not contended that the mineral acids are not useful in tooth-ach, but they act only as caustic on the nerve; and a drop or two applied by a steady hand directly in the hollow, but not suffered to extend to the adjacent parts, will sometimes give ease, but in the diffusive manner, such nostrums are generally used, a most severe inflammation is often created, which increases the raging of the tooth-ach to distraction. I have frequently seen the texture of the gums and inside of the cheek near the tooth entirely destroyed, and hanging in shreds; and even in this tender and painful state, have, at the pressing intreaty of the patient, removed the tooth, as the only means of relief. In addition to the present evil, its chemical action on the other teeth often lays the foundation for future mischief in them; the instances are numerous, where, from a frequent use of such nostrums, many of the teeth have been entirely lost in a short time.

Other daring empirics, who superintend the operation themselves, trust entirely to the strong narcotics.

These are generally applied either in the form of smoke, or oil; in the former way by a peculiar apparatus, they contrive to convey into the mouth the fumes from burning henbane, or other substances, whose narcotic principles will ascend into smoke.* In the latter, the oil of tobacco is generally used, and applied to the hollow of the tooth; in either way the effects are the same, the tooth-ach is perhaps for a time relieved, and said to be cured. These narcotic remedies are certainly free from the objection to caustic applications, but their effects on the system are more extensive and deleterious; they produce in many, all the symptoms of violent intoxication; cold sweats, and fainting for hours, succeeded by violent head-ach, are a very common consequence; sometimes even convulsions will be induced, and the patient with difficulty snatched from the jaws of death. I have extracted teeth to which these *infallible specifics* had been applied, from persons whose constitutions suffered such a shock, that nature perhaps will never recover; however, as narcotic fumigation will frequently relieve the tooth-ach, it may be tried without any disagreeable effects, by putting some lighted

* We cannot help remarking a curious imposition, frequently practised on the credulous patient; by blowing in the smoke, a few of the henbane seeds, or fine dust, pass along with it, and on the patient's spitting them out, he is gravely assured "they are the worms which gave him the pain!" It is one grand art of a quack to avail himself of popular prejudice to his own pecuniary advantage, without regard to rectitude. This absurd notion of worms in the teeth can scarcely be noticed with seriousness.

tobacco into a pipe, the small end should be placed as near to the affected tooth as possible, when a person applying his mouth to the bowl, should by gently blowing, cause a stream of air to pass into the hollow of the tooth, if the patient has not been used to smoking, he should be careful not to take any of it into the stomach by swallowing the saliva; he should likewise breathe through his nose during the application; with these precautions no deleterious effects will be produced, or at most, only a slight dizziness, which will soon pass off.

Electricity is frequently recommended in tooth-ach; for this purpose a small electrical shock or a spark is passed through the tooth by an instrument contrived for that purpose; but the remedy, though it sometimes succeeds, is by no means certain, and the pain it produces is said to be equal to extracting the tooth, and is therefore seldom repeated.

It would be endless to enumerate all the applications for tooth-ach; every one knows of something which one time or other has proved successful in relieving the pain, and provided they are not of a nature to injure other teeth, they may be tried, as it will at least prolong time, and give the pain a chance of, as it were, wearing itself out.

The influence of the imagination on tooth-ach has been remarked by every one; innumerable charms have been recommended, and often succeed for a time; but the most common is that of the dentist's house, or instruments; this is so generally the case that a dentist

seldom extracts a painful tooth. I knew a woman, who, having a very violent tooth-ach, ran fifteen times in one day to have it extracted, and every time she came to the house, the pain instantly vanished, and returned on her going home. With some more fortunate it has been frightened entirely away for years. It is likewise a remarkable circumstance which sometimes occurs in carious teeth, that the application of *cold* water gives instant ease, and, as the water becomes warm, the pain returns with redoubled violence; we have constantly observed when teeth are in this state, other applications produce no good effect, and it is very rare that the pain ever subsides till the tooth is removed.

Attempts have frequently been made to exterminate the nerve by burning it with a hot wire: this, to produce the desired effect, must be pushed to such an extent as totally to obliterate the nerve from the cavity, otherwise it will do no good; and in doing this, such severe pain is sometimes induced, as even to be attended with temporary insanity, and therefore cannot with any propriety be recommended; extraction is far preferable to such an operation.

To those who value appearance, articulation, &c. the front teeth are an exception; decay in either of the six front teeth is not usually attended with the severe pain as in others, and even where they are painful, they should not be permitted to be drawn, while the roots are firm in the sockets; for if rendered unserviceable or disagreeable by decay, a dentist will take

the remaining part off close to the gums, and by introducing proper instruments, the nerve may be completely destroyed, thus preventing the recurrence of tooth-ach as completely as if the root was extracted, and by a particular contrivance, an artificial, or the crown of a natural tooth may be attached to it, answering all the purposes of appearance and articulation equally well as the natural one.

If a decay is discovered before it has produced pain, or if even pain has been experienced, and we have been so fortunate as to overcome the sensibility of the nerve, so as it will bear a sufficient pressure; such cavities should be completely filled up with gold leaf; this operation, termed stopping, if properly performed, will, by preventing the access of air, and extraneous substances, generally prevent any further decay or pain; but even if caries does proceed, it is much slower; and by introducing fresh leaf as the other sinks down, such teeth never occasion any pain. From the insensible manner in which caries often proceeds, it frequently happens this operation is too long deferred; it is useless to do it while the tooth is in a tender painful state, for if it is submitted to, the stopping from the irritation it occasions must soon be removed: indeed stopping a tooth should rather be considered a preventative than cure; and in this view it is the most satisfactory operation which falls within the province of a dentist, but to secure its desired effect, it should be done early, as soon as a sufficient cavity is discovered to retain it.

It is much to be regretted that we have not attained any satisfactory practice in the treatment of tooth-ach, and from the nature of circumstances, it is to be feared, never shall; sometimes the decay is so inaccessiblely situated, that it is not known to exist but by the symptoms, till the tooth is taken out. At all times there is a difficulty of retaining any thing to the affected part, and from the saliva soon dissolving it, nothing should be applied that will prove injurious, if taken into the stomach; so that the remedies in tooth-ach are necessarily reduced to innoxious stimuli held in the mouth from time to time, as a temporary alleviation of pain.

We have yet only treated of the effect of caries while confined to the affected tooth, and of the remedies, except that of extracting the tooth, we have chiefly witnessed only their inefficacy. The influence of carious teeth is often very extensive; not only the face and parts adjacent, particularly the eyes and ears, but the whole head, neck, shoulders, and even the arms, the whole system becomes disordered by want of rest, and the patient is reduced to a very miserable state; indeed the severe and extensive effects of carious teeth is truly astonishing; and was it not confirmed by numerous incontestible instances, many of them would be almost incredible, the symptoms are so remote, and so often clearly designate some other disease, that not only the patient, but also the medical attendant has not suspected the real cause for a considerable time; such instances are repeatedly recorded; and

every person of the least considerable practice must have met with them. As these pages are intended for popular information, a precise delineation of cases will not be necessary, but it may be proper to select a few instances of the effects of carious teeth, in order that persons in general may be led to suspect the source of disease, which, in numerous individuals, would prevent the protracted pain they experience from want of knowing the true cause of complaint.

Instance 1st. A young man complained of a large swelling at the right side of the neck under the jaw, with a particular tenderness of one of the large grinders nearly over it; the tooth did not exhibit any external mark of decay, although rather loose; on this account practitioners had frequently refused to extract it, but having met with similar deceptions, at his request, I did not hesitate to do it; on its being removed, a decay was discovered on the side of the tooth, and to the outer side of the root was attached a long firm fleshy substance, a considerable discharge of blood and matter followed, the swelling of the neck subsided, and a cure was soon obtained. This complaint had been variously treated a long time before the true cause was suspected; indeed it is not uncommon for such swellings to be attributed to scrofula; but if there is a suspicious tooth near, feeling sore and tender, or rather loose, or in any way the least connected with the swelling, such tooth should be removed, as being the probable cause.

Instance 2d. Rheumatic pains had been complained

of for some years by a lady, and numerous remedies applied without any effect, but on removing several stumps, the remains of decayed teeth, which it was not recollected had ever given any uneasiness during their decay, the symptoms vanished, and the pains never returned. Such instances as these are numerous; the roots of decayed teeth are often the source of much distress; but they appear so little connected with the general complaint, that it is frequently with the greatest reluctance persons will submit to their removal; sometimes out of a number of stumps, the pain will seem to lodge in *one*, but it is never of much use to remove one without the rest, and when this is properly done, we seldom fail to give relief. This observation of removing the *whole of the stumps*, is equally applicable to carious teeth; where there are several of them, the pain may appear fixed to *one*, yet on its removal, it generally shifts to another, though it is on the opposite side of the mouth, and we seldom succeed in giving complete ease till the whole of them at various times are removed.

Instance 3d. A person complained of seemingly violent spasms in the head, which instantly deprived her of sense and motion, and she fell down lifeless for some time; she had been subject to these fits I think for two or three years, but of late they were become very frequent, no pain succeeded them, nor were they preceded by any symptom, except a trifling pain which darted into one of the third grinders (*dentes sapientiae*) which was decayed; nor did she know

what tooth-ach was; having seen many instances of the most astonishing effect of caries in these teeth, I recommended the tooth to be extracted, and on my removing it, she expressed "that it seemed to pull up the root of the complaint;" nor have I heard of any return.

Instance 4th. I have twice extracted teeth when the most severe pain was in the elbow; in both instances it was one of the large molares of the under jaw; and in both the pain of the elbow vanished on removing the teeth. These few instances, out of numberless others, are sufficient to shew the great and extensive effects of carious teeth. In general we may remark, that caries of the upper grinders affect the upper part of the head, and of the lower, the ears, neck, and shoulders. Stumps appear to induce pain similar to rheumatism; and caries in the front upper teeth often occasion swelling under the eyes, and even partial blindness, from excess of pain.

Next to caries, tartar commands attention. When a term has once attained common currency, however vague, inconsistent, or scientifically improper it may be, to propose an alteration would induce confusion, and the absurdity must be continued. This is the fate of the term *tartar*, which, in science and commerce, means an acid vegetable salt, deposited in wine-casks, &c.; but when speaking of the teeth, its signification is very different: by *tartar*, then, we are to understand that *calcareous crust or stony substance which concretes on the teeth.*

Tartar is a natural production secreted from the salivary glands, and is brought into the mouth with the saliva; it exists in all persons, though in different degrees; in some constitutions the saliva seems supersaturated with it, and having more than it can hold in solution, the excess is deposited in the mouth, at first in a soft mucus state, which by degrees becomes extremely hard. As the mouth is, as it were, frequently wiped and washed by the food necessarily taken, the tartar cannot accumulate, but is soon removed; except on those parts of the teeth not exposed to action during mastication, where if it is permitted to make an undisturbed deposit, by constantly accumulating fresh matter, it sometimes attains an enormous bulk, (see plate 4.) The principal constituent of tartar appears to be the same as bone, viz. phosphate of lime, but without any gelatinous substance interposed; yet, unlike bone, it never possesses any organic properties, or arrangements, but is as a soft cement or sediment, which hardens as chance had left it, without assuming any form of utility.

Tartar cannot be considered a disease, but as it is the cause of many, its progress should be particularly understood, and we daily find the most happy effects result from its timely and proper removal.

The colour of tartar is various, frequently of a pale yellow, little differing from the teeth; in others it is brown, and in some, particularly those accustomed to smoaking, it is a complete black. The difference in colour is but of little consequence, except that the

pale yellow is generally the softest. The tartar at first attaches itself to the teeth in a soft state, and may with ease be brushed off; but if permitted to harden, it becomes almost like stone; it continues to increase by fresh accession of calcareous matter, insinuating between the teeth and gums, detaching them from the teeth, and by being thus removed from their natural situation, they become diseased, and instead of being compact, firm, and not very sensible, they are flabby, relaxed, and exquisitely tender; and their vessels are so extremely weak as to bleed on the slightest touch. Though the gums recede from the outer and inner side of the teeth, yet, between them they grow much higher than they naturally should, shooting up in very disagreeable and unsightly pyramidical points. They likewise lose their natural colour, and from being a fine pale vermilion, they become purple, and sometimes almost black: in this state, they are very unpleasant, and occasion a breath of the most fœtid kind; the saliva partakes of the fœtor of the gums, and this being constantly applied to the palate, it becomes vitiated, and the natural taste destroyed.

If the tartar is still permitted to accumulate, the gums are at last entirely destroyed from around the roots of the teeth, it then descends between them and the sockets, causing, as it advances, their obliteration; the teeth of course become loose, and ultimately fall out, or, from their unsteady state, are so inconvenient as to render it necessary to extract them.

It unfortunately happens that the accumulation of tartar is imperceptible, occasioning no pain, nor for a long time any inconvenience, so that it is often permitted to lay the foundation of irreparable mischief before it is attended to. When the gums are tender, and frequently bleed, it is called *scurvy*, and when the teeth become loose, the *scurvy* is said to have rotted them out; but ninety-nine times in a hundred, the *scurvy* has nothing to do with it; indeed why should we expect to find *scurvy* in the gums when the constitution shows no symptom of it? and we have no good reason to believe that the *scurvy* has a particular determination to the mouth.

When the scorbutic appearance of the gums proceeds from tartar, which we observe it generally does, all the antiscorbutic applications will be of no use; they may indeed produce temporary benefit, but the swelling and bleeding of the gums will soon return, and increase, till either the tartar is removed, or the teeth fall out. Sometimes indeed the teeth will become loose when no particular accumulation of tartar or disease of the gums can be detected, and the general state of health is good; this appears to proceed entirely from an absorption or loss of the socket. This disease has not been satisfactorily accounted for, and no specific remedy has been discovered to arrest its progress; it never produces any serious mischief, but ultimately the tooth becomes so loose from the loss of its socket, that the irritation it occasions by its unsteady state renders its removal necessary. It may

be remarked this disease seldom exists early in life ; in general, after forty-five or fifty years of age ; but where tartar really exists, delicacy and propriety of appearance, if there was no other reasons, would induce persons to get rid of this disagreeable concretion ; for from being considerably porous it retains the juices of the mouth, which stagnating, become extremely offensive, and adds to the fœtid effluvia of the gums ; and when besides this we see, that if suffered to continue, it removes the teeth, we cannot hesitate strongly to recommend an early attention to it.

Before the teeth are loosened, the tartar may readily be taken off ; this is termed *scaling* the teeth. In favour of this operation, we may observe, the tartar never produces a caries of the teeth ; but whenever it can with propriety be removed, we shall always find them perfectly sound ; this cannot however be done when they are very loose, or if cemented together by it, for when removed, the teeth will soon fall out of themselves, if not by the operation, but when performed under favourable circumstances, the gums will regain their natural situation and appearance, and be restored to a state of health.

The extent to which this substance will collect is astonishing. Instances are often seen of the molares, or large grinders being so completely enveloped, that one tooth cannot be distinguished from another, and in the lower front teeth, it often far exceeds the bulk of the teeth themselves, and extends on the inside so far under the tongue as even to impede the speech.

The quantity of tartar, however, does not appear to be of much consequence, but its mischievous effects are produced in proportion to the *depth* it has insinuated; for if a thin lamela of it has descended between the tooth and socket, it produces an obliteration of the socket, and loosening of the tooth, the same as ever so large a collection would do.

In complaints attended with loss of the sockets, from whatever cause it may proceed, it is often said that the *teeth grow longer*, but this is a mistake; for such teeth when extracted do not prove longer than usual; but from the sockets, and consequently the gums, going from them, and exposing their roots, they have the *appearance* of elongating, though not really so.

Besides the effects of tartar already mentioned, it sometimes produces peculiar actions on the salivary glands, which it seems to do by keeping up a constant irritation on the *ducts* or passages of the saliva, stimulating them to a perpetual discharge of their contents, so that the mouth is constantly full of water, and from its continually running, is taken into the stomach in large quantities, so as to induce sickness, indigestion, and other unpleasant symptoms, and the person is supposed to be under the influence of medicine, which is not the case; for, on removing the tartar, all these disagreeable circumstances gradually cease.

When the tartar is once completely removed, by a careful attention to cleaning the teeth with a brush and warm water, and, where necessary, a proper tooth

powder, we may generally prevent its future collection; though in some constitutions, the deposit of tartar is so rapid, that the teeth cannot be kept free from it, but by frequently scaling them; nor is there any objection to repeating this operation as often as necessary; for in doing it, the substance of the teeth should not be meddled with, but simply the extraneous matter taken off, and if nature has left the teeth brown, art should leave them so too.

The diseases induced by caries and tartar are by far the most frequent which fall within the notice of a dentist. There are many others to which the mouth is liable, but to describe them here would be foreign to the present intention.

From a review of this chapter, it is evident that cleanliness in the mouth is an object of primary attention, and should be particularly observed by every one who values a healthy state of the gums, an agreeable breath, or propriety of appearance. We may just observe, that there are some circumstances that particularly require the mouth to be attended to, especially ladies after confinement, or persons in general after recovery from fevers, or any fit of sickness, and more especially if mercurial preparations have been administered, as this medicine particularly affects the mouth; a judicious treatment of teeth at such times would save many which are unfortunately ruined for want of attention.

CHAPTER VIII.

OPERATIONS ON THE TEETH.

AS these pages are intended for popular information, we shall not give a surgical detail of the operations, but only a general description, so as to enable persons to form a tolerable idea of what is proper to be done, and what may reasonably be expected from the assistance of a dentist. Was this generally understood, his practice would be more satisfactory; for, from ignorance of the natural construction of the teeth, the most absurd expectations have been formed, and have opened a way for torrents of empiricism, which, by extravagant promises and flattery, has tended to confirm and increase the false ideas already entertained, and thus each reciprocally produces the other, till by experience the patient finds them false, and the whole practice of a dentist is hastily condemned as a cheat.

It should be recollected that the art of a dentist is as much subject to the laws of nature as any other

profession; and although much depends on experience and habitual dexterity, yet it is grossly unreasonable to expect performances little short of absolute miracles; such ideas can only be rectified by a general knowledge of the subject, and thus place the profession of a dentist on its proper basis in popular estimation.

In attending to the teeth, four general objects naturally present themselves: to rectify irregularities: when carious, if possible, to fill the cavity artificially; this is termed *stopping* the teeth: to remove the tartar, or other extraneous substances, by *scaling*: and when so far diseased that they cannot be any longer retained, to remove them by *extraction*.

We have already observed, that if sufficient room is made for the permanent teeth by a timely removal of the temporary, we should not often meet with irregularities of them; and if these irregularities are become confirmed, it is difficult, and often impossible, to correct them: if, however, the teeth are only one a little longer than another, or have ragged edges, this may easily be rectified by a proper application of the file; the edges of the front teeth are often very irregular, somewhat like a saw; these prominences should be filed down. At other times, by accident, as in biting thread, &c. the edges will be notched; these should likewise be taken out by filing, for, in either case, besides the unpleasant appearance, something by chance may catch hold of it, and if it is a brittle tooth, or somewhat decayed, the enamel will

be splintered, or even the tooth broken off; these are no uncommon cases.

By the decay of the internal substance of a tooth, the enamel is often broken so as to leave very sharp edges or points; these may easily be removed by a judicious application of the file; which, if suffered to continue, will produce inflammation and ulceration of the tongue, lips, or cheek; sometimes the effect of such sharp points is very extensive, inducing inflammation all over the mouth, and even down the throat, so that their removal is an object always early to be attended to.

The correcting of irregularities by the file should be cautiously recommended: for in injudicious hands it is the cause of much mischief, by exposing the bony substance, which should as much as possible be kept covered with the enamel as its preserver.

Stopping the teeth. When a tooth has a cavity produced by caries, which is not in a particular tender or painful state, we recommend such cavity to be filled with metallic leaf, such as gold or silver, the rotten and decayed particles should as much as possible be removed, and the metallic leaf pressed closely in, so as completely to exclude the access of air or moisture; this operation, as was observed, is one of the most satisfactory which falls within the province of a dentist; for we not only prevent such teeth from aching, but a tooth may be retained serviceable for many years, which otherwise would have been lost in a short time; and should the stopping be worn or pres-

sed down by mastication, so that the cavity is not full, it is easy to add more or replace the whole, as may be necessary. It likewise completely prevents the disagreeable effluvia which decaying teeth emit. For this operation to produce its full effect, it should be done as soon as a tooth is discovered to have a cavity sufficient to admit the stopping, because, if let alone too long, the cavity becomes large and shallow, by the edges breaking away, so that no application can be retained, and if it has reached the centre of the tooth, it is frequently so tender that it cannot be borne, and therefore must not be attempted, or we bring on tooth-ach; such teeth should be kept filled with cotton, dipped in spirits, or essential oil, as oil of thyme, &c.; and if the tenderness is overcome, which is sometimes the case, the proper stopping should be immediately introduced.

Scaling the teeth. This operation is not attended with any pain, and, as we have shewn, the accumulation of tartar is the cause of such extensive mischief, we cannot hesitate to remove it. Scaling the teeth has been brought into discredit by the improper manner in which it is often performed; but this can be no real objection to the operation itself. In removing the tartar, the teeth themselves should not be touched, but simply the extraneous substances taken off; and, if the teeth are *naturally* of a bad colour, they should be suffered to remain so; for by going further, we remove a part of the enamel; and though this will make them appear whiter at first, such teeth

will soon turn black, and often decay. Numerous are the instances of the finest teeth being ruined by this injudicious management.

From a general desire for the teeth to appear white, and from the attention necessary in accurately scaling them, a more expeditious method is often adopted, to remove the tartar, by solvents applied in the mouth; but as we have shewn that tartar is in its constituent property similar to bone, viz. a phosphate of lime, it is evident to demonstration nothing can be taken in the mouth which will dissolve the tartar, that will not equally injure the teeth. Such solvents no dentist of respectability will ever adopt; and when we consider that scaling, however often it may be necessary to repeat it, does not do the least injury to the teeth, it must indisputably appear the best method. Persons should not estimate the benefit obtained by the *quantity* of tartar removed, for we have observed it produces its mischief in respect to loosening the teeth in proportion to the depth to which it has penetrated, and therefore if a small quantity is deep seated below the gums, it is of equal importance to scale the teeth as if there was ever so much; and this is confirmed by our seeing teeth become loose, and fall out equally early, which have only a very thin crust of tartar on them as those which have much more.

Extracting the teeth. There are but few arrived to maturity who have not been under the necessity of submitting to this, as a last resource; and notwithstanding the care and attention in order to perform it

as easy as possible, both in improving the construction of instruments, and the dexterity of dentists, it still remains a very disagreeable and painful operation, yet we are happy to say that it is brought to such perfection, that to a skilful and expert operator, *one much accustomed to the practice*, a serious accident seldom or never happens, and in such hands the too frequently disagreeable consequences are generally avoided, and even many of these would not occur by a proper conduct on the part of the patient. When it is found necessary to remove a tooth, it should be submitted to as soon as possible, as every day makes it worse by its decaying further, and it is of course mor-
 liable to be broke; but we may remark that it is not proper to extract a tooth when the mouth is under the influence of mercury, as from the debilitated state of the gums there is generally a great effusion of blood, nor when there is a severe inflammation, or swelling of the gums and parts adjacent, for the tooth is not only more difficult to be removed, but the operation gives much more pain: this observation particularly applies where the inflammation proceeds from the application of hot or stimulating medicines in order to relieve the tooth-ach, for such inflammation generally goes off by discontinuing their use, and applying warm emollients to the gums; when these symptoms proceed from a permanent disease implanted in the gums or sockets, and will not yield to the usual remedies, the tooth must be extracted in order to obtain a cure, notwithstanding the tender state of the parts.

Patients sometimes express a timidity at losing a tooth, especially if they have conceived it to be the eye-tooth, on account of the danger attending it, from the connection these teeth are supposed to have with the eyes; but this is erroneous; long practice proves there is no danger in extracting any of the teeth; the *cuspidati*, or eye-teeth, certainly have a longer root than any other of the front teeth, and are a great support to them; it is from this cause, and not the danger of extracting them, that we would recommend these teeth to be retained as long as possible—for we observe, when they are gone, the *incisores* frequently lose their proper position, and become irregular: it is likewise generally supposed that the large teeth give more pain in removing than the small ones; but experience provesth is is far from being always the case; indeed the intensity of the pain does not appear to be in proportion to the force used, provided the tooth is removed with as little force as is absolutely necessary to the purpose. I recollect a remarkable instance of this in a man from whom I removed a small double tooth with very little exertion; he expressed excessive pain, which I in part attributed to timidity, as there did not appear any inflammation, or other cause, to occasion it; I however extracted a large grinder for him a few weeks afterwards—and though the tooth was removed at once, yet it required as much force as I had ever applied. I expected he would have been half dead after this, but, to my surprise, he assured me “it was but a flea-bite to the other;” the

intensity of pain, therefore, often depends on causes we are not able to explain.

When the patient has determined on the extraction of a tooth, a firm, prompt resolution will be found of infinite advantage, for procrastination at the moment it should be done, produces faintness, and a train of disagreeable sensations, which can only be prevented by contrary conduct; he should likewise be particular not to catch hold of the dentist's hand, or occasion any interruption at the moment of removing the tooth, for this not only prolongs the operation, but creates infinite more pain, and every disadvantage timidity can occasion: nor is it necessary the patient should be held by assistants, for we observe persons when confined make much greater exertions than when at liberty.

From a natural wish that the operation should be performed as quick as possible, persons often request the gums may not be lanced, and that the tooth be *pulled out instantly*; from ignorance, or compliance, this practice is too often adopted, to the irreparable injury of the patient. In some instances, to take a tooth out suddenly may no doubt succeed, and the rashness of the dentist is praised for dexterity, and he obtains credit for a knowledge of his business, when his practice proves him totally ignorant or unprincipled; and the few instances in which he obtains success by no means counterbalances the mischief produced in numerous others. In such hasty proceedings, we can never ascertain whether the gums

adhere strongly round the neck of the tooth, whether the sockets are strong, or the roots of the teeth particularly long or diverging. Should any or all of these circumstances be the case, by attempting to extract the tooth suddenly, either the tooth will be broke, or its extraction will be attended with extensive fracture of the sockets, not only of the tooth extracted, but extending to the neighbouring teeth, and even sometimes, if in the under jaw, a complete fracture of the jaw itself; and when the gums are not previously relieved from the tooth by the lancet, if they adhere strongly, a large portion is often torn away, and sometimes a strip of the cheek, leaving a wound which discharges much blood, and is tedious in healing; even under the most favourable circumstances, the gums are always left ragged and uneven, and much more tender than they otherwise would be. As lancing the gums certainly prevents all inconveniences of this kind, patients cannot with reason make any objection to its being done, especially as it gives so little pain as not to be mentioned. When the gums are completely relieved from the tooth, so that the instrument can be properly fixed, it is generally removed at once, but if it does not move readily, it is no discredit to a dentist to replace his instrument and try it in another direction; for, although teeth are almost always taken out at first, yet it is not in every instance proper, and to persist in it is often productive of bad consequences, which a prudent dentist will avoid by shifting his instrument as often as is necessary, in order to take advantage of every favourable circumstance, for it

does not require the great violence which is generally imagined, and too often applied in removing a tooth ; and if it does not give way by a moderate force in skilful hands, it must arise from some particular divergency of the root, pressure from other teeth, or some such circumstance, which should be attended to : on the whole we may observe, the most experienced dentist will remove a tooth with the best directed and least possible exertion. By these observations, in censuring haste and precipitancy, we do not mean to shelter *weakness* and *indecision* ; the conduct recommended is a *cautious firmness*, which is equally far from *rashness* or *timidity*.

For extracting teeth of the lower jaw, the patient is usually placed in an arm chair, with a back of a convenient height for the purpose, and the operator stands rather on his right side, but for teeth in the upper jaw, it is the common practice for the dentist to stand *behind* the patient ; for this purpose the patient is either set on the floor, or if in a chair, the operator is elevated by small steps to a proper height behind, so that the patient's head, when leaning back, rests on his knees ; this has certainly a very awkward and disagreeable appearance, and sometimes in timid minds excites much unnecessary alarm, for the position itself makes no difference to the operation, as every one will extract a tooth best in the way in which he has been most accustomed ; yet if the operator was to stand on the floor in the same situation as for the lower teeth, it would be far

more neat and pleasant, and we are convinced, from our constant practice, that every tooth may be extracted in this way equally well as in the former.

In extracting a tooth, some part of the *alveolar process*, or sockets, will sometimes be so closely united to the root, as unavoidably to come away with it; from this circumstance, dentists often lay under the disagreeable imputation of *breaking the jaw bone*, who never had such an accident; he is certainly blameable when the fracture is large, and extends to other teeth, if the patient submitted to the operation in a proper manner; but so far from its being of any bad consequence if a small part of the socket is removed, that it is of considerable advantage, for if the lancet has been properly applied, the gums will not be in the least torn, and they may be closed down so as completely to cover the opening, which is generally healed by the next day; so that it is desirable, if we could, at all times to remove a *proper* portion of the socket with the tooth; for if it is left firm and whole, it keeps the gums from closing till it is obliterated, which sometimes is several days, and in some instances a week, or even more, during which time the part is very tender, and liable to take cold in the opening.

We by no means intend to excuse dentists, who from negligence and inattention, are in the habit of breaking the socket, because, as we have shown, such fractures may produce much mischief, but only to induce patients to discriminate between a real injury

and the removal of a small part of the socket, which would have been absorbed in the course of nature, and which, by being brought away, in fact expedites the cure.

After a tooth is extracted, a person sometimes finds himself disappointed by the pain not ceasing immediately, and concludes that either the tooth was not the cause of his pain, or that it was not properly removed; neither of these may be the case, not only from the cause just mentioned, viz. the sockets being left standing complete, and keeping the gums open, thus occasioning a continuance of pain, but (and which is more frequent) if a long succession of pain has been experienced, and particularly if it has produced a general affection of the head, attended with nervous or rheumatic symptoms; on removing such teeth, the pain is often more severe than ever for five or ten minutes; and though the violence of this subsides, it does not entirely vanish for some time, and yet the operation may have been very properly performed. The quantity of blood discharged after extracting a tooth varies from different previous circumstances; if only simple tooth-ach has been experienced, it sometimes does not exceed a few drops; but where much inflammation exists, and the pain very generally affected the head, the vessels become relaxed and full of blood, so that on removing the tooth, they discharge freely; but this in the hands of an expert dentist is never dangerous, but, on the contrary, of great service—for the inflammation is thus speedily

reduced, and the parts soon heal: it is therefore a very bad practice immediately a tooth is out, to take brandy, or other ardent spirits or tinctures in the mouth, or to fill the opening with cotton, &c. with a view to stop the bleeding. I have seen many instances where, from this circumstance, the inflammation, and consequently pain, has long continued, to the great distress of the patient; when a tooth is out, and the bleeding subsided, nothing more is necessary than to rinse the mouth with luke-warm water, and keep the cold air from the mouth by tying an handkerchief over it; when at home, the patient may again rinse the mouth with weak brandy and water, as blood will perhaps discharge triflingly for some hours; but by the next day the orifice generally is nearly closed, and there is little danger of taking cold; if, however, the patient is obliged to be exposed immediately after the operation, a bit of lint or old rag moistened with diluted spirits, may be laid over the gums, taking care to remove it *completely* as soon as convenient; as if any stick in the opening, it will prevent the gums healing; for we have observed, that bad effects after extracting a tooth have generally proceeded from taking cold in the opening where the tooth had been, or from strong styptics; it is therefore the first object to prevent the access of cold, or any improper stimuli, and leaving nature to herself always insures the best success. Sucking the gums is likewise very improper; this is sometimes done inadvertently, from the habit of formerly sucking the tooth; this must be avoided,

or the gums will discharge too much blood. I have known this occur two or three days after the operation ; it should therefore be carefully attended to until the tongue is accustomed to the absence of the tooth.

When the body of a tooth is decayed off, and the root remain in the gums, it is termed a *stump*. Much apprehension is generally expressed at the thought of having stumps removed, on account of their being *punched* out ; no fear, however, need be entertained, as a dentist of experience will never use this instrument (the punch) so as to produce any mischief. In the hands of ignorance or temerity, it certainly has done much injury ; but this has entirely arisen from the incautious method of using it ; where a punch is once applied, the stump is soon out, if it is properly managed ; but from the inaccessible situation of some stumps, which often renders the proper application of the instrument impossible, and from the direct and sudden force necessarily used, which puts it out of the power of the operator to have a proper command of the operation ; it would be well if its use was entirely abandoned, as we may in every instance succeed in removing stumps in the same gradual manner as teeth, and by instruments nearly similar. It is true this method is not quite so expeditious, but the ease with which it is done to the patient, and the consequent satisfaction to the operator, amply repays a few moments of time. I speak from experience, and am so impressed with these sentiments, as now never to use a punch on any occasion.

The permanent teeth in *children* sometimes prove decayed almost immediately on their coming through the gums; these are generally the large grinders; and from the violence of the pain, extraction of these become necessary; this is always done with reluctance, as they will not have others to replace them; but when a proper degree of patience has been exercised, with the usual remedies in tooth-ach, if the decay does not stop, or the pain subside, extraction is the only resource; this is sometimes declined by the dentist, on account of the teeth having attained their full size, not only in the body, but in their roots, which are now as large as ever they will be, fearing, that in removing such large teeth, much risk is run of doing mischief to the jaw or parts adjacent; and at first sight, such apprehensions do not appear unfounded, but experience proves, that with a proper caution on the part of the operator, such teeth may be removed with as little danger as in adults, and indeed, from the yielding state of the sockets at this age, they come away with much less force than we could expect.

The pain in children is generally more severe for a few minutes after removing such teeth than in adults; but this always subsides, and in every instance I have seen, they always do well.

Before closing this chapter, we cannot help observing, there are some so very impatient under pain, that the moment a tooth begins to ach, they instantly run to have it out, and thus a number of teeth are successively sacrificed in a short time; this is a bad

practice: we would recommend that the *first* fit of tooth-ach be borne with patience, and permitted to pass off, by using the common palliative remedies; for sometimes the nerve becomes obliterated, and the tooth remains serviceable, though decayed; but should pain ever recur in it again, it may with propriety be removed, as this will show its sensibility is not destroyed, and that it will therefore be continually troublesome. We may likewise mention as a frequent impropriety, that of persons requesting a tooth to be extracted by candle-light; by such light the diseased tooth cannot be so readily distinguished, and unless the patient is very firm and steady, the dentist will be liable to make a mistake, and should it be much decayed, or require particular attention, he will see to take advantage of every favourable circumstance; so that day-light is far preferable, and should be adopted, if possible, on every occasion.

CHAPTER IX.

GENERAL MANAGEMENT OF THE TEETH.

THE grand art of retaining the teeth as long as their physical construction will permit is cleaning them so as to prevent the accumulation of extraneous matter, which ultimately rots the gums, destroys the sockets, and the teeth fall out. They should at least daily be cleaned with a brush and water; for this purpose the brush should be stiff, the bundles of hairs not standing close together, but at such a distance, and of such a length as to admit a considerable degree of elasticity when pressed on; the form of the brush is not material, but those tapering towards the point are best, as they reach more conveniently to the back teeth. As the long flat brushes cannot readily be applied to the inside of the mouth, particularly behind the front teeth, there are brushes constructed for this purpose, somewhat like a small rake; these are extremely handy, and the use of them should never be omitted with the other, which is too generally the case; their

effects in keeping the mouth sweet and pleasant is well known to all who adopt them, and will always be used by every one who values an agreeable breath.

When it can conveniently be had, the water should always be a little warm, for cold water is apt to jar the teeth, occasioning much pain, without doing any good; and where there are decayed teeth, it frequently occasions a fit of tooth-ach—besides, warm water is a more complete solvent than cold, and as the concretion deposited on the teeth is at first soft, it is more completely dissolved and removed.

Much depends on the manner of applying a tooth-brush: *violence should never be used*. This only abrades the gums, without any better cleaning the teeth; they should first be brushed gently across, then upwards and downwards, so as to make the hairs of the brush pass between them, which by a soft brush cannot be done. The inside brush should be used in the same way: if this practice is duly persisted in every morning, or morning and evening, other applications very often will be unnecessary; in some persons, however, particularly where there are decayed teeth, the food, &c. which collects round them soon becomes very foetid; such persons should rinse their mouth after every meal, for notwithstanding a disagreeable breath is frequently attributed to heat of the stomach, diseased lungs, or scurvy in the mouth; yet we generally find it arises from a foul state of the mouth, through negligence and inattention.

Tooth picks of gold, silver, or any hard substance, as

ivory, &c. should be avoided; the constant use of them, where there is at first but a small hollow, will rapidly excavate a tooth, and induce early pain, which perhaps, if it had been let alone, would never have taken place; and by their being forced in between the teeth, they press the gums from their natural situation, and expose the roots to the cold air, which frequently produces pain in perfectly sound teeth. The same objections will apply to pins, with the addition of their being a very improper metal. Tooth-picks are certainly very useful, and not to be altogether condemned; but a clean quill, or a single bundle of stiff hairs, fixed in a small ivory handle, are the best; these, as they grow soft by being kept in the mouth, where picking the teeth is become a habit, the amusement may be continued without doing mischief.

Although simply a brush and water will frequently answer every purpose, yet either from constitutional disposition, or former neglect, something more is required. The application generally preferred is a *tooth-powder*; but where there are decayed teeth that a brush cannot reach, or the teeth and gums so tender as not to bear its use, a proper tincture may be substituted, with great advantage, to rinse the mouth with thoroughly. A tooth powder in general should be simply some finely pulverized vegetable production, such as myrrh, or cinnamon, or, if the teeth are already brown, and the colour not much an object, or the gums tender, and bleed, bark in powder, or tincture, will be proper, applied on a tooth-brush if pos-

sible; but if too tender, a sponge, or fine old cloth, may be substituted.

The colour and exterior appearance of the teeth being generally considered an object of the first importance, has given opportunity for an inundation of ruinous nostrums, under the specious titles of tooth-powders, tinctures, or pastes, for cleaning, whitening, beautifying, strengthening, fastening, restoring, &c. &c. the teeth and gums; to which is often added, the epithets royal, imperial, &c. To enumerate these is unnecessary, and to describe their mischievous effects would be endless. They are all formed of similar ingredients, variously combined, but the active constituents are generally the same. From the well-known property of sulphuric acid (oil of vitriol) to whiten the teeth—this article is liberally distributed in the tinctures and pastes. In the tincture it is variously concealed by spirituous or aqueous infusions of spices, differently coloured and scented. In the form of paste it is generally combined with a gritty powder, such as pumice stone, with the addition of some other lighter powder, and brought to a proper consistence with honey, which is adding mischief to mischief, for honey, sugar, and all sweets, act very strongly on the teeth, without doing any good, even in appearance; and when once it affects the teeth so as to occasion pain, it induces a tooth-ach of a peculiarly severe and excruciating kind, of which we have numerous instances in confectioners, pastry-cooks, and those in the habit of eating sweetmeats, whose teeth are unavoidably much exposed to

the action of the peculiar corrosive acid which sugar contains.

As the mineral acids cannot be applied in the form of powder, corrosive salts are substituted, such as cream of tartar, alum, &c. with some gritty powder, as pumice stone, or even brick dust, finely pulverized, and intimately blended with others more bulky or coloured, as vehicles.

From what has been said on the structure of the teeth, the consequences of such ingredients will be readily apparent; we have shewn that teeth, as well as other bone, exposed to the action of acids, are decomposed, the enamel is *entirely* dissolved, and the bony substance rendered soft and gelatinous. The action of the acid, or acid salt, is much accelerated by the gritty powders, and brushing. These nostrums are frequently accompanied with directions to apply them, "till they have produced the desired effect." This they at first apparently do, for the parts most exposed to view are rendered white and clean; but after the enamel is once removed, which on some teeth is very thin, the bony substance is exposed to the air, moisture, &c. becomes black and decays, rendering the mouth unsightly and offensive, and as the front teeth are generally taken the most care of, that is, *are most brushed*, they are the first to feel its effects, and thus many are obliged to substitute artificial teeth, who otherwise would have had no occasion for them. It would therefore be much better, if persons cannot bring their teeth to a satisfactory

colour or appearance by the simple means above directed, to consult a respectable dentist, who will immediately suggest what ought to be done; for it often happens that the brown appearance of teeth is their natural colour, and they should not be meddled with; and to attempt to make such teeth white, as it cannot be done but by acid solvents, would be their certain ruin. Sometimes a natural depression, or furrow, is mistaken for decay, or something that should be brushed out, or removed; in endeavouring to do this, the enamel is abraded, and a tooth destroyed, which was perfectly sound, and would have continued so had it been let alone.

More generally the unpleasant state of the mouth arises from a collection of tartar; as this never can be properly removed by the person himself, it should be done by a dentist; this is termed scaling the teeth. When the tartar is once removed, a strict attention to cleaning the teeth, with any proper application their state requires, will mostly prevent its future collection; but if it should not, the operation may be repeated as often as is necessary, without the least injury to the teeth; but this substance and its effects were more particularly noticed when treating of Diseases of the Teeth, &c.

It perhaps may not be unacceptable briefly to notice the most common applications for cleaning the teeth, pointing out their advantages or defects. *Soot* is frequently recommended; this certainly possesses one good quality of a tooth-powder—that of producing a

very slight mechanical friction, but is in no respect superior to any common bitter powder, as bark, &c. and at the same time is more dirty, disagreeable, and indelicate. Soot has likewise attained celebrity, from the supposition that chimney sweepers, (whose teeth are constantly exposed to its action) have much whiter and better teeth than others; but this is not the case, for when extracted, they are not found generally whiter than usual, and only appear so when in contrast with a black face, and which is the case with blacks and tawnies. *Charcoal*.—This of late has been a very popular tooth-powder when finely pulverized but does not deserve the high encomiums bestowed on it; when applied to the teeth it only acts mechanically by friction; that it is a fine grit, and will cut hard substances very fast, is known to all engaged in polishing metals, as it is constantly used by them to rub out file marks, scratches, &c. from gold, silver, brass, and other plates, which it does very expeditiously; for such purposes the softest smooth charcoal is preferred, as cutting much the fastest, being kept quite wet during its use; from which we conclude, its effects when applied to the teeth is only to polish them, and that at the expence of wearing away the enamel very fast; besides, when there is an incrustation of tartar, it is of little use to polish the exterior, and prominent parts of the teeth without removing this also, now the tartar being often of a spongy porous texture, and at all times much softer than the enamel, the charcoal will not act on it, for it is a well

known fact that an apparently soft impalpable powder which will cut the hardest substances with ease, will not act on soft ones, but only imbed itself in them; this every glass-cutter is sensible of; he can make a considerable cut on glass with many impalpable powders, whilst the *lead-wheel* by which it is applied is not worn down in many years. The *antiseptic* properties of charcoal as a dentifrice appears likewise to be much over-rated; how a substance so indestructible as charcoal can perform the miracles attributed to it, in curing scurvy and rottenness of the gums, and all the diseases to which, as organic bodies, they are subject, by occasionally using it with water is totally unaccountable. It unfortunately happens for charcoal, as a dentifrice, that it remains unaltered and entire, through the united efforts of air, sun, and water, for many ages; nor can a single particle of it be dissolved in water, or any liquid proper to be taken into the mouth, so that any pretended *solution* of it is the height of absurdity, and betrays the most consummate ignorance. Upon the whole, notwithstanding the valuable antiseptic properties of charcoal ascertained by philosophers, in its action on various inanimate substances, under favourable circumstances, the physical effects of *genuine* charcoal in the mouth, is by no means worthy the eulogiums bestowed on it; so sensible are charcoal tooth-powder manufacturers of this, that although it is the cheapest rubbish that can be put into boxes, they generally combine it with some more active in-

redient to produce in any apparent degree the promised effects. Persons who wish to try charcoal as a dentifrice-antiseptic, may readily do so, by pounding a piece of soft well burnt charcoal very fine, taking half a tea-spoonful of the powder, with a little warm water, and thoroughly agitating it in the mouth some minutes, taking care to rinse it all out afterwards, or it will lodge between the teeth and appear unpleasant, but the use of a brush, or any friction, should at all times be avoided, and thus we may have all its antiseptic benefits without wearing the teeth, or risk of acrid adulteration. *Burnt crust* is a charcoal of wheat or flour, and is not materially different from other charcoal. *Gunpowder*.—This produces no effect but from the charcoal and nitre it contains; the latter is in so small a quantity, as to be totally insignificant. *Allum* is a most mischievous application to the teeth; this salt is a produce of oil of vitriol and clay, (a sulphate of alumine); it is a very strong styptic, but on coming in contact with the teeth, is immediately decomposed, the acid uniting with the teeth, and producing all the effect of oil of vitriol. *Salt*.—Common table salt is perfectly innocent; as it completely dissolves, it does not produce any effect by friction, nor does it appear to be particularly serviceable; when any saline substance is required, it is far inferior to nitre. *Nitre*, or salt-petre, is a valuable saline application in an inflamed state of the gums, and removes the tough viscid slime which in many persons collects over the mouth and teeth; indeed it is well

known as a useful gargle, and as it does not act on the teeth, it may be freely used where necessary. *Cream of tartar.*—This salt acts on the enamel, and produces very disagreeable tooth-edge; its use is therefore improper, but from its effects in whitening the teeth it is frequently recommended.

The virtues of some applications appear to reside only in their nauseous qualities, as a mixture of *soot* and *salt, soap, &c.* In a dentifrice we should expect neatness and delicacy; on the contrary, nothing has been thought too disagreeable or disgusting to be adopted; it will be needless to mention more—the above are a specimen of those in general use. On the whole, it is much better to trust to regular cleanliness by brush and water; in this no harm can be done; and if any thing more be necessary, it should be applied under the direction of a person acquainted with the nature and structure of the teeth, and of what he recommends.

CHAPTER X.

ARTIFICIAL TEETH.

THE derangement of the features, defect of articulation, and general deformity of the countenance, &c. consequent on the loss of the natural teeth, are inconveniences, to obviate which must always be a desirable object; and much labour has been exercised, and ingenuity displayed, for this purpose, in constructing *artificial teeth*, which are now brought to great simplicity and perfection; but notwithstanding the excellence to which dentists have arrived in constructing these useful articles, candour obliges us to say they do not answer the extravagant descriptions of them too frequently obtruded on the public, and which can only be done with a view of puffing them off. This is unnecessary, as their utility is sufficiently established, and their success must depend entirely on the dexterity of the dentist in properly adapting them to the place required.

In recommending artificial teeth, two objects naturally present themselves; to rectify the deformity which absence of teeth produces in exterior appearance, and to restore the natural articulation; both of which may be completely and satisfactorily obtained, and even mastication may be performed in a considerable degree, when accustomed to using them.

When either or all of the six front teeth are decayed and painful, or so unsightly as to render their presence disagreeable, they should by no means be extracted, for by filing them off close to the gums, an artificial, or, which is far preferable, natural teeth, may be fixed to the roots—in doing this, the natural canal in the root is enlarged, and the nerve of course destroyed, so that after the teeth are properly settled; no tooth-ach can ever occur, nor is the operation itself attended with the pain generally supposed; frequently it does not occasion any at all; for we observe, that the bony substance of teeth has no nerves, consequently no feeling; therefore filing it gives no real pain, only a trifling kind of jar, which soon passes off. Whenever, therefore, this method of fixing teeth can be adopted, it is far preferable to any other, and should always be recommended; for, as long as the roots remain firm, which is often many years, we can renew them at any time without the least inconvenience, as they are independent on any other teeth; they may likewise be fitted to such a nicety, as it is impossible to detect them, even on a minute examination; add to this their firmness, for if the root is

sound, they will answer every purpose almost equally well as the former natural teeth, whose place they occupy ; and indeed, so superior in every respect are teeth placed in this manner to any other, that it can be only from inability to adapt them properly, that any other are recommended where it is possible to apply these.

When the roots are unfortunately lost, or so unsound as not to permit teeth to be fixed to them, the number required are constructed in one solid piece, (or, which is still more elegant, *natural* teeth, to the number required, may be artificially fixed to a false gum, or bed of bone, and if necessary to be particularly thin and delicate, the bed may be of gold or silver), so as completely to fill the vacancy between any two contiguous teeth, which are firm in their places, and to these it is attached by fine silk, or gold springs, as circumstances may render proper. Much has been said against this mode of fixing teeth, on account of loosening those to which they are tied ; the fault, however, generally is in the artificial piece not being accurately fitted to the part, for if it is too large, it presses the teeth out of their natural situation, and if too small, by tying them they are made to approximate towards each other ; in either case, looseness of such teeth will be produced : but where they are very nicely adapted, such inconveniences will not occur, at least for many years : but this must entirely depend on the abilities of the dentist, com-

bined with the after attention of the wearer to strict cleanliness in the mouth. I attend several who, by following these directions, have now worn a considerable number of artificial teeth, several years, without the least variation of the natural teeth to which they are attached.

It would indeed be a desirable attainment if there were any other method of retaining artificial teeth superior to that of attaching them to the contiguous natural ones—but there is not; and from the nature of circumstances, it appears there never can be; so that however the public may be alarmed with the mischiefs of tying in teeth, in order to induce them to adopt some *improved method*, such improvement is only substituting *springs* for *strings*; either way, the artificial teeth are equally retained by being attached to the contiguous natural teeth, which is the grand objection; such evasions are quack sophistry, which no person who values a liberal or ingenuous character would descend to, especially as the contrivance is old, and has long been used by experienced dentists, when circumstances rendered it preferable.

When the whole of the upper teeth are gone, so as to require a complete row, without any to fasten them to, if the artificial piece is very accurately fitted, so as to accommodate every rising and depression of the gums, persons often wear such a row by its adhesion to the gums, which it will form in a very considerable degree, when by use it is thoroughly moist, and the surface of contact rendered complete, and as it were

assimilated to them; but when this cannot be attained, which, from the form of many mouths, it cannot, it may be supported in its place by proper springs, which are attached at one end to the row of artificial teeth, while at the other end they are constructed so as to bear on the teeth or gums of the under jaw; this contrivance keeps the upper teeth in their place, and at the same time allows of every motion of the mouth. On the same principle is fixed an upper and lower row, or a complete set. These certainly feel very awkward at the first, indeed so much so, that it is not at all uncommon for persons to suppose they shall never be able to wear them, but in nothing is the effect of habit more apparent than in this particular, for by persisting in their use, relieving them where they appear to press too hard, and using cooling and emollient applications to the gums, such as roasted figs, and rinsing the mouth with warm water, or, solution of nitre, &c. the inconveniences gradually vanish, the gums become hard, compact, and insensible; and they are at length perfectly pleasant and satisfactory, so that a person who a few months before could scarcely bear their use, cannot now do without them; for not only the appearance, but the articulation is also deranged, and which can only be restored by their being replaced. When the lower teeth only are wanting they do not require any fastening, as they rest on their own proper base: a whole row or a complete set may likewise be furnished with natural teeth, engrafted on

the artificial bed or socket, equally well, as mentioned before for a smaller number. These are the usual methods of adapting artificial teeth; but an ingenious dentist will take advantage of every circumstance in order to insure success, though perhaps out of the ordinary course.

The substance of which artificial teeth are generally made, is the large curved tooth or tusk of the hippopotamus, commonly called the sea-horse; and as this is the only part of the animal usually imported, it is pre-eminently termed *sea-horse bone*; this bone is preferred on account of its great solidity, whiteness, and durability, in all which it far exceeds ivory, or any bony substance of a large size with which we are acquainted, and especially for the enamel which naturally covers great part of it, and which is so advantageous in forming the front teeth, where particular delicacy or elegance is required. Although many other substances both of natural and artificial production have been adopted for the construction of artificial teeth, none appear to stand the test of experience so well as the bone of this particular tooth, which, from the great request in which it is held for this purpose, and from its being seldom used in articles of general manufacture, it is often with difficulty procured in the necessary perfection.

The animal which furnishes these remarkable tusks is amphibious, a native of the warm climates of Africa; we have heard several instances of its extraordinary prowess and sagacity from eye witnesses,

and indeed had procured some descriptive particulars respecting this wonderful animal, but as being more generally informing, and, we presume, not ungratifying to the curiosity of our readers, we take the liberty of extracting the following brief but correct description of it from Mr. Nicholson's British Encyclopædia, part 6, article "HIPPOPOTAMUS." "This animal appears very naturally to have attracted the early attention of mankind; and it is supposed by most critics acquainted with natural history, to be the Behemoth so sublimely described in the book of Job. The Greek and Roman writers have also alluded to it; but their observations upon it are by no means such as could have resulted from accurate and philosophical observations; and both Aristotle and Pliny have fallen, on this subject, into the most absurd deviation from truth. Indeed, it is only recently that clear and just representations of this animal have been published, with interesting circumstances relating to its manners and habits, collected by persons who had inclination and opportunities of particularly examining it. Dr. Sparman, and colonel Gordon, and Mr. Mason, are particularly entitled to honourable mention on this occasion. The largest female that the colonel ever had an opportunity of observing was eleven feet in length; and the largest male nearly twelve. It is stated, however, on respectable authority, that they are frequently much larger; Mr. Bruce reports that they are occasionally found even of the length of

twenty feet. The form of the hippopotamus is particularly awkward; its head is astonishingly large, and its body extremely flat and round; its legs are very short and thick, and its teeth are of vast strength and size; one of them is stated to weigh no less than three pounds; occasionally each of the tusks weighs even six: the whole animal is covered with short hair; its skin is so tough, as in some parts to resist a bullet; and its colour when dry is an obscure brown. It inhabits the warmer latitudes, and is to be found chiefly in the interior of Africa, dwelling in the largest rivers, in which it ranges at the bottom, sometimes reaching the surface for the purpose of respiration. It sometimes quits the rivers for the sea, merely, as is supposed, for the sake of expatiating with greater freedom, as it never drinks salt water, and eats no fish, and indeed takes no animal food whatever. By night it quits the water to feed, and devours a vast quantity of grass, and the tender branches of trees. Its disposition has nothing in it sanguinary or ferocious; it never attacks other animals. It frequently commits great depredations on the plantations of corn or sugar, which are within the reach of its nocturnal progresses, and by destroying with its vast teeth the roots of trees. Its motion on land is generally not only highly inelegant, but slow; yet, if surprised and pursued, it runs with great speed, till it reaches the water, into which it instantly plunges, and though it is able to swim with great rapidity, its progress in the water is at the bottom, by walking. If wounded in

the water, it sometimes is highly infuriated, and has been known to attack the boats or canoes which it supposed to contain its enemy, and overturn them by its vast strength, or sink them, by making a large hole in them with its teeth. It produces but one at a birth, generally in the little rushy isles of the rivers where it frequents; and in these inlets it generally sleeps. When taken young, it is capable of being tamed. These animals are sometimes seen in considerable numbers, ranging for several miles beyond the banks of their rivers. They are often shot by the Africans, and frequently taken by the harpoon; pitfalls are also sometimes dug for them. They are valued by the natives of Africa for food; and the fat which it supplies is supposed to be equal to that of the hog. The feet are highly gelatinous, and regarded as a particular delicacy. With their skins the warriors of Africa are furnished with shields and bucklers. The grand motive to destroy these animals, however, is the value of their tusks, which are whiter than those of the elephant, and retain their original clearness and beauty. They are likewise of a harder consistence, and are, on both these accounts, preferred by dentists, for artificial teeth, to every other substance."

Besides the various methods of supplying teeth artificially, it was once a very popular practice to substitute a complete tooth in the place required, but for this purpose, the root and socket of the diseased tooth must be perfectly firm; it is then effected by first completely extracting the tooth, in whose place we

wish another introduced, the tooth to be substituted is now extracted from a person previously provided for the purpose, and immediately transferred to its destined place, where it is fixed in its proper situation till it is firmly united to the socket; this operation is entirely confined to the six front teeth, these only having single roots.

The practice of transplanting teeth was first introduced by Mr. John Hunter, who supported it with his influence as long as it was morally or practically tenable; for in addition to the moral turpitude of disfiguring one person for the appearance of another, in many instances it did not succeed at all, and when it did, the transplanted tooth in general remained only a few years; from such circumstances, it gradually sunk into disuse, and is now, we hope, consigned to its merited oblivion; nor is its failure to be in the least regretted, for by placing a tooth on a stump with a pivot, as before described, we have every advantage of the best transplanted tooth, with the addition, that if any accident happens, we can renew it, without the least inconvenience, as long as the root remains, and when the roots are gone, or become so unsound as not to permit a tooth with a pivot to be again fixed to it, the number required can be furnished of artificial teeth, or of *natural* teeth, fixed to a bed, or false gum, and supported in the usual manner. Another false idea which has probably arisen from the practice of transplanting teeth, is that when a tooth has been recently fixed by a pivot to a root, if tooth-ach succeeds, the

gums swell, or a gum-boil is formed, the dentist is immediately suspected of having introduced a tooth of an improper description; these consequences by no means result from such a cause, and is merely occasioned by irritation produced on the nerve from the contact of the instruments used, and necessarily admitting the cold air into it, which though it may have given no pain at the time of fitting the tooth, will sometimes produce the effects described; when this is the case instead of removing the tooth it should be carefully retained, and the parts treated exactly as in any other case of cold taken in the teeth; the face may be fomented with chamomile flowers, toasted figs laid warm to the gums, and a leech applied on the swelled or most prominent part of the gums will be of infinite service, or the gums may be lanced; by these means the symptoms soon abate and all is perfectly well in a few days: if violence, which is at all times unnecessary and improper, has not been used in fitting the tooth these circumstances very rarely take place, except in irritable habits, and their occurrence, though painful for the time, is not much regretted, for the small remains of the nerve becomes now completely destroyed, the tooth settles firm in its place, completely excluding cold air or extraneous substances, and pain from such a root need never be apprehended in future.

On the whole, notwithstanding the few objections to which artificial teeth are liable, they need no eulogium to recommend them; they have stood the

test of experience many years, and their utility in restoring the natural pronunciation, symmetry of the features, and the whole exterior appearance, is universally admitted, and even their service in mastication is often very considerable and important, and the perfection to which they are now arrived, will insure their general approbation to those who are under the necessity of adopting them.

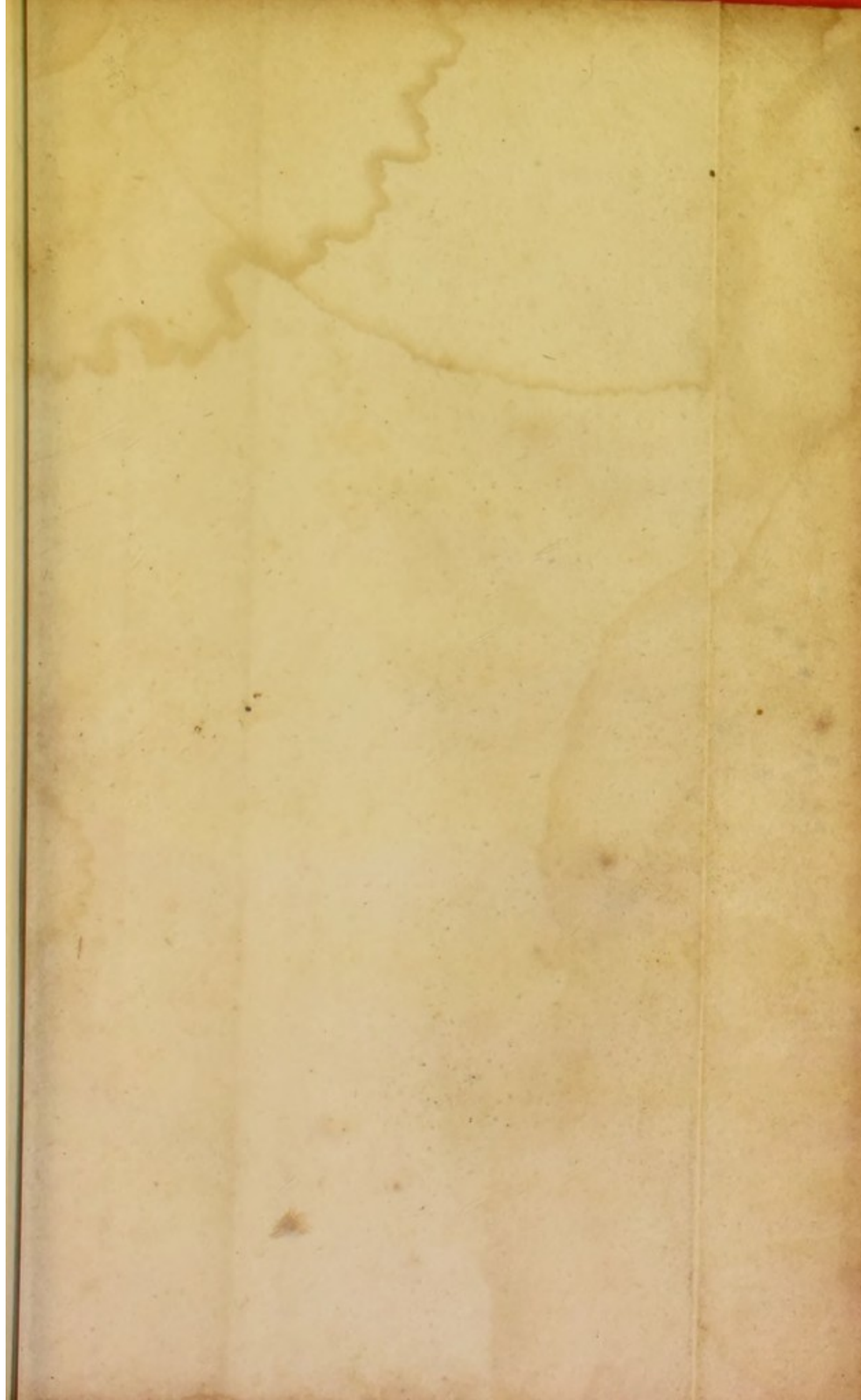
It is very commonly supposed, that a dentist can fix teeth in the place where others have come from, whether after they had been extracted, or had fallen out of themselves, from disease. This opinion perhaps had its origin from the operation of transplanting; but it is completely erroneous; it has been shewn that the sockets appeared to be dependent on the teeth, at least that they exist only a short time after they are gone, and the gum healed; so that if a dentist were even to perforate the gums, he could not re-create a socket; of course such an operation is naturally impossible, and there are no other methods of artificially supplying the loss of teeth but those we have generally mentioned.

Those who wear artificial teeth cannot be too attentive in keeping them perfectly clean, as they unavoidably collect tartar, particles of food, &c. which adhering to them, they become very disagreeable, unless frequently taken out, which is easily done, and cleaned with warm water and a hard brush, with some of the more active kind of tooth-powder, or a little cream of tartar, will answer very well; nor

should they be suffered to remain till the silk string breaks, as is too frequently the case, but taken out, if convenience permit, every day, or at least once a week; much advantage would be found in having two pieces or sets of teeth, for while the one was in use, the other might be properly cleaned and laid by, which would assist much to retain their colour, the disagreeable effluvia would go off, and they would be found much more pleasant in wearing. Attention should likewise be paid to the natural teeth which are remaining; for, by keeping them properly clean, and removing any extraneous substance that may collect on them, they will continue firm, and capable of supporting the artificial teeth much longer than where they are neglected. Those whose teeth are so awkwardly situated that they cannot replace their artificial teeth themselves, and are obliged to have recourse to their dentist, but which distance or other circumstance may prevent, so often as is necessary; in addition to the usual cleaning their teeth, should frequently, morning and evening at least, rinse their mouths with some aromatic or mild astringent tincture, as tincture of bark, cinnamon, or myrrh, sufficiently diluted with water, or such antiseptic application as their dentist may recommend; this method is highly useful, and were it more generally attended to, many teeth would be retained which drop out prematurely, merely from the disagreeable concretion collecting around them, producing disease and weakness of the gums, and destroying their sockets.

These observations do not apply to teeth artificially fixed by a pivot to a root, for these, if firmly fitted in their proper situation, do not expose a greater surface than the original natural tooth, and may be kept perfectly clean and pleasant in the usual way of brushing and cleaning the teeth in general.

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Drawn and Engraved by James Sayer



EXPLANATION
 OF THE
 ENGRAVINGS.

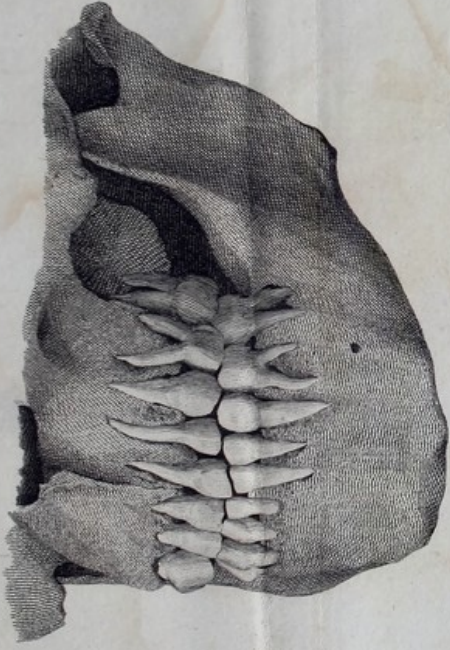
PLATE I.

THIS plate represents as many of a complete set of permanent teeth as can be distinctly shewn at one view, *a, a; a, a*, are the first or central *incisores*: *b, b; b, b*, are the lateral or second *incisores*, those in the upper jaw are frequently called the small *incisores*, from their being much less than the central: *c, c; c, c*, are the *cuspidati*, or canine teeth; those in the upper jaw are sometimes called the eye teeth, from a mistaken notion of their being connected with the eyes. These twelve constitute all the front teeth, and have generally but one root each.

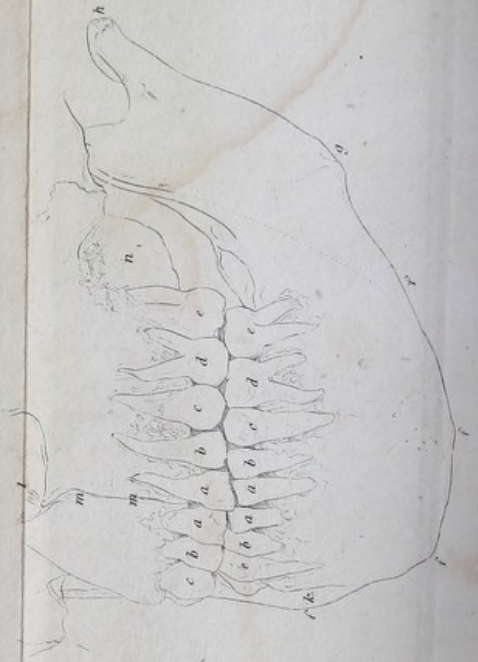
The teeth and parts on the other side of the mouth, which could not be shewn in this view, are of the

same description, and in the same order, as those delineated. *d, d,* are the first *bicuspides*, or small grinders. *e, e,* are the second *bicuspides*; *f, f,* are the first *molares*, or large grinders; *g, g,* are the second *molares*; *h, h,* are the third *molares*, or *dentes sapientiæ*. *i, i; i, i,* is the margin of the lower jaw the part at *k* is termed the angle of the jaw; from this it rises almost perpendicularly in a thin plate of bone, which terminates at its hinder part, *l,* in a knob or knuckle, termed the *condyloid process*, which is received into a depression in the temporal bone, immediately before the ear, forming a joint or hinge on which all the motions of the jaw are performed; at *m,* this plate of bone terminates in a sharp point termed the *coronoid process*, leaving a semi-lunar notch between it and the joint. It is to the point and sides of this plate of bone that the moving powers of the jaw, (the muscles) are fixed, in order to perform its various motions in mastication, &c. *n, n,* are the two openings through which the remainder of the blood-vessels and nerves are transmitted to the lips and cheek, after they have supplied the teeth and substance of the lower jaw. These vessels and nerves *enter* the jaw on its inside, on each side a little above the angle. *o,* is the opening of the nostrils; *p, p,* a line or *suture* where the bones of the upper jaw meet. This line always extends exactly from the centre of the nose to the space between the two central *incisores*.





Drawn and Engraved by James Peck.



In the preparation from which this figure was drawn, a partial absorption had taken place; so that it shews the manner in which the teeth are fixed in their respective sockets. It will be observed, that in the figure, the space between the two centre *incisores*, in the lower jaw, is not directly opposed to that in the upper; but this arises from the perspective view necessarily taken in order to shew the back teeth; but in a front view, in all well formed sets of teeth, the centre spaces are directly opposite each other; it will be likewise noticed that each tooth, on shutting the mouth, is reciprocally opposed to two others.

PLATE II.

Is a view of a complete set of temporary teeth. *a, a*; *a, a*, are the first, or central *incisores*, *b, b*; *b, b*, are the second, or lateral *incisores*; *c, c*; *c, c*, are the *cuspidati*, or canine teeth. These twelve teeth never have more than one root each. *d, d*, are the first grinders; *e, e*, are the second grinders; *f, f*; *f, f*, is the margin of the under jaw; *g* is its angle, which in the infantile state is more obtuse than in the adult. *h*, is the *condyle* or joint; *i*, is the *coronoid* process; *k, k*, are two openings for the transmission of the blood-vessels and nerves to the lip, &c. after they have supplied the teeth and sub-

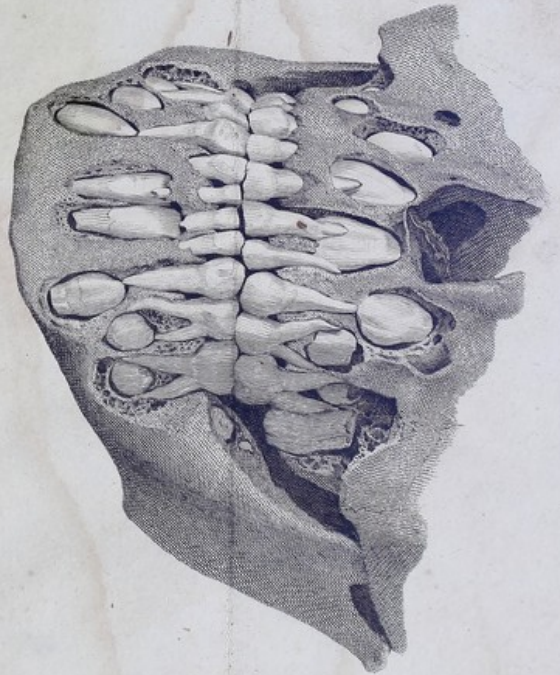
stance of the jaw. *l*, is the opening of the nostrils ; *m, m*, is the line, or *suture* where the bones of the upper jaw meet. At *n*, is a tuberosity in which are lodged the permanent grinders.

The subject from which this plate is taken was about six or seven years old ; a sufficient portion of the bone is removed, in order to shew the insertion of the roots into their respective sockets.

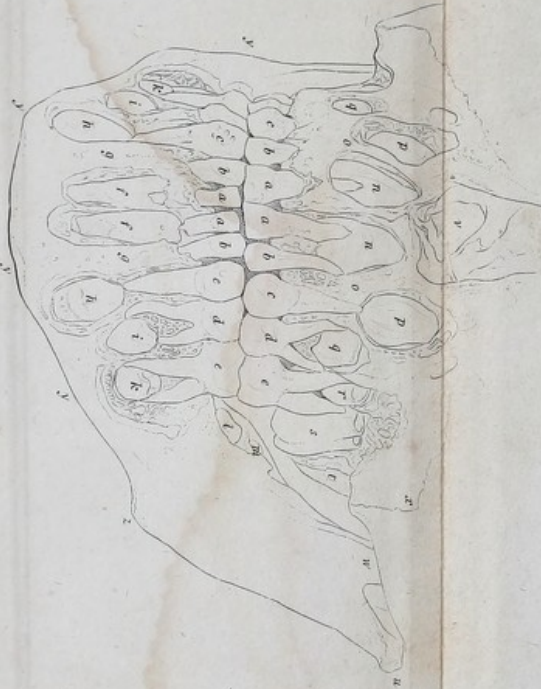
The parts for the motion of the under jaw, and attachment of the moving powers and other circumstances, as particularly noticed in the former plate, are applicable to this. It will be observed that the parts described are divested of their natural covering of the skin, &c. ; and from around the teeth, the gums are likewise removed, so that nothing but the bones are exhibited ; the principal object being to shew the teeth and their situation in the sockets. It is particularly intended, that by comparing these two plates together, persons may make themselves acquainted with the difference between permanent and temporary teeth, so as to discriminate one from the other.

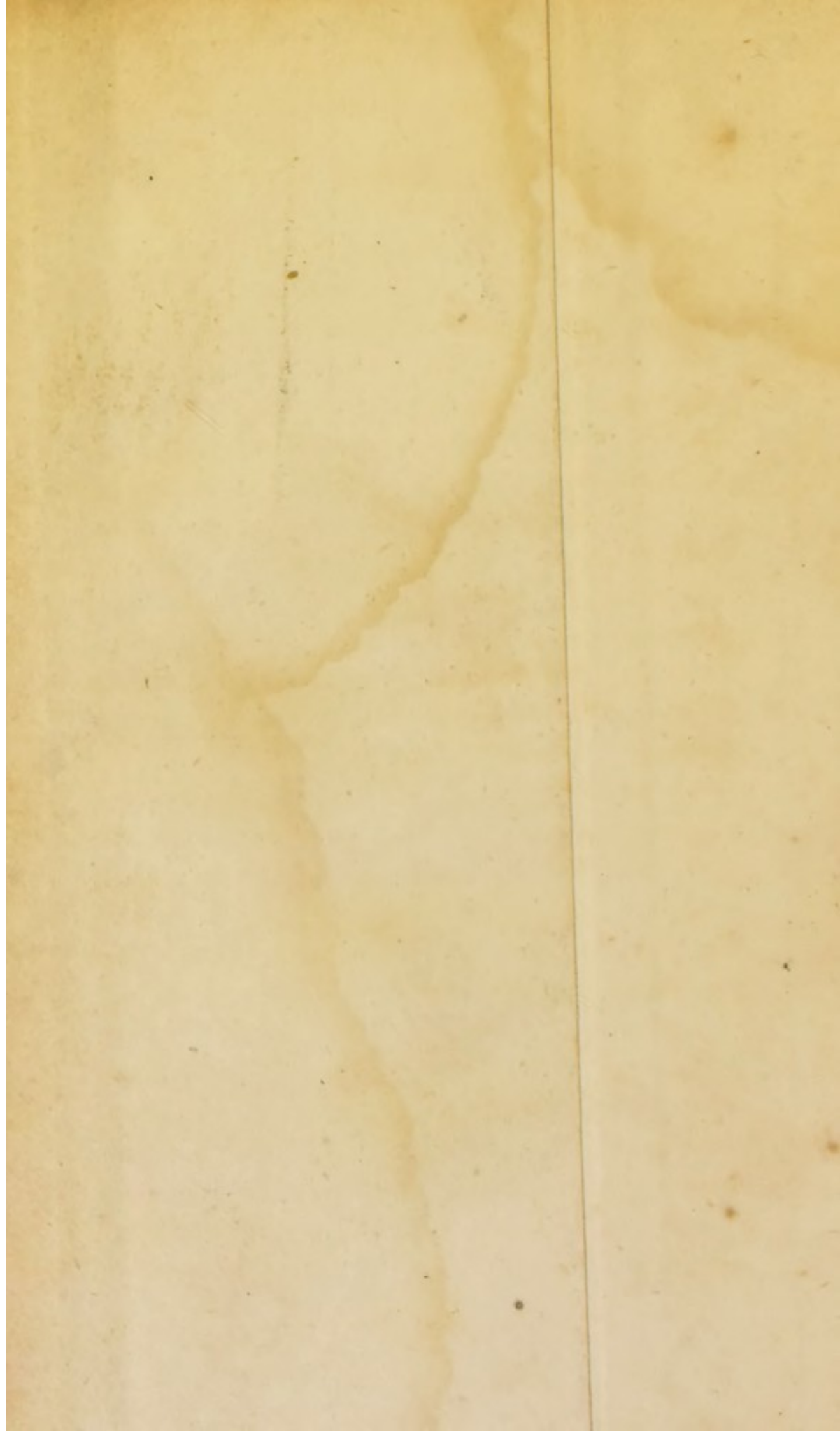
PLATE III.

This plate is taken from the same original as the former ; but besides exhibiting a complete set of temporary teeth, various portions of the bone of the jaws are removed, in order to shew the situation of



Dissected and Engraved by James Taylor.





the permanent teeth that are forming, and which would have succeeded the temporary set. The curious position of the permanent teeth, while in embryo, must excite astonishment, and was it not repeatedly demonstrated in nature, it would be almost incredible. This figure is taken at that particular time, when the first of the temporary teeth, (at *a* in the lower jaw) began to loosen in order to its being shed, of course the mouth, under such circumstances, contains a greater number of teeth than at any other period of life, comprising the *twenty* temporary teeth, and from *twenty-eight* to *thirty-two* permanent teeth, according to the number of the *Dentes Sapientiæ* that may be forming; making a total of from *forty-eight* to *fifty-two* teeth that are formed or forming.

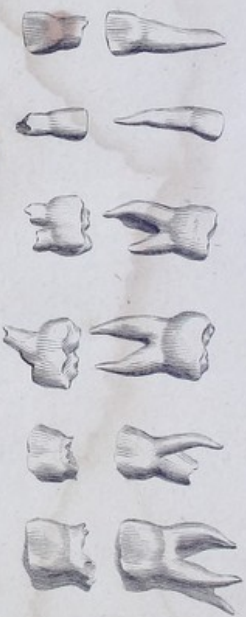
The situation of the temporary teeth are the same as in the last plate, viz. *a, a; a, a*, are the central *incisores*, *b, b; b, b*, are the second, or lateral *incisores*, *c, c; c, c*, are the *cuspidati*; *d; d*, are the first *grinders*, *e; e*, are the second *grinders*. The permanent teeth are situated as follows, beginning with those in the under jaw. *f; f*, are the central *incisores*; at *g; g*, between those of *f*. and *h*, on the inside of the jaw, (which prevents their being shewn in this view) are placed the second or lateral *incisores*, in nearly an equal degree of forwardness. *h; h*, are the *cuspidati*; *i; i*, are the first *bicuspides*, or small *grinders*; *k; k*, are the second *bicuspides*;

l, is the first of the *molares*, or large grinders ; and at *m*, is the second.

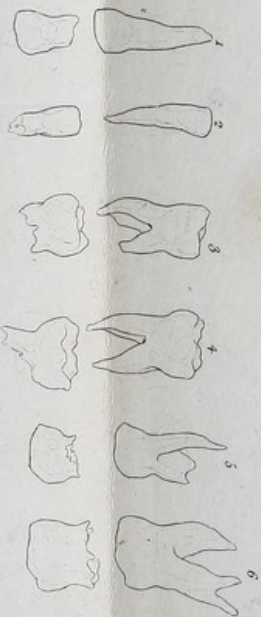
The relative situation of the permanent teeth in the upper jaw are nearly the same as in the lower ; *n ; n*, are the central *incisores* ; at *o ; o*, between and behind the central *incisores* and *cuspidati*, are placed the second or lateral *incisores*. *p ; p*, are the *cuspidati*, or eye teeth, in the angle between the nose and the eye ; *q ; q*, are the first *bicuspides*, or small grinders ; *r*, is the second *bicuspidis* ; *s*, is the first of the *molares*, or large grinder ; at *t*, is placed the second, but so much imbedded in the socket that it could not be shewn. The *Dentes Sapientiæ*, if forming at this age, are always in a soft state, and therefore cannot be delineated from a dry preparation. *v*. is the opening of the nostril ; *u*, is the *condyle* or joint ; *w*, is the *coronoid process* ; *x*, is the *zygomatic process* of the *os malæ*, forming the prominence generally termed the cheek bone ; *y, y, y, y*, the lower margin of the jaw, *i*, its angle.

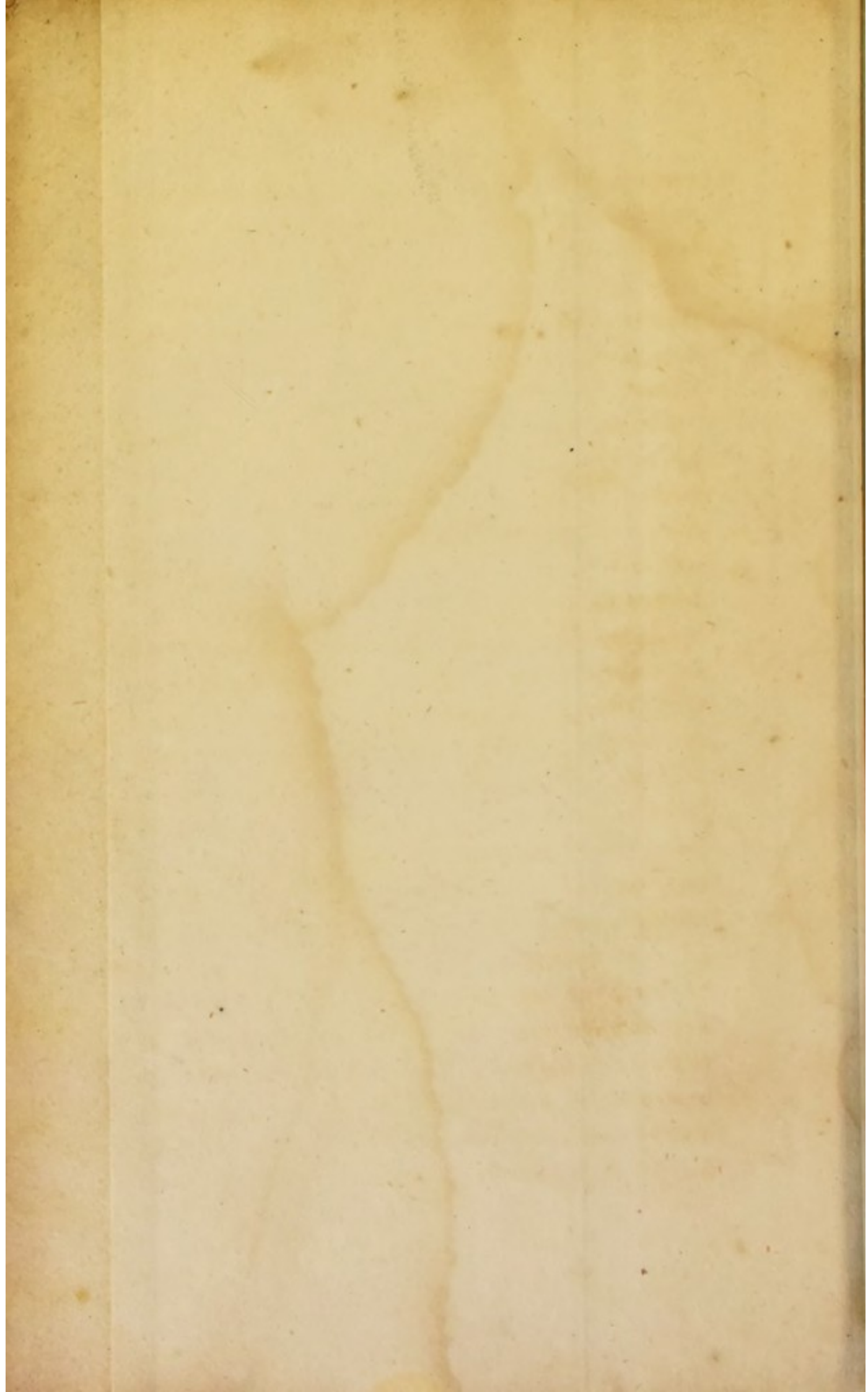
PLATE IV.

The first six figures in this plate correctly represent six of the temporary teeth, with their roots of the full size, just as they actually are before the absorbing process has taken place, preparatory to their being shed, (see Plates 2 and 3) ; and under-



Drawn and Engraved by Adam Sedgwick





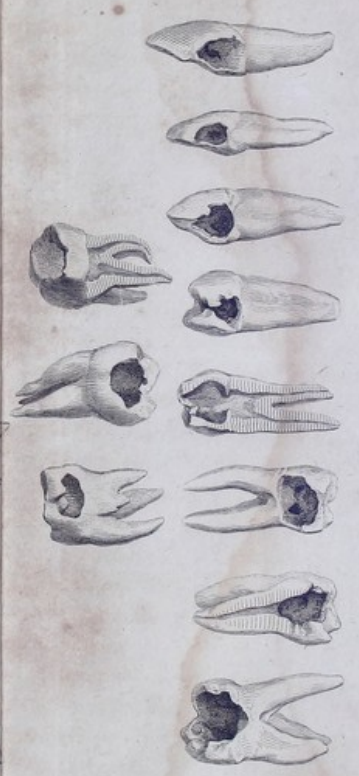
neath each is delineated a corresponding tooth, as it appears after the absorbing process is complete and it is naturally shed. Fig 1. is an upper *incisor* ; Fig. 2. is a lower *incisor* ; Fig. 3. is a first *molaris* or grinder of the lower jaw ; Fig. 4. is a second ; Fig. 5. is a first *molaris* of the upper jaw. Fig. 6. is a second.

Figures 7 and 12, inclusive, are sections of perfectly sound teeth ; parts being cut away in order to shew the central cavity, with the passage through each root leading to it, in which were the blood-vessels and nerves, being the remains of the pulp that formed the tooth. In each we may remark the following particulars: 1st, the central cavity is of the same shape as the exterior of the body of the tooth. 2dly, that there is a canal through the whole length of each root, communicating with the central cavity. 3d, the enamel is deposited thickest on the points or edges of the tooth, and diminishing gradually towards the neck, when it terminates. Fig. 7. is an upper central *incisor* ; Fig. 8. is a lower ditto ; in these the central cavity is a mere canal dilating in the body of the tooth. Fig. 9. is a *bicuspis* or small grinder, with one root, which perhaps when in a soft state had been two. In this the vessels enter by two distinct openings near the point, and after approaching so as nearly to run in one canal they diverge and enter the cavity on the opposite sides. Fig. 10. is a *bicuspis* with two distinct roots, and

a canal leading through each root. Fig. 11. is a *molaris* or large grinder of the lower jaw, with its usual two roots. Fig. 12. is a *molaris* of the upper jaw, with its usual three roots, and a canal leading through each to the central cavity. Sometimes the vessels enter near the point of the root, by two or three distinct openings, and which unite in the canal; of this I have met with several instances.

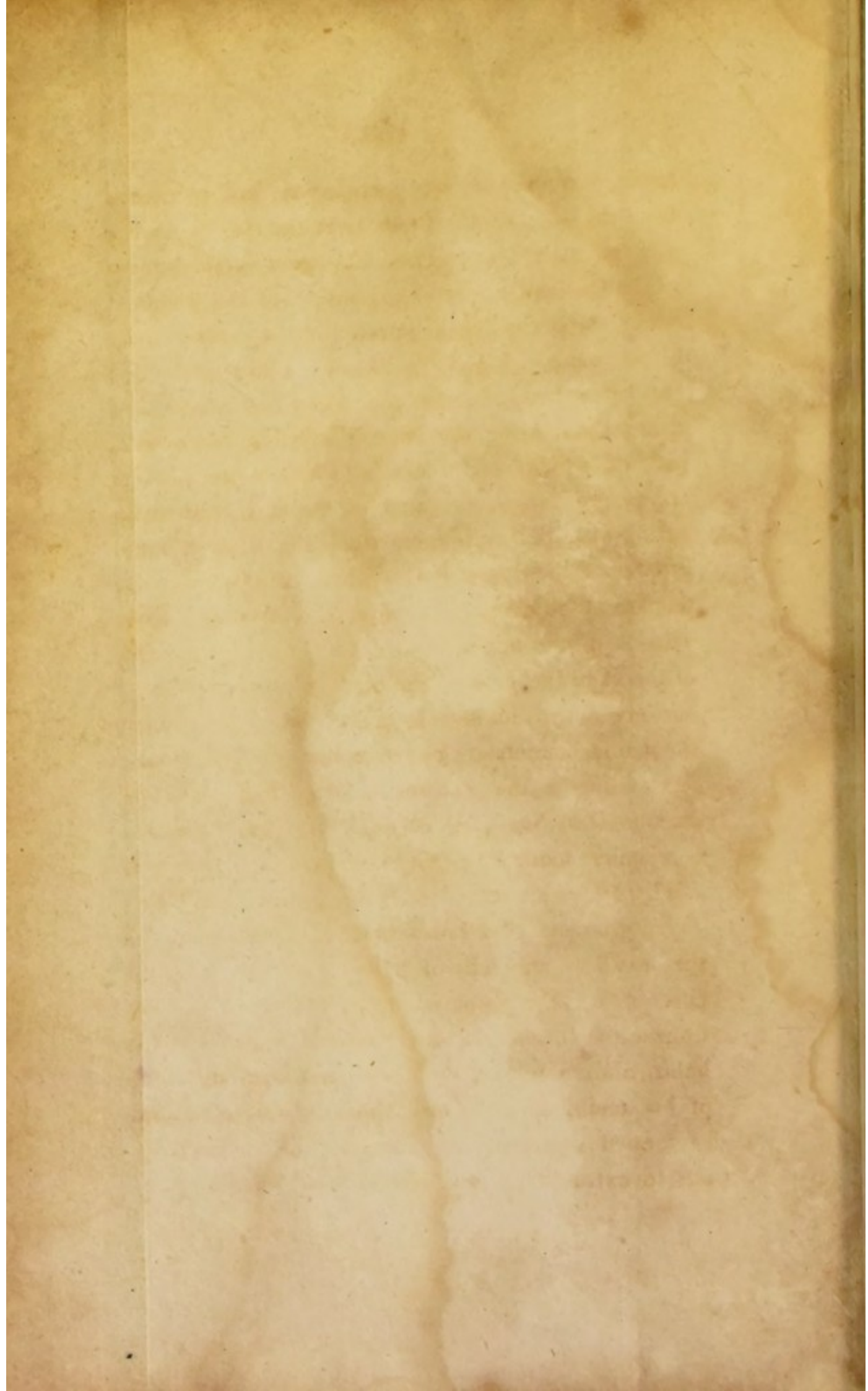
PLATE V.

The first eleven figures of this plate exhibit carious teeth: care has been taken to represent accurately the carious cavities. Fig. 1. is a side view of a central *incisor* of the upper jaw; Fig. 2. is a similar view of a lateral or second *incisor*. Fig. 3. is a side view of a *cuspidatus* or eye tooth. Fig. 4. is a side view of a *bicuspis* or small grinder, with one root. Fig. 5. is a side view of a *bicuspis* with two roots. In this the side of the roots is cut away, in order to shew the canal through each root, for the transmission of blood-vessels and nerves to the natural central cavity; and likewise shewing that the central and carious cavity communicate with each other; thus exposing its exquisitely sensible organs to the action of extraneous substances, and of course such a tooth must immediately become the source of pain. Fig. 6. is a large grinder of the



Diagrammes des dents de l'homme





lower jaw; the carious excavation had proceeded from the side of the tooth next the cheek. In this and the other figures, the black spots at the bottom of the carious cavity is expressive of the points at which the decay had penetrated to the central cavity of the tooth. Fig. 7. is likewise a large grinder of the lower jaw. In this the decay had commenced internally, leaving the enamel standing like a shell, part of which, and the side of one of the roots, is cut away to shew the canal of the fang, communicating with the carious cavity. Fig. 8. is a large grinder of the upper jaw, with a caries on its side, next to an adjacent tooth. Fig. 9. is likewise a large grinder of the upper jaw. The carious excavation of this is in the centre, the bony substance is almost entirely destroyed, and the enamel left a mere shell; the two front roots are cut so as to shew their canals, terminating in the carious cavity. Fig. 10. is a carious *Dens Sapientiæ* of the lower jaw. Fig. 11. is a similar tooth from the upper jaw.

Fig. 12. is a remarkable strong, long rooted, decayed grinder, of the lower jaw. The mean height of this tooth is an inch, of which the root and part covered by the gums is three-fourths. The man from whom this tooth was extracted was of a spare habit, and no ways indicated such a firm structure of his teeth, which shews, that little opinion can be formed respecting the roots of the teeth, previous to extraction; and likewise the necessity of

caution in removing them. Fig. 13. and 14. are two supernumerary teeth, which are sometimes found in addition to the regular set. Fig. 15. and 16. are two views of a remarkable *Dens Sapientia* of the upper jaw. The concavity at *a* is a natural depression and covered with enamel, into which a prominent part of the adjoining *molaris* had projected; indeed all the three upper grinders of this person were strongly locked into each other, which made the extraction of this tooth very difficult: its carious cavity is shewn at *b*. Fig. 17. and 19. are two views of a lower front tooth, enveloped in a large incrustation of tartar. *a*, is the point of the root, which still adhered to the gums; the socket being of course entirely lost. *b*, is the upper edge of the tooth; *c*, is the front of the tooth, and tartar towards the inside of the lip; *d*, that part of the tartareous concretion which projected towards and under the tongue. Fig. 18. is a tooth, the natural size of that enveloped in the tartareous concretion.

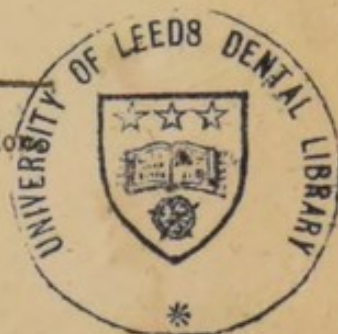
PLATE VI.

Is an under jaw of its actual size, after all the teeth had been lost, shewing the effects produced by the absorption of the *alveolar* process or sockets, in reducing the size of the jaw, and of course shortening the face. The thickest part of this jaw at

the chin, *f*, is about three-fourths of an inch, and at its thinnest part, at *e, e*, about three-eighths; while the thickness of an adult jaw, including the teeth, is about $1\frac{1}{2}$ inch. Compare this figure with the under jaw of Plate 1, and as a corresponding defect takes place in the upper jaw, the loss of the teeth and sockets produce a shortening of the face of nearly two inches. *a, a*, are the *condyloid processes* or joints; *b, b*, are the *coronoid processes* as before explained in Plate 1. *c, c, c, c*, is the part where the teeth and sockets formerly stood, and is still expressed by a porous appearance, being the small remains of the *alveolar processes*. *d, d, d, d*, the margin of the jaw; *e; e*, the angles of the jaw; *f*, the chin, *g; g*, are the openings for the transmission of the blood-vessels and nerves, after they have supplied the jaw, as noticed in Plates 1 and 2.

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