The teeth in health and disease : with practical remarks on their management and preservation.

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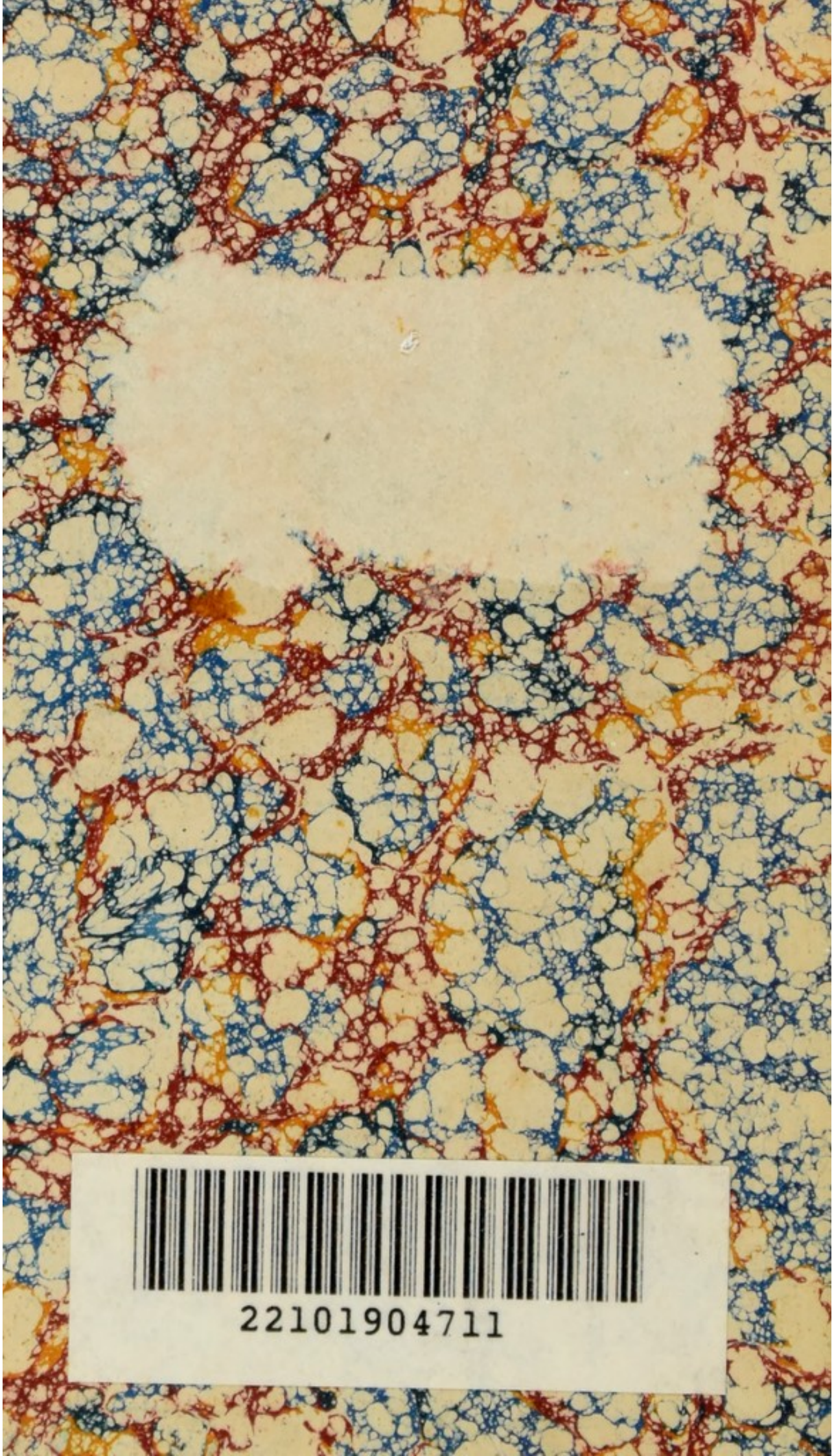
THE TEETH
IN
HEALTH AND DISEASE

HULME.



J. Adams Esq.
with the Author's Compts

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PREFACE.

In writing the present work my object has been to give a concise though brief account of the anatomy and diseases of the teeth. I have divested my descriptions, as far as possible, of all technical language, being desirous of rendering the following pages intelligible to the public as well as to the professional reader.

The prevailing popular ideas concerning the nature of the teeth, and their disorders, are for the most part erroneous, and belong to a by-gone age. The insidious and secret manner in which disease attacks these organs renders it desirable that everyone should possess some information as to the best means of preventing its approach, and of remedying its ill-effects.

25, Argyll Street, Regent Street,
January, 1864.

THE TEETH

IN

HEALTH AND DISEASE.

CHAPTER I.

INTRODUCTORY—THE NECESSITY OF FOOD—FOOD AND SLEEP—THE TEETH IN RELATION TO DIGESTION, PERSONAL APPEARANCE, AND LANGUAGE.

Of the various acts which every living creature is capable of performing, that of procuring and preparing its food is the one most essential to the well-being of the individual.

The gift of life contains at its very commencement the elements of its own extinction, for no sooner does the animal enter upon the active enjoyment of its existence, and begin to exercise the functions with which it is endowed, than at the same time it commences the work of dissolution. Every movement involves the destruction of certain portions of the body, and if this were allowed to continue unchecked, the powers of the

animal would be speedily exhausted, and death would soon terminate its career. It is, therefore, not sufficient that the creature should be furnished with the powers of motion and sensation; these might suffice for its momentary existence, but if it is to grow and develope itself into a higher grade of perfection, or even it is to continue to live and to exercise the functions it possesses at birth, it must also be furnished with the means of procuring materials from the external world that shall be converted into the tissues of its body and take the place of those portions which have been lost.

Two things are necessary in order that a man may remain in a healthy and vigorous condition; a due amount of food, and a sufficient period of rest by which the body may recover the tone and vigour it had lost during the hours of active life. "Praise be to him," says Sancho, "who invented sleep, which is the mantle that shrouds all human thoughts; the food that dispels hunger; the drink that quenches thirst; the fire that warms the cold; the cool breeze that moderates heat; in a word, the general coin that purchases every commodity; the weight and balance that makes the shepherd even with his sovereign, and the simple with the sage."

The functions of nutrition and sleep, whose due performance is so essential to the health and

happiness of all the higher animals, are intimately associated together, and mutually favour or hinder each other.

None of the bodily functions are more under the influence of external circumstances than that of sleep. Naturally it occurs at certain intervals which correspond to the hours of darkness, but these intervals will frequently vary according to the state of the individual, and the conditions by which he is surrounded. Mental anxiety wards off sleep, light and noise are generally unfavourable to it, while quiet and darkness with the recumbent posture tend to induce it. Even the increased pressure of the blood upon the brain produced by the horizontal posture may become the cause of sleep. In many persons, as in the case of the celebrated physiologist, Müller, sleep can be brought on at will by the assumption of the recumbent position while the thoughts are kept in an unexcited state. Dr. Boerhave relates an instance of a Dutch physician, who, having persuaded himself that waking was a violent state, and sleep the only natural one of the system, contrived by abstracting all disturbing causes, and surrounding himself by favourable circumstances to sleep away whole days and nights, until at length he impaired his understanding, and finally perished in a public hospital in a state of idiotism. On

the other hand, in cases of extreme exhaustion and of great suffering, nothing appears to be capable of warding off the tendency to sleep. Men will sleep amidst the roar of artillery, and it is said that Damien slept upon the rack.

The condition of the stomach has a marked influence upon sleep, and the latter state in like manner affects the digestive function. "Abundant food," says Müller, "induces sleepiness partly by giving increased activity to the organic functions, and thereby disturbing the reaction of the animal functions, and partly by the pressure which the crude and imperfectly assimilated nutriment newly introduced into the blood exerts upon the brain." The fat boy in *Pickwick* is only an extreme example of a physiological fact, and the annals of medicine readily furnish us with his counterpart. The most extraordinary instance of voraciousness on record is probably that of a Frenchman, named Tarrare. At seventeen years of age, when he weighed only one hundred pounds, he could devour, in the space of twenty-four hours, a quarter of beef as heavy as his body; and on one occasion, when in the army, he devoured in a few minutes a dinner prepared for fifteen German labourers, and composed of various substantial dishes. He was strongly suspected of cannibalism; and was often repulsed with difficulty from the ward appro-

priated to the dead. He at length fled from the army in consequence of a rumour that he had devoured a child sixteen months old, which had suddenly disappeared. After gorging his stomach, Tarrare slept, and emitted torrents of perspiration, a symptom common to the disease. He afterwards fell into a hectic, and died of marasmus. Dr. Mortimer has recorded the case of a boy, only twelve years old, who, from a feeling of inanition, would gnaw his own flesh when not supplied with food; when awake he was constantly eating; the food given him consisted of bread, meat, beer, milk, water, broths, potatoes; and of these he swallowed, in six successive days, three hundred and eighty-four pounds eight ounces avoirdupois, being sixty-four pounds a day on an average. The disease continued for a year; the food, however, in this case was rejected soon after it had been swallowed.

In order that this great law and condition of our existence should be fulfilled, and that sleep should be that kind of health-giving and invigorating repose which "*knits up the ravelled sleeve of care,*" it is absolutely necessary that "*good digestion waits on appetite.*"

The *bon vivant* who indulges in late and luxurious suppers, knows too well that he must often pay the penalty of a sleepless night, or pass through one of disturbed and broken rest

in which some undigested portion of his last meal appears to him as an avenging demon seated upon his chest, stifling the life within him.

Dr. Abercrombie relates the curious instance of a gentleman who, forty-five years previously, was placed in circumstances of great alarm and danger, from being pursued by an infuriated bull. Ever since that time, if he eats meat at supper, or anything of an indigestible kind he is annoyed with dreams, and the subject of them almost invariably turns upon the situation in which he was then placed from the pursuit of the bull.*

Before the food is passed into the stomach, it undergoes a preliminary process in the mouth, by which it is prepared and fitted for the action of the gastric juice. This preparatory operation is partly of a mechanical and partly of a chemical nature, and is accomplished by means of the teeth and of the saliva. The special changes produced in the food by mastication will be more particularly explained hereafter when speaking of digestion, at present it is sufficient to point out the intimate relation existing between the teeth and this important function.

Besides the effect which the teeth have upon the healthy nutrition of the body, they add greatly

* *Inquiries Concerning the Intellectual Powers.* By John Abercrombie, M.D., p. 290, 13th edit., London.

to the personal appearance, and are essential to a clear pronunciation.

It is scarcely necessary to remark upon the disfigurement produced by decayed or even irregular teeth. This is especially the case in the female, the most pleasing features are deprived of their powers of attraction where the teeth are defective, and plain features are often greatly enhanced by the possession of a well-formed and regular set of teeth. "A woman," says Rousseau, "who has beautiful teeth cannot be ugly." Irregularity is often a matter of more importance than the mere question of personal appearance, although this alone should be a sufficient reason to induce those having the charge of children to see that proper care is bestowed upon their teeth while the temporary set is being gradually replaced by the permanent, and by which the evil can almost invariably be prevented.

When the arch of the teeth is broken, and one or more of them project beyond or stand within the proper line, a deposit of fur and tartar is almost sure to occur on some of the instanding teeth, and whatever pains the person may take, he will hardly succeed in keeping them of a proper colour. Not only is the dark colour of the teeth unsightly, but the accumulation of foreign matter is apt to lay the foundation of decay, leading to the early loss of the teeth.

Irregularity of the teeth is most frequently accompanied by overcrowding, by which the teeth are closely wedged together. Whatever views may be entertained as to the nature of caries of the teeth, there can be no question that a crowded condition of the mouth and the pressure of the teeth upon each other, favours its development and progress, both of which might have been avoided, had the teeth been examined and attended to at proper intervals while the process of dentition was proceeding.

It is the great privilege and characteristic of man that he is able to utter articulate sounds and to communicate his wants and his ideas to his fellow-men through the medium of language. The true organ of voice is situated at the upper part and opening of the windpipe, consisting of a little tongue-shaped process, of the glottis, and of the vocal chords, the latter being set in vibration by the air as it passes from the lungs. The sounds produced by the organ of voice are modified by the action of the tongue, lips, and cheeks. The simplest of the articulate sounds are those forming the alphabet, amongst these are certain letters which are produced by the pressure of the tongue against the teeth, and are therefore termed dental letters, these are, *c*, *d*, *t*, *s*, and *z*.

C, *s*, and *z* are simple sounds, during whose

utterance the front teeth are made to approach each other, while the point of the tongue is pressed against the backs of the lower teeth in the case of *c*, but is brought behind the upper teeth in pronouncing *s* and *z*. *Th* is pronounced by the same action as *s* and *z*.

D and *t* are termed explosive sounds. The organs of speech, when engaged in their formation, undergo a sudden change of position, the sound commencing with the closing of the mouth and terminating with the opening of it. Hence these consonants cannot be prolonged *ad libitum*. In the pronunciation of *d* and *t*, the tongue is applied to the anterior part of the palate, or to the posterior surface of the upper teeth.

Some other sounds are accomplished by the aid of the teeth. In pronouncing the letter *f* the lower lip is seen to be elevated, so as to come in contact with the edges of the upper teeth, and the sound of *v* is produced in nearly the same way.

These remarks sufficiently prove what important assistance the teeth afford us in conversation and in our daily intercourse with our fellow-men. Any irregularity in the position of these organs can scarcely fail to modify the sound of the voice, and a contracted condition of the palatine arch is well-known to be a great hinder-

ance to the success of the orator and of the vocalist.

Most important of all is the relation existing between the teeth and to the functions of digestion and nutrition, these being the agents that repair the daily loss of the body, and are, at the same time, the true source of health and longevity.

CHAPTER II.

THE ORIGIN AND DEVELOPMENT OF THE TEETH—THE NUMBER AND KINDS OF TEETH BELONGING TO THE TEMPORARY AND PERMANENT SETS.

THE origin and development of the teeth were long surrounded by an impenetrable mystery, which baffled the ingenuity and perseverance of the anatomist; many speculations and theories have, from time to time, presented themselves to the mind of the investigator, but all failed to give a satisfactory account of the manner in which these organs first presented themselves. For a correct solution of this difficult problem we are indebted to the labours of a distinguished French anatomist of the present day. Some of the older writers accurately described what they saw; but when they commenced their observations, the teeth had already acquired their proper form and shape, and bony matter covered a considerable portion of their crowns. It is clear this was not the commencement of the teeth, but only a particular stage of their formation. Other writers indulged themselves in unfounded assertions and absurd speculations, some, for

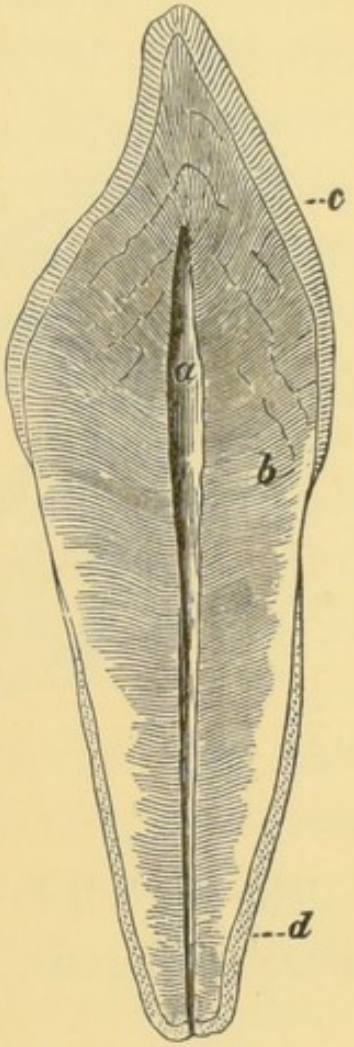
instance asserting that the milk teeth had no fangs, while others admitted that they did possess them; but that they were gradually consumed in the formation of those belonging to the second set.

The germs of the teeth appear at a very early period in the development of the child. When the parts, which ultimately form the jaws, are still of a soft and uniform structure, little opaque masses are seen to arise in the shallow groove of the jaw; by degrees these assume a definite form, bearing some resemblance to the perfect tooth. At the same time the jaw continues to grow, the groove deepens, it becomes divided into separate compartments, corresponding to the sockets of the future teeth, while the earthy particles, that convert it into bone, are slowly deposited and blended with the animal tissues.

The germ of each tooth consists of three portions, first a central mass through which the principal portion of the tooth, the dentine, Fig. 1 *b*, is formed, and whose remains afterwards constitute the pulp (*a*), filling the interior of the tooth; second, a conical cap, covering the crown of the tooth, through which it receives its coating of enamel (*c*); and, third, a membrane, which ultimately adheres to the neck of the tooth, extends itself over the fang or fangs as they continue to grow, and invests them with an outermost

layer (*d*), of a peculiar kind of bony structure, to which the anatomist has given the name of cement, because, in the compound-teeth of some of the lower animals, it joins or cements the different portions of the teeth together.

Fig. 1.

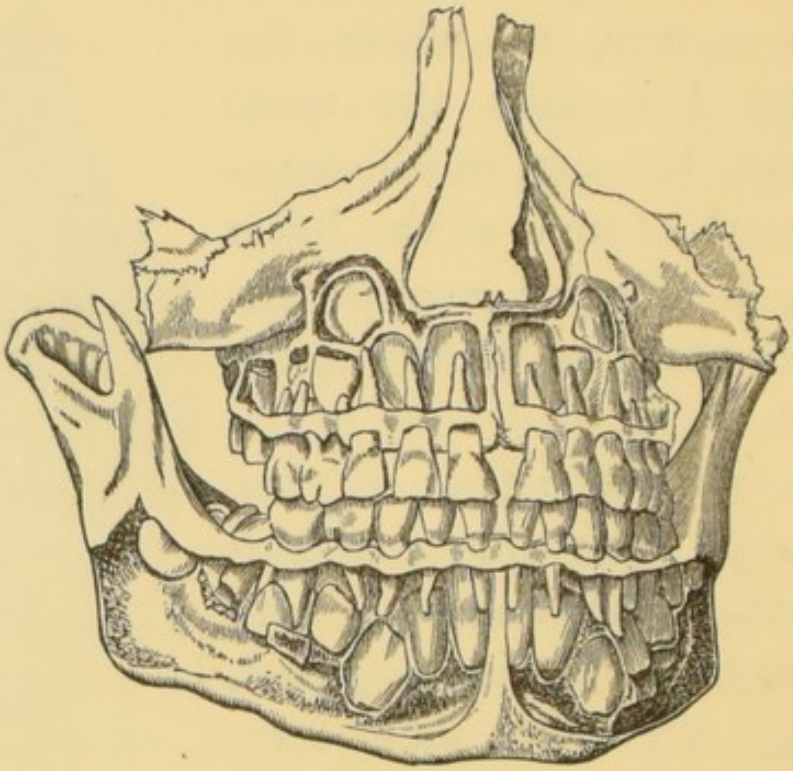


Section of an incisor tooth.

Early as the germs of the teeth make their appearance, it is not until some time after birth that their formation is completed, and they begin to take their proper place in the mouth of the child.

Man is furnished with two sets of teeth. The first, intended only to serve the requirements of childhood, and to last for a few years, consists of *twenty* teeth, *ten* in each jaw, viz.: four Incisors, two Canines, and four Molars or grinding teeth. These teeth are termed the *first, temporary, milk,* or *deciduous* teeth, they are all shed by the eleventh or twelfth year, and have been replaced by their permanent successors. The appearance and arrangement of the temporary teeth are represented in Fig. 2 two-thirds the size of life.

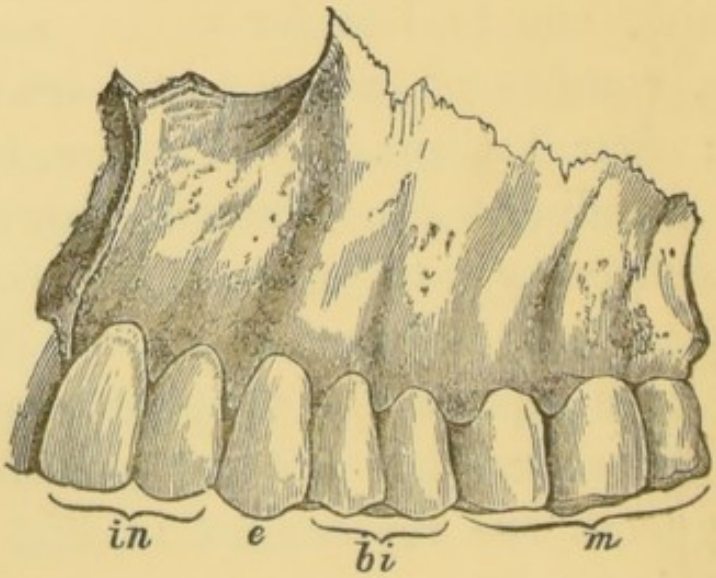
Fig 2.



Temporary Teeth.

The teeth belonging to the second set, Fig. 3, are more numerous, powerful, and larger than those

Fig. 3.



The left half of the upper jaw, showing the permanent teeth on that side.

of the first; these are known as the *second, permanent,* or *adult* set, and consist of *thirty-two* teeth, *sixteen* in each jaw, viz.: four Incisors, two Canines, four Bicuspids or small grinders, and six Molars or large grinders. In the drawing only the eight teeth belonging to one side of the upper jaw are represented but these are life-sized, the teeth on the opposite side being perfectly symmetrical. Those of the lower jaw correspond in number and arrangement with those in the upper, although they are somewhat modified in size and shape.

These teeth were doubtless intended to last until a late period of life, but, from various causes, that arise partly from our artificial mode of living, and exercise an injurious influence upon them, they are very subject to disease, which either destroys them or necessitates their removal, so that it is rare to meet with persons past the middle period of life who have not lost several teeth.

The shape of the teeth and the special purpose they fulfil in the act of mastication, have led to their arrangement into certain classes, each of which has received a particular name, derived either from the form of the teeth or the office they fulfil. Thus, the Incisors (*in*) are so named from their cutting properties, and because they accomplish the first separation of the food; they are

further distinguished as the central or large incisors, and as the lateral or small incisors, in both sets.

The Canines (*c*), although small in man are largely developed in the dog tribe, and hence the origin of their name. The fangs of these teeth are very long, and, in the upper jaw, are directed towards the eye, hence they are frequently termed in popular language the *eye-teeth.* We would warn the reader against this name, leading him into the common error of supposing there is some special connection between these teeth and the eyes, and that the latter are therefore liable to be injured when the former are extracted. As we shall hereafter show, the eyes are sometimes affected in consequence of the presence of diseased teeth in the mouth, but this is just as likely to arise, and probably more so, from one of the molar teeth as from one of the canines; in either case it is the presence and not the removal of the tooth which is the source of the evil. There are two canines in each jaw, placed one on each side of the incisors, forming the prominent angle that marks the corners of the mouth.

The term bicuspid (two pointed), is given to the four teeth (*bi*), of the permanent set, which take the place of the four molar teeth of the temporary set. The two points are only characteristic of these teeth in the upper-jaw, in those of the

lower the crowns are blunted and marked by a transverse ridge passing between the inner and outer surface of the crown.

The molars or grinding teeth (*m*), so named from *mola* a millstone, are three in number on each side the two jaws. These teeth are added to those which replace the temporary set, and when lost are never reproduced; they are distinguished as the first, second, and third grinding tooth, commencing from the anterior part of the jaw and proceeding backwards. The first is the earliest of the second set, which makes its appearance in the mouth, the last is frequently termed the wisdom tooth, on account of the late period at which it protrudes through the gum.

In Fig. 2 a portion of the jaws have been removed so as to show the permanent teeth and the position in which they are placed with regard to the temporary teeth. At the back part of the lower jaw, on the left side, and beyond the last tooth of the temporary set, are seen the germs of the first and second large grinders belonging to the permanent set, the third or wisdom tooth is still very minute, and is concealed in the jaw.

CHAPTER III.

THE TEMPORARY TEETH—TIME AND ORDER OF THEIR ERUPTION—DISEASES OF DENTITION—LANCING THE GUMS—IRREGULAR DEVELOPMENT—TEETH PRESENT AT BIRTH—RETARDED DEVELOPMENT—WEANING.

Between the sixth and seventh month after birth, the healthy child usually commences to cut his teeth.

The teeth which first come through the gums are the central incisors of the lower jaw. These teeth almost invariably precede those of the upper jaw, although, occasionally, the latter may come through about the same time, or may even appear before those in the lower. It is generally considered, that as regards the remaining teeth the same precedence prevails in respect to those of the lower jaw; but, as will presently be explained, this is very doubtful, and by no means invariably the case. According to some writers, the order of priority is reversed after the central incisors are in place. The next teeth that present themselves are the lateral incisors, which complete the full complement of this class of teeth.

The lateral incisors are followed by the first

molar or grinding tooth, which comes through the gum about the twelfth or fourteenth month. A vacant space is thus left in the mouth between the first molar and the lateral incisor; this is afterwards occupied by the canine from the sixteenth and twentieth month.

Lastly, a second molar makes its appearance behind each of the first, from the twenty-third to the thirtieth month, and thus completes the twenty teeth belonging to the temporary set.

Mr. Bell gives a wider range of time over which the eruption of the teeth may extend; and as his table will therefore include a larger number of cases than the former, it may be useful to append it for the information of parents whose children may be somewhat backward in their growth.

From 5 to 8 months,		the four central incisors.
„ 7—10	„	the four laternal incisors.
„ 12—16	„	the four anterior molars.
„ 14—20	„	the four canines.
„ 18—36	„	the four posterior molars.

It appears somewhat remarkable that medical writers should still differ upon a subject apparently so simple as the order in which the temporary teeth make their appearance. There are, however, several difficulties attending the investigation. In the first place, the order in which the teeth present themselves is not absolutely fixed and invariable; and next, there are few persons

who have the opportunity of examining a sufficient number of cases, and at the same time possess the means of recording them with that degree of accuracy which would entitle them to speak authoritatively upon the question. All observers are agreed that the central incisors of the lower jaw precede those of the upper, and that those of the two jaws are the first teeth erupted, but they differ as regards the order in which the remaining teeth assume their position in the mouth.

Sir Richard Croft long since asserted that, with the exception of the central incisors, the teeth of the upper jaw precede those of the lower. This statement is confirmed by the observations of M. Trousseau, a physician of the highest authority and experience in Paris, who remarks how strange it is that this fact, so familiar to every female who has reared children, should be unknown to medical men, even to those who have written specially upon the subject.

A circumstance of greater importance than the precise order in which the teeth are erupted is that they appear in groups, and that, during the process of dentition, there are intervals of repose between the appearance of the last tooth belonging to one group and the first of the next. The following is the number and order of these groups as given by M. Trousseau :—

The first group consists of the two central in-

cisors of the lower jaw, their eruption being followed by an interval of repose, which lasts from between two and three months.

The second group includes the central and lateral incisors of the upper jaw, and is followed by an interval of repose extending over two months, dating from the appearance of the central tooth.

The third group includes the lower lateral incisors and the four first molars; it may commence with one of the lateral incisors, or with one of the molars. After the last of the molars has come through the gum, an interval of three or four months elapse before the first tooth of the next group makes its appearance.

The fourth group consists of the canines, and is followed by an interval of repose varying from three to five months.

The fifth group comprises the four second molars, which complete the temporary set.*

The diseases which sometimes accompany dentition are neither few in number, nor of slight importance. The French have a saying, *Bel enfant jusqu'aux dents*, and the truth of this remark is borne out by daily experience. The period of dentition is too often the commencement of ill-health in the child; and, although every disorder which occurs at this time is not to be indiscriminately attributed to the process of

* *Clinique Medicale*, par A. Trousseau, vol. ii, p. 464.

dentition, yet it is even a greater and more dangerous error to maintain that, because dentition is a natural process it cannot give rise to any of the numerous disorders which have been attributed to it. It may sound very scientific to say that dentition is a "normal physiological process," and therefore it is absurd to suppose it could prove fatal to the existence of a living being. Happily for the safety of the individual, this doctrine is not generally accepted by medical men, but the feelings of parents often tend in this direction, and many are apt to neglect the first indications of illness, regarding them only as the necessary accompaniments of dentition. Daily experience tells a different tale to the above philosophical dogma, and teaches us that, notwithstanding all the care and skill that may be used, children do die from the disorders produced directly or indirectly by teething, and that many more would be added to the list if such a principle was accepted, and guided the practice of the medical man. But, I would ask, to what process of growth and development the same term might not be applied? Is not the growth of the spine "a normal physiological process?" and yet we have lateral curvature and many other serious affections of this important organ. So also the growth of the bones is a "normal physiological process," but still the ricketty child waddles

through our streets; the same remark may be applied to the development and growth of the glandular system, and yet how often is the normal process converted into a case of scrofula. That disorders have often been attributed to the cutting of the teeth, which depended upon other causes is highly probable, and that ignorant or careless practitioners have often made it the scape-goat of their own want of knowledge or care, is not to be denied; but, the skilful and experienced practitioner will always discriminate between those cases where dentition is merely a concomitant circumstance and those in which it is the true source of the disease.

It is not the intention of the writer to enter upon a minute description of the affections which accompany dentition, still less to speak of their treatment. These disorders belong to the province of the medical man, and do not come under the care of the dentist, nor, indeed, could any popular directions for their treatment be otherwise than injurious and dangerous. Only such a notice of them will therefore be given as may serve to excite the watchfulness of the parent, and induce her to have recourse to medical advice whenever any untoward symptoms arise, or even when the health of the child continues disturbed for any length of time.

Under the most favourable circumstances, the

eruption of a tooth is usually accompanied by some slight derangement of the general health, as well as by local symptoms. The gum is swollen and tender; there is a profuse discharge of saliva; the child is fretful and capricious; it refuses its food, and its rest is disturbed; an eruption on the skin and a disordered condition of the bowels are frequently present.

When the general health is still more seriously affected, the child often starts and moans in its sleep; the hands are clenched, with the thumb thrust into the palm. These symptoms demand immediate attention, for they are often the precursors of others still more serious, and, if they are neglected, it is possible for them to terminate in convulsions, or even in insensibility and death.

There is one remedy applicable to some of these cases of disordered dentition which requires a few remarks, because of the popular prejudices and opinions which have been held regarding it. I refer to lancing the gums. If the maternal anxiety has erred in considering the diarrhœa which accompanies dentition of no importance, and rather as a safeguard than otherwise, it has run into the opposite extreme with respect to the operation of lancing the gums. Some mothers are so prejudiced that on no account would they allow the use of the lancet, for the purpose of removing the tension of the gum over the coming

tooth, and it is not to be denied that there are also practitioners of high authority who hold it in no estimation. That the remedy has been abused there can be no question, and also that its indiscriminate use has led to its being neglected where it might prove of the utmost service. I have known more than one instance where the cutting of each of the first molars and of the canines has been accompanied by disturbed sleep, twitching of the muscles, and clenching of the hands—signs, which I have said are but the precursors of more serious mischief. These symptoms have lasted for a day or two, yet no sooner has the lancet been used, so as to cut down to the surface of the coming tooth, than the child recovered its cheerfulness; the hands were no longer clenched, and it returned to the enjoyment of calm and undisturbed sleep. When we see in the same child the recurrence of precisely the same train of symptoms with the cutting of certain teeth, and the use of the lancet followed by the same beneficial results, it is impossible not to connect them together as cause and effect, and to regard the remedy as of the utmost importance.

Dr. Ashburner is a strenuous advocate for the use of the lancet, and in his valuable work *On Dentition and some Coincident Disorders,* has related several very marked cases illustrating the benefit to be derived from its employment. We

have selected one of these cases for the purpose of confirming what has been said.

"I attended," says Dr. Ashburner, "a fine boy from the cutting of its first incisor tooth to the completion of its dentition of twenty teeth. It was the last child of a family in which all the children had afforded examples of anormal (irregular) dentition. This boy was of a nervous temperament, with black hair and eyes. Every tooth had come forward with a want of biliary secretion. Nothing could exceed the care observed by the watchful mother as to the diet of this infant; yet, whenever an effort at developing a tooth took place, she was always aware, from the deficiency of bile in the evacuations, that he was to have slight fever, sometimes with a catarrh and cough, always with twitchings of the face and fingers, and starting and moaning during sleep, and a catch in fetching a deep sigh. With the appearance of the four first molars the spasms were more severe. The thumb of the right hand was thrust into the palm, and the fingers clenched upon it; the toes were drawn down; the face was disturbed. These spasms relaxed and disappeared. I found, on these occasions, that the tooth was always abnormal in its progress; seldom observing its turn, and never its time. The gum-lancet freely used, always cured these spasms. On the last occasion I was sent for in great haste, for the spasms had

been continued into an epileptic fit; from which I speedily and effectually relieved my little patient by cutting through the capsule of the coming tooth.

Another writer treating of the same subject says: "When the dentition is difficult, the treatment becomes more important. There are two indications to be followed; first, to relieve the local irritation; and second, to subdue the constitutional disturbance. If, on examining the mouth, the gum is found hot, red, tender, swollen, and indurated, the practitioner may feel pretty certain that this condition is the cause of the general symptoms; and, consequently, that if he relieves the painful tension, much of the symptomatic fever, &c., will disappear. The gum is therefore to be freely lanced; taking care to divide the tissues down to the surface of the pressing tooth, even if this be at some little depth. When this operation is properly performed, immediate relief often follows."*

Let us hope that the influence of these authorities may suffice to do away with any prejudice that may yet linger in the mind of the reader against a simple, harmless, and often efficacious remedy, one which the writer firmly believes has often been the means of preserving life.

* *A Practical Treatise on the Diseases of Infancy and Childhood.* By T. H. Tanner, M.D., F.L.S., p. 156.

If the tables of mortality are to be trusted, out of a hundred deaths occurring within the first year of life, four of them are caused by teething, while between the ages of twelve months and three years, they are no less than seven in every hundred. Under the head of teething must be included the diseases which accompany or are excited by it, and although it is probable that in some cases the disorder has been wrongly attributed to this process, still these returns serve to show the perils besetting the life of the child at this time, and the only conclusion to be drawn is, that constant watchfulness is called for on the part of the parent, and that there should be no dallying with its health by resorting to the family medicine chest, or by trusting to the wise maxims of that household autocrat the head of the nursery, but that prompt application should be made to the medical attendant.

It may be as well to remark that, the eruption of some of the groups into which we have divided the teeth, are usually attended with greater severity of the morbid symptoms than others. Thus the incisors are generally produced without much trouble, but with the evolution of the first molars, the symptoms are often increased in severity, and the general disturbance is of a more serious character. It is, however, especially the canines that give rise to a marked increase in the

severity of the local and constitutional derangement. The disorders produced by dentition are the more to be feared, says M. Trousseau, as we approach the development of the fourth group, and it is not without reason, perhaps, that popular opinion dreads so much the appearance of the canines. This probably arises from the length of their roots; and possibly also because the jaws are not sufficiently developed, and the spaces destined to receive these teeth are so. These being the only teeth belonging to the first set which are locked in between two teeth previously developed. The same writer is guided by the appearance of the canines as to the proper time for weaning the child. The danger attending the eruption of the canines is mentioned by Hippocrates, and there is an old proverb which says—that parents cannot truly rejoice in their children before they have cut their eye-teeth. The evolution of the second molars, although often troublesome, is not generally attended by such dangerous symptoms; first, because the jaws are more perfectly developed; and, second, because the child is better able to resist the effects of disease.

The process of dentition as it has now been described contains the order of events which most parents will find exemplified in their own children. There are, however, numerous cases on record in

which the eruption of the teeth has deviated very materially from the above account. These exceptions to the general rule may mostly be referred to two series, consisting of cases in which there is either a precocious or a retarded development of the teeth.

Many instances have presented themselves to the notice of the medical practitioner in which the child has had one or more teeth protruding through the gums at the period of birth, and many more have occurred in which two or more of the incisors have made their appearance during the first six weeks after birth. That love of the marvellous, which is so deeply seated in the mind of man, and leads him to regard every unusual occurrence as the forerunner of some important event, has not failed to surround this kind of irregular dentition with superstitious notions. The early development of the teeth has long been held as a prognostication of greatness, or as indicating something extraordinary in the future character of the individual. Richard the Third, Louis the Fourteenth of France, Mirabeau, and some other celebrated characters are said to have been born with teeth, but by the side of these persons might be enumerated hundreds of children in whom some of the teeth have been present at birth, or have appeared soon after, but whose lives have passed unmarked by any extraordinary

event, and who have exhibited only the ordinary dispositions and capacities of their race.

A matter of more practical value is to ascertain what effects this precocious development may have upon the health of the child, and what is the nature of these congenital teeth. Two opinions have been put forth with regard to the latter point, some writers considering them to be imperfectly formed members of the first set, while others maintain, that properly speaking, they are not true teeth, inasmuch as they differ greatly in substance and form, and especially in the nature and consistency of their exterior layer to ordinary teeth. The latter are the opinions of Dr. Nessel, Professor of Dental Surgery in the University of Prague, who in three instances removed the congenital teeth, believing that the true teeth would appear afterwards; he considers, moreover, that these early formations are principally observed in individuals who will exhibit symptoms of general scrofula in more advanced life. I am not aware that this opinion has been confirmed by any other observer.

Whatever may be the true nature of these early developed teeth, the majority of them are very imperfectly formed, are but slightly attached to the mouth, and during the act of sucking are an annoyance both to the mother and to the child, hurting the nipple of the one and the tongue of

the other; moreover, if left to themselves, they generally fall out in a short time. Under these circumstances there can be no hesitation as to the propriety of removing them. In some rare instances the teeth have a more perfect development, are more firmly attached to the mouth, and show no indication of falling out until the period of the second dentition; when this is the case it may be advisable to permit them to remain. At the same time it may be mentioned that in a case where Mr. Whitehead removed two teeth from the lower jaw of a newly-born infant, for the purpose of facilitating suckling, they were reproduced at the time when the canines came through the gum, or at the end of a year and a half, instead of the usual time of six or seven months. It must also be considered that the greater firmness of the teeth renders them more liable to become a source of serious annoyance to the mother; and it is necessary to employ a guard, such as the ordinary india-rubber nipple, during the act of sucking.

Another departure from the usual course of events consists in the retarded development of the teeth. Many children, more especially those who are sickly or are ill-fed—and those who are what are called backward children—are late before they begin to cut their teeth, and when other children can run alone, they can hardly move without

assistance. In these cases there is frequently a want of proper development of the osseous system, the limbs are weak, and the bones are apt to yield under the weight of the body. When this is the case the teeth are almost sure to partake of the impoverished condition of the osseous system, and do not make their appearance until after the usual period.

Ashburner records the case of a delicate, though lively infant, with large head, tumid abdomen, and peculiarly small sized extremities, who only cut its first tooth, an incisor of the upper jaw, when it was twenty-two months old.

In the case of eight children attacked with rickets, or softening of the bones,—in three the incisor teeth came at the regular time, but the other teeth were late,—in three the first tooth made its appearance at twelve months, the others following in rapid succession,—in one the first teeth were cut at the regular time, before the ricketty condition of the osseous system had shown itself; but at eighteen months only eight teeth were present, and—in one case, where the disease was very severe, not a single tooth had appeared at the age of twenty-five months.

M. Trousseau remarks that much of the peculiar cast of countenance belonging to the ricketty child arises from the imperfect development of the jaw-bones. The disease seldom appears until after

the commencement of dentition, but, should it do so, then the evolution of the teeth is often delayed for an indefinite period, and if it shows itself while this process is going on, then it becomes arrested. Referring to cases under his notice in the hospital at the time, in one child, aged twelve months, not a single tooth was present; in another, aged sixteen months, there were only two; and in a third, aged twenty months, although the attack was slight, there were only eight teeth present. If rickets appear at a later period, when dentition is further advanced, the teeth will soon exhibit symptoms of caries, or become loose and fall out. So constantly does retarded dentition co-exist with rickets that many writers place it amongst one of the earliest indications of the disease.

Having referred to the connection which exists between rickets and imperfect or retarded development of the teeth, it may not be amiss to remark that another disorder, scrofula, often coincides with a very opposite condition. The teeth, instead of being defective, are regularly, and sometimes rapidly developed, and remain perfectly sound and unaffected during the entire progress of the disorder.

Let us, however, avoid the risk of creating unnecessary alarm in the mind of the mother, by leading her to suppose that a late development of the teeth is necessarily connected with ill

health, or is invariably accompanied by more serious disorders. A difference of several weeks occurring in the eruption of the same class of teeth, even in perfectly healthy children, as shown by the table given at page 19, is a sufficient proof that greater deviations, from what is usually regarded as the natural order of events, may occur without involving any serious disturbance of the general health.

Van Swieten relates the case of a very healthy female infant, who did not cut a tooth until she was nineteen months old; many other instances might easily be quoted to the same effect, and numerous examples still more remarkable have been recorded by different writers, who have, however, said nothing to lead us to suppose that the patient was not in the enjoyment of ordinary health. Lanzoni mentions the daughter of an apothecary whose first teeth came through the gum at seven years of age, and it was not until that period she began to talk; upon which Ashburner observes, that he had noticed so many cases of tardy access of speech, and of stammering, connected with erroneous development of the teeth, that he had noted the concomitance for the future treatment of the fault. Rayger relates the case of a girl who got her four temporary canines when thirteen years old. Fauchard, that of a child, from five to six years of age, who had only some

of the incisors. Brouzet knew a girl, twelve years old, who had but one-half the proper number of teeth, the margin of the jaws having the firmness and solidity of the gums of old age. Dugès saw the first tooth appear in the eleventh, and Smellie, in the twenty-first or twenty-second year.

Although nothing can be done to remedy or to alter these aberrations of nature, yet, as they are sure to cause considerable anxiety to the parents, and to excite the curiosity of friends and relations, it may be worth while to inquire what effect they produce upon the progress and development of the second set. It is probable that, in the last cases referred to, the temporary teeth were absent, and that it was those belonging to the second set which made their appearance; the records we possess are too imperfect to enable us to decide positively; but such, at least, was the case in the following interesting example which came under the notice of Mr. Tomes:—

"The child had been destitute of temporary teeth, excepting only the second temporary molar on the right side of the lower jaw; the maxillæ were, notwithstanding, well-formed, and the permanent teeth appeared with an unusual regularity of arrangement."

This case deserves to be borne in mind, for, although it would not justify us in asserting that a child, in whom the temporary teeth were absent,

would, nevertheless, have the permanent set, yet it shows the possibility of these teeth appearing at the usual time, and affords grounds for a parent to hope that such might happen in any future case where the temporary teeth were absent.

The eruption of the teeth is accompanied by other changes in the physical condition and constitution of the child, all of which indicate that a different kind of food to the milk of the mother is now required for its nourishment. The stomach has undergone a marked alteration in form, size, and position. At birth this organ is little more than a dilated portion of the intestinal canal, communicating by one extremity with the æsophagus and by the other with the intestine. At this time its capacity is exceedingly small, so that it cannot contain so much as an ounce of fluid; but when the teeth begin to make their appearance it has increased in size, not only positively, but also relatively to the rest of the body; its left extremity, which is especially concerned in the act of digestion, now bulges out; its general form is more curved, and this, combined with the contractions which the organ undergoes, impresses a kind of rotatory movement upon the food, and prevents its passing into the intestines before it has been duly acted upon by the gastric juice. Such precautions were unnecessary while the child fed upon the milk which nature had provided for

its sustenance during the first months of its existence; but the time has arrived when a mixed kind of food is required for the growth and development of the body, hence the stomach is rendered more capacious, and is fitted to act upon food requiring a more prolonged and careful process of digestion before it can be assimilated. Similar changes occur in the condition and development of the salivary glands. For some time after birth these organs contribute little or nothing to the moisture of the mouth, which in the young infant is comparatively dry, but about the fourth or fifth month a great change occurs, the saliva is secreted in large quantities, and constantly dribbles from the mouth.

The appearance of the teeth is a certain indication that before long the child should be weaned, and an artificial food substituted for the parent's milk. It would be fortunate if mothers were more strictly guided by these teachings of nature than they are often inclined to be, either from mistaken notions of kindness to their offspring, or from certain prejudices which possess the minds of the lower classes of society, and are occasionally accepted as true by persons whose education should have freed them from these popular delusions.

Amongst the higher and middle ranks of society the advice of the medical attendant is usually followed as to the proper time and manner of

weaning the child; but occasionally the over-anxious mother will persevere in suckling her offspring beyond the usual period, and the consequence is, that she not only undermines and weakens her own constitution, but she cannot persevere for long in such a violation of nature's laws without also injuring the health of the child. Less worthy motives often influence the conduct of others in this important matter. A notion very generally prevails that so long as the mother continues to suckle her child she is not likely to become pregnant. The fallacy of this doctrine has been proved by Mr. Robertson, who has shown that amongst the lower classes of women residing in Manchester more than fifty per cent. become pregnant during the performance of lactation. The injury which results from such a line of conduct cannot be too strongly or too frequently insisted upon, both on account of the mother and because it is a most certain means of bringing into the world a weak and degenerated offspring, which either perishes in childhood, or grows up to a manhood of sickness and misery.

CHAPTER IV.

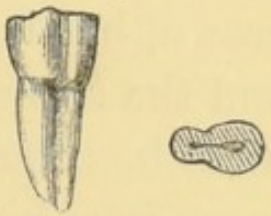
IRREGULARITIES OF THE TEMPORARY TEETH—UNION OF THE TEETH—DISEASES OF THE TEMPORARY TEETH—IMPORTANCE OF PRESERVING THE TEMPORARY TEETH—CARIES—GUM-BOIL, OR ALVEOLAR ABSCESS—EFFECTS OF DEAD TEETH—LOSS OF PORTIONS OF THE JAW BONE AFTER THE ERUPTIVE FEVERS.

It is seldom there is any irregularity in the number and arrangement of the temporary teeth. Occasionally one or two teeth may be absent, and still more rarely one beyond the usual number may be present. These deviations are of little importance, as they do not necessarily imply any corresponding irregularity in the number and position of the permanent set. It is needless to say that in the case of absence of the teeth nothing can be done, but should the supernumerary teeth be so placed in the mouth as to be a source of inconvenience they might be removed, without the fear of doing any injury to those which are lodged in the jaws, and are destined to serve the child in after life.

There is a peculiar malformation arising from the union of neighouring teeth which is occasionally met with in the temporary set, and more rarely in

permanent. In these cases, two of the front teeth are found united together by bony union, it may be the central and lateral incisor, or the lateral incisor and the canine, as in Fig. 4.

Fig. 4.



Two Temporary Teeth United.

It sometimes happens that all the three front teeth on one side are united together, but such instances are very rare. The union takes place during the process of growth, and when the teeth are cut across, the pulp cavity is seen to be common to the two as shown in Fig. 4.

The union of the teeth may be partial, and extend no farther than the fangs, so that the crowns appear separate, or, it may be continued throughout the entire length of the teeth, as in the above specimen.

The only point of importance connected with this peculiarity of the temporary teeth relates to their extraction. It is a matter of necessity, where two teeth are united, that the operator in extracting the one, must at the same time remove the other. As, however, the teeth which are thus united are seldom removed, except for the purpose of making room for the permanent teeth, no injury will result to the child. When the crowns are united, it would be the duty of the operator to inform the parents or friends that the two teeth would come away at the same time;

when, however, the union does not extend to the crown, but is confined to the fangs of the teeth, and the two are extracted together, the operator must be acquitted of all blame, as there are some cases in which the union would not be noticed without a very careful inspection until after the teeth were drawn.

The temporary teeth are liable to the same disorders as the permanent, and require nearly the same kind of treatment, when it is considered desirable to retain them in the mouth. The most common of these diseases is caries, or decay of the crown, the nature of this disease and its treatment will be described hereafter when speaking of the permanent teeth. It is therefore unnecessary to enter upon this portion of the subject at present.

Bearing in mind that the first teeth are only intended to last for a limited period, and are eventually to be succeeded by others of a more durable nature, an important question arises, as to whether it is advisable that any attempt should be made to preserve these teeth from the effects of caries, or whether it is better to let the disease take its course, and, if pain arises, to extract them.

Parents generally are apt to consider the loss of the temporary teeth of very little consequence, and therefore make no attempt to preserve them

from the effects of decay. Inasmuch, however, as nature evidently intended the first teeth to remain in the mouth until their successors are about to take their place, it is not to be supposed that these teeth can be lost long before the proper time, without producing more or less irregularity in the position of the permanent set. From birth until the wisdom teeth are developed, the condition of the jaws and of the teeth they contain, is continually undergoing change. The most important period, however, is that which intervenes between the completion of the twenty teeth, constituting the temporary set, and the appearance of those of the permanent set which are to take their place, because these include the six front teeth, that is, the incisors and the canines being those most liable to irregularity and whose misplacement causes the greatest amount of deformity and produces the most inconvenience.

The growth of the jaws depends very materially upon the state of the teeth, and the relative position in which the two sets are placed with respect to each other. If the first teeth are prematurely lost, those of the second set are liable to come through the gums before their appointed time, and assume a wrong position in the mouth. Thus, for instance, if the second temporary molar is prematurely lost, the first

large grinder belonging to the second set—being the first of those teeth that makes its appearance in the mouth, and which ought to be placed entirely behind the part occupied by the temporary grinder—is liable to come forward and encroach upon the space intended for the reception of the incisors, the canine, and the two bicuspid teeth. The result of this misplacement of the permanent molar is, that the teeth in front of it become crowded, and the natural arch of the teeth is broken. The ill effects of this want of space is most evident in the case of the canines, these teeth being the last of the five to make their appearance.

Nothing is more common than to find the eye-teeth projecting and producing positive deformity, from the extent to which they stand out beyond the line of the other teeth, and when this is the case, the personal appearance can only be restored by a tedious and troublesome process, which often involves the loss of a tooth.

If, on the one hand, the loss of the temporary molars gives rise to want of room, and produces, as a necessary consequence, irregularity of the permanent teeth; so, on the other, if the temporary teeth are decayed, and the disease is allowed to pursue its course, it is liable to injure those of the permanent set which are placed next to them, or are developed beneath them, involving their

early decay, and probable loss. This ill effect is not the result of any power which a decayed tooth has of communicating the disorder to a neighbouring tooth, after the manner of a contagious affection, as is popularly supposed. It depends partly upon the decomposition of the tooth itself, but much more upon the chemical changes taking place in the particles of food that necessarily collect in the cavity of the decayed tooth. In the same way, any acids or other fluids which are taken as drink, will accumulate at this part, and assist in producing those conditions most favourable for the production of caries.

Another and even a greater evil which appears to be engendered by the loss of these teeth is an arrest of the growth and development of the jaw itself, whereby it becomes contracted, or rather ceases to expand or increase, so as to provide for the greater space occupied by those permanent teeth, that take the place of the temporary set.

I am aware that it is a disputed point amongst dental physiologists whether the ten anterior permanent teeth do occupy a greater space than their predecessors. It is impossible in a popular treatise to enter fully into this somewhat complicated and difficult question, but the injurious effects which we see resulting from early loss of the temporary teeth, and the fact that where denti-

tion is proceeding favourably, the temporary teeth become separated from each other, appears to me to be strong evidence in favour of the opinion that the permanent teeth do require a greater space than that occupied by their predecessors. In support of this I may also adduce the evidence of Mr. Bell, who, when speaking of this subject, says: "The only way in which the fact (the increased space occupied by the permanent teeth) can be ascertained, is by making observations on the same person at different ages, and comparing the arch of the jaw at seven years of age, with the same jaw at twelve or fourteen. This I have repeatedly done, and have no hesitation in saying that the ten anterior permanent teeth occupy a somewhat larger arch than the temporary ones, which preceded them, had done, and, consequently, that the view taken by Hunter and Fox, is incorrect, though not to the extent which Dr. Blake and M. Delabarre have supposed. As is often the case, the medium between the two conflicting statements would appear to be nearest the truth."*

If these statements are accepted, then it is very important that the temporary teeth should be properly and regularly attended to until their successors have taken their proper position in the

* *The Anatomy, Physiology, and Diseases of the Teeth.* By Thomas Bell, F.R.S., second edit., p. 83, London, 1835.

mouth. If only ordinary care and attention were bestowed upon the temporary teeth, the child would often be spared attacks of tooth-ache during that tender age, when he is unable to bear much physical suffering, and when it cannot last long without causing serious constitutional disturbance. It would be well if the child's mouth was occasionally inspected from five years of age, but from between six and seven, when the first molar belonging to the permanent set usually makes it appearance up to fourteen or even fifteen years of age, when all the teeth, with the exception of the wisdom teeth, are in place, the mouth should be regularly examined at fixed intervals, never longer than six months being allowed to elapse, while in cases where the jaws are contracted, or the teeth have a tendency to irregularity, it is very desirable that not more than three or four months should pass by without an inspection being made.

Parents are little aware of the trouble and annoyance they would often save themselves, and those whose welfare they regard with so much anxiety, if this plan were adopted. When such attention as I have recommended is paid to the progress of dentition, the cases are comparatively rare in which the six front teeth cannot be trained into their proper positions, and the arch of the teeth preserved in an even and regular curve. Where

nature has been allowed to trust entirely to her own resources there are, of course, cases in which the teeth will be properly developed and no irregularity result, but unquestionably, these are the exceptions and not the rule.

The first effect of caries is to destroy a portion of the crown of the tooth; if the destructive action is allowed to proceed, sooner or later it affects the pulp of the tooth and gives rise to an attack of tooth-ache. Even when an attack of this kind has come on, it is often possible, by proper treatment, to give relief and preserve the tooth until the time has arrived for its being shed. The mischief, however, often extends to the membrane covering the fang, which becomes inflamed, and produces what is known as gum-boil, or alveolar abscess. The formation of matter, which is pent up in the bony socket of the tooth, gives rise to intense suffering, from which there is no relief until an opening is established in the side of the socket, through which the matter escapes, or until the tooth is removed.

The highly irritable and nervous condition of the constitution in early life renders the child very intolerant of pain, and produces more general disturbance than in the adult. The child is fretful, irritable, and constantly crying; he refuses his food, and obtains little or no sound and refreshing sleep; such a state of things cannot long continue

without the health becoming seriously affected. Even in the adult the restoration of a tooth, which has once been affected with gum-boil, is, to say the least, extremely doubtful, and the successful cases are few in number.

There is still less hope of restoring such teeth to a healthy condition in the child. It is true that when the matter has found an exit the pain ceases, and for a time the patient obtains relief, but sooner or later the matter reaccumulates, and the same state of suffering has to be gone through. These alternations of pain and ease continue until either the tooth is extracted or its vitality is destroyed partly by the progress of the decay in its crown, and partly by the repeated attacks of inflammation in the membrane covering the fangs. When the tooth has arrived at this condition it may still be a source of suffering and annoyance to the child in the manner which will presently be described, when speaking of the effects of dead stumps of the temporary teeth remaining in the mouth.

Abscesses around the fangs of the temporary teeth are also liable to injure the permanent teeth, and may cause the death of a portion of the jaw bone. The late Dr. Chapin Harris, than whom there is no higher authority in dental surgery, has the following remarks upon this subject:—

"The occurrence of alveolar abscess in the

socket of a temporary tooth is often followed by exfoliation of the sockets of several teeth, and sometimes of considerable portions of the jaw bone, seriously injuring the rudiments of the permanent teeth, and sometimes causing their destruction. The author saw a case a few years since, in which an abscess of the alveolus of the first lower temporary molar had occasioned exfoliation of the socket of a cuspidatus tooth, and of two molars. About one-half of the alveolar cells of the two bicuspids, and the cuspidatus of the second set, were also exfoliated—thus leaving their imperfectly-formed crowns entirely exposed."

These disastrous results are more frequently met with in children with fair hair, blue eyes, a delicate but blooming complexion, having the skin exceedingly thin and transparent so that the course of the superficial veins are indicated by deep blue lines, which form a strong contrast with the delicate and almost white complexion of the skin. They occur, in fact, in the scrofulous temperament where the individual is liable to enlargements of the glandular system, and to diseases of the joints.

Under these circumstances there is little encouragement to attempt any other mode of cure than the extraction of the tooth. Cruel as it may appear to the mind of the parent to subject the child to such a severe operation at this early age, it

is not only the most judicious method of treatment, but is, in reality, the kindest, and that which, in the end, produces the least amount of suffering. The extraction of a temporary tooth is never difficult, the operation occupies less than a minute of time; the relief it affords is almost immediate, and it cuts short a long train of suffering that might otherwise extend over weeks or even months

In delicate children various results may ensue from neglecting a diseased tooth. In the course of last year a child was brought to me, bearing all the characters which have just been described as belonging to the scrofulous constitution, in whom a large portion of the outer wall of the lower jaw on the right side had become dead, and was gradually being separated from the healthy bone. This state of things had already lasted for more than a twelve month, and originated from a diseased molar tooth at the back of the jaw. In all probability another twelvemonth would pass before the part would recover the injury it had received, and it was quite impossible to say what would be the effect produced upon the permanent teeth.

The influence of temperament or constitution in modifying the effects of disease is very remarkable, and affords a reasonable explanation of the different results which ensue from the

same cause in different individuals; what will produce little or no injury to one, may give rise to acute inflammation or extreme constitutional disturbance in another. Thus, in the case just recorded, had the child been of a different temperament the injury would probably have been confined to the decayed tooth, and he would not have been subjected to the disease of the jaw bone, or to the protracted suffering and ill health which ensued from such an apparently simple cause.

The scrofulous constitution appears to be of special importance in connexion with diseased teeth, for, in the majority of cases recorded, when diseased bone or abscess of the jaws has ensued from the presence of diseased teeth, the writers almost invariably remark that the patient was of a scrofulous constitution.

The two following instances of the replacement of a sound bicuspid tooth in the lower jaw, that had been accidentally but unavoidably removed in extracting a neighbouring fang, which was level with the jaw and overlapped by the bicuspid, well illustrates what has been said above of the effects of constitution in modifying disease.

Both patients were females, between fifteen and sixteen years of age, and in both cases it was a lower bicuspid which was returned to its socket. The one girl was of a bright, clear, somewhat florid complexion, having all the appearance of

perfect health, and residing in London; the other lived in the country, but the countenance was pallid, the skin delicate and transparent, the stature below the average, and although she was free from any special disease, her general appearance was anything but healthy.

In the first case the extracted tooth was rinsed in warm water, it having fallen on the floor, and immediately replaced in its socket, the patient being directed to call the next day. Accidental circumstances prevented my seeing this patient for more than three months, when, one morning, she brought a younger sister to the dispensary. Upon inquiring after the tooth that had been replaced, she informed me it was a little tender for a day or two, but this soon went off, and that now she knew no difference between it and any of her other teeth; nor could I myself detect any alteration in its appearance any more than if it had never been removed from its socket, thrown upon the sandy floor, washed, and replaced in the mouth.

In the second case the tooth was replaced, and when the patient was seen on the following day, the parts were found to be swollen and painful, the tooth tender to the touch, and it was quite evident if allowed to remain, violent inflammation would supervene. There was, therefore, no alternative but to remove the tooth when the symptoms speedily subsided. Had the tooth, in

this case, been allowed to remain it would certainly have produced an acute abscess, and, as in the case of the little boy before mentioned, it would very probably have involved the death of a portion of the jaw-bone.

Another effect arising from caries is the entire death of the tooth, and this occurs so often in the temporary teeth that it may be regarded as a peculiarity belonging to them.

It is a common occurrence to find the fangs of some of the temporary teeth protruding through the sides of the gums or lying on their surface, and remaining in this state for a considerable length of time, sometimes producing great annoyance to the child, and seriously affecting its general health. At other times the greater part of the crown is left, the tooth is of a dark blackish colour; the gums are swollen, spongy, somewhat inflamed, and receding from the neck of the tooth. The crown of the tooth is more or less decayed, the pulp destroyed, and the fang, when the tooth is removed, is found to be deprived of the membrane which covers it in a healthy condition. The consequence of this destruction of the pulp of the tooth, and also of the membrane covering the fangs is, that the supply of nourishment which it ought to receive is cut off, and the tooth deprived of its vitality. This change takes place gradually, and it is only by degrees

that the tooth assumes the characteristic black colour which indicates its death.

Generally speaking, when a portion of the body has lost its vitality, whether consisting of hard structure, such as bone, or of soft structure, such as skin or muscle, nature endeavours to get rid of it, as being no longer of any use; it becomes separated from the surrounding parts, and is either thrown off immediately from the surface, or first makes its way to the surface and is then cast off. In the case of the temporary teeth, when these organs are about to be removed to make way for their permanent successors, two processes are at work in order to expel them from the mouth; first, there is absorption of the fangs; and, second, absorption of the alveoli and of the surrounding parts. In order that absorption should take place it is necessary that the part should be in a living state; hence it happens that when these teeth have become necrosed, or dead, the process of removal—so far as absorption of the fangs of the teeth are concerned—is arrested, and their expulsion depends entirely upon the changes occurring in the surrounding structures. The teeth have, in fact, become foreign bodies, and produce an irritation, which appears to retard the absorption of even the surrounding parts. Inflammation and ulceration arises in the gums; the fangs of the teeth become misplaced in various directions,

sometimes lying on the surface, the edges projecting either towards the interior of the mouth or towards the cheek, irritating and often producing ulceration of the cheeks or tongue. This happens most frequently with the molar teeth, but occasionally with those in the front of the mouth, and I have sometimes seen the teeth of the upper jaw retaining their proper position in the mouth, but dead, and with the gum and sockets absorbed so that the extremities of the fangs were left exposed, projecting against the upper lip, and causing it to be ulcerated.

In the end these dead fangs are removed, but the process is very long and tedious where nature is left to accomplish it for herself. This arises not only from the teeth being dead, but because this state of things generally occurs in children who are more or less in a bad state of health, either from sickness or from the want of proper food and good air. It therefore occurs most frequently amongst the children of the poor, but those of the rich are by no means exempt from it; and the health of the child may even be seriously affected from this cause.

A young boy, between four and five years of age, whose friends were well off and residing in the country, was brought to me on account of his inability to eat his food, which his friends thought might arise from the state of his mouth. It an

peared that for some time the child had been peevish, fretful, and out of health ; he had little or no appetite, and at length showed complete aversion to taking food. The child had lost his spirits, had become miserably thin, and was rapidly passing into a very bad state of health. After examining the child's mouth, I found the fangs of several of the temporary teeth both in the upper and under jaws dead, and lying exposed in various positions in the mouth ; the gums were swollen and ulcerated in consequence, and in one or two places the points of the fangs and the sharp edges of the dead teeth had buried themselves in the cheeks, causing them to be inflamed and ulcerated, and producing considerable pain whenever any attempt was made at mastication. I therefore removed all the remains of the teeth, and in the event of his not recovering his health after that, desired him to be placed under medical treatment. I afterwards heard that he immediately began to improve ; his inclination for food returned, he recovered his usual spirits, at the end of a week his appearance was greatly altered for the better, and he speedily regained his usual health. Many similar cases have come under my notice, which have caused more or less annoyance and discomfort to the child, rendering him fretful and peevish, but none in which the ill effects of these dead stumps were so marked as in the case just narrated.

The occurrence of certain eruptive fevers during childhood, such as measles, small-pox, or scarlet fever, is sometimes followed by the death of portions of the jaw bone, involving the loss not only of the temporary teeth lodged in that part of the jaw, but also of the permanent teeth which are to succeed them. Instances of this are extremely rare amongst the children of the upper or middle classes, who enjoy the inestimable blessings of pure air, cleanliness, and a proper supply of nutritious food. It is amongst the children of the poor, who are deprived of these necessaries, and who living in the miserable dens of this great metropolis, surrounded by dirt and narrow alleys, are unable to obtain a mouthful of fresh air or a sufficient quantity of nutriment, that these diseases occur. Attention has been especially called to these cases by Mr. Salter, who has met with several amongst the out-patients of Guy's Hospital.

The following is an instance of this kind which occurred after an attack of small-pox. A boy, five or six years of age, applied at Guy's Hospital on account of the state of his mouth. The child had recovered from the small-pox, and was quite convalescent. About a fortnight after his recovery, the gum around the central and lateral incisor of the right side was observed to recede or ulcerate away, and this was followed in a few days by a similar affection on the left side. At the same

time, the bone was denuded opposite these teeth on the surface of the palate. In a few days the bone on the right side, together with the temporary teeth and the large central incisor of the permanent set, came away. This was followed in a short time by a similar loss on the left side. Fig. 5 represents the portion of the jaw bone which came away from the right side of the upper jaw; and Fig. 6, the germ of the permanent incisor from the same side. Exfoliation had commenced in the lower jaw, but its further progress could not be traced, as the case was lost sight of.

Fig. 5.

Fig. 6.

In another case, a portion of the lower jaw, lost after measles, consisted of the central portion of the jaw corresponding to the incisor teeth: the temporary teeth were lost while the bone remained in the mouth; the immature permanent teeth being retained in the sockets in the dead bone, except the right lateral, which escaped.

In one case, that of a little girl, aged four years, who had had an attack of fever. Five or six weeks after her illness the face on the right side began to swell; on the following day two temporary

teeth dropped out, and soon after another was shed. The cheek speedily became black, and a large slough from the side of the face, of the dimensions of half-a-crown, came away. The child had been living in squalid poverty, was very badly fed, and in a state of most imperfect nutrition.

This occurred in November, when she was sent to the workhouse. In January, the greater part of the right upper jaw bone was dead, and readily came away, leaving only the second temporary molar and that portion of the jaw bone in which it was lodged*.

Mr. Fox, in his work on the Teeth, published in 1803, mentions similar instances of the loss of portions of jaw bone occurring after small-pox. "Effects," he says, "similar to those arising from the injudicious use of mercury sometimes attends that dreadful disorder, the small-pox. In the excellent museum of Mr. Heaviside are several specimens of exfoliations which have been occasioned by the deadly operation of that loathsome pestilence." And in another part he remarks: "Similar exfoliations sometimes take place in consequence of fever;" but he does not mention the particular kind of fever which caused it.

It is only under certain external conditions

* See a paper in the *Transactions of the Pathological Society* for 1860, by A. J. Salter, Esq.

that the poison of these diseases exert their injurious effects upon the jaws and their contents; were it otherwise, these cases would be far more common than is actually the case. It is in the present day extremely rare to meet with a case of exfoliation of the jaw bone after any of these disorders, unless the child has been also exposed to the depressing influence of bad air, want of cleanliness and proper food. The treatment of these cases must be conducted upon general principles; as the diseased bone becomes separated from the living it must be removed, and, in order to assist nature in this process, the patient should be removed into a healthy atmosphere, provided with a nourishing and liberal diet, while the strength is supported and the appetite improved by the administration of tonics. The mouth should be kept perfectly free from all offensive discharge, by frequent washing with tepid water, or, what is better, with a disinfecting gargle, of which the following is one of the best:

Liquor Sodæ Chlorinatæ	one ounce.
Water	eleven ounces.

The mouth may be frequently washed with this lotion, and in some cases it will be found convenient to place a strip of lint or a small quantity of cotton-wool, saturated with the lotion, over the part from where the offensive discharge issues.

CHAPTER V.

DISEASES OF THE GUMS IN INFANCY AND CHILDHOOD—THRUSH —STOMATITIS—CANCRUM ORIS.

THERE are certain diseases of the gums which are peculiar to early life; some depending upon the irritation produced by dentition, while others possess an epidemic character, but are only developed amidst want and misery, and such external circumstances as give rise to an impoverished condition of the blood, and render the child extremely susceptible to disease.

Occasionally, when the teeth are about to pass through the gums, the part over the summit of the tooth becomes inflamed and ulcerated, giving rise to a disease which has been termed *odontitis infantum*. Whenever there is difficult dentition, the gums are red, swollen, and tender over the coming tooth, and the part is exceedingly painful.

The remedy which should be applied is the free lancing of the gums; this will generally relieve not only the local, but also the constitutional disturbance which accompanies this condition of the mouth. It is not intended to imply that this alone is sufficient, because, if other organs have

become affected during dentition, they will, of course, require the usual means to be employed which are necessary to combat the symptoms that are present; but, unquestionably, the general treatment will have a much better chance of succeeding if the local irritation, the original cause and source of all the symptoms is relieved.

At other times the gum becomes thickened, and offers a serious impediment to the progress of the tooth, although it is neither red or tender. The same use of the lancet will be necessary as in the former case, but it should be made to penetrate sufficiently deep to liberate the tension over the coming tooth. The following case, taken from Tomes' *Lectures on Dental Surgery*, illustrates this condition, and shows the great relief afforded by freeing the tooth from the pressure of the hard indurated gum.

The child, a boy, seven months old, usually very healthy, became extremely irritable, the cheeks were flushed, and he cried frequently, without apparent cause; he slept badly and refused his food, or took it at irregular intervals. On examination the lower central incisors could be indistinctly felt in outline, on the anterior surface, but could not be at all distinguished on the ridge of the gums, which part was not more elevated than the adjoining gum; nor was it more florid. The gums were incised on the ridge over the central teeth,

and the lancet sunk three-sixteenths of an inch into the gum before it came into contact with the teeth. On the following day, at the same hour, each tooth could be seen above the level of the gums, so that the teeth must have risen, in twenty-four hours, more than the eighth of an inch. The child, too, had perfectly regained his comfort.

Children are very liable to a disease of the mouth termed thrush; it also occurs in the grown-up person, but it is far more frequent in infancy. The disease itself is of no great importance further than it is an indication of impaired nutrition, and a low condition of the vital powers. It consists of a number of white specs, looking like pieces of curd, covering the lips, cheeks, tongue, and gums; the specks fall off but are soon reproduced. This affection depends upon the presence of a minute microscopic plant, which, strange as it may seem, is so organised as to grow in the interior of the mouth.

Attention to the state of the digestive organs, sponging the mouth with cold water, and the application of a mild astringent lotion are the means which will effect a cure when the thrush is not complicated with any more serious disorder. A favourite application in this affection is one composed of borax and honey, but as the honey is apt to undergo fermentation it tends to favour the development of the plant, and it is therefore better

to use it in the form of a simple solution, composed of—borax one drachm, water one ounce. The application of this will generally cure the disease in a short time. Dr. Tanner, in his work on *The Diseases of Infancy and Childhood*, recommends a lotion in which the sulphite of soda is employed instead of the borax. This preparation, he says, will remove the disease from the mucous membrane of the mouth in twenty-four hours.

The secretions of the mouth are always unusually acid during the existence of thrush, and is probably the condition which favours the development of the microscopic plant. The secretions being acid, the sulphite of soda is decomposed, and sulphurous acid is set free, which destroys the parasite.

The mouth of the child is liable to inflammation, which may present itself under three different forms, named follicular, ulcerative, and gangrenous stomatitis (inflammation of the mouth).

The first affects the minute follicles, or glands of the mouth, and is the mildest of the three. The child has a difficulty in sucking; he is restless, feverish, and has but little appetite; the saliva is increased in quantity, and the glands beneath the jaw are swollen and tender. On examining the mouth, it is seen to be covered with a number of minute vesicles or bladders, which ultimately burst and leave an ulcerated surface

below; as one set of vesicles heal up, others make their appearance and go through the same changes. This state of the mouth may occur as a separate disease, or it may be associated with measles. In the first instance it generally depends upon a disordered condition of the stomach, which must be corrected before the mouth-affection can be cured; local applications are, however, useful, and may consist of the same remedies that have been recommended in the case of thrush.

The second, or ulcerative, is altogether of a different character; it commences on the margin of the gums, generally near the molar teeth, the part becomes swollen, tender, and of a dark colour; it soon passes into ulceration, which rapidly spreads to the neighbouring teeth, and may affect the cheek. The disease is only seen in children of a strumous and debilitated constitution, who have been residing in damp, unhealthy localities, deprived of fresh air and proper nourishment. The only cases I have seen occurred at the Westminster Dispensary; they were not of a severe character, and were cured by the local application of the nitrate of silver, aided by tonic medicines.

A few years ago the chlorate of potash was introduced as a remedy for this disease, and further experience has confirmed the use of it. Three grains dissolved in a small quantity of water may be given to a child, three years old,

every four hours, and five grains to a child of eight or nine. The remedy produces a marked improvement in the course of two or three days, and the cure is generally complete in eight or ten.

The third form, or gangrenous stomatitis, is by far the most serious, and is fortunately extremely rare. It occurs in children between two and five years of age, who have been prostrated by some previous disease; commencing on the inner surface of the cheek, the ulceration rapidly spreads to the neighbouring parts, and is accompanied with a most offensive discharge. The constitutional disturbance is very great, and the disease has generally a fatal termination.

All these diseases should receive the prompt attention of the medical man, and they have been mentioned here for the purpose of placing those who have the care of children on their guard, and in order that time may not be lost and the disease allowed to undermine the health of the child before the proper remedies are applied.

CHAPTER VI.

ERUPTION OF THE PERMANENT TEETH—FREQUENT LOSS OF THE FIRST MOLAR—RELATION OF THE TEETH TO THE AGE OF THE INDIVIDUAL—THE NATURE OF CERTAIN FOSSIL SKULLS, AND OF THE AZTECS DETERMINED BY THE TEETH.

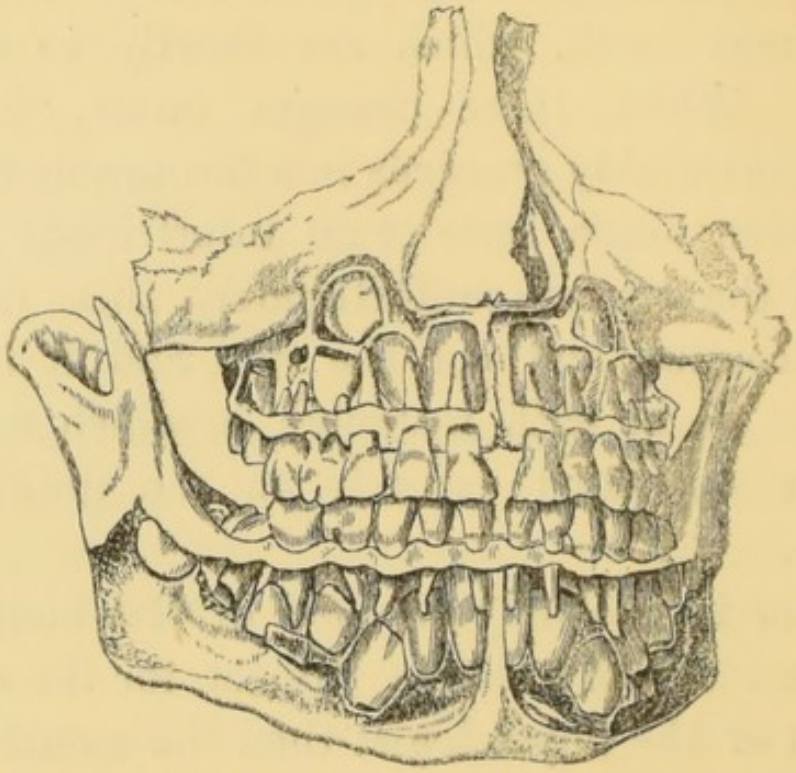
When the child has arrived at six years of age, and growth has proceeded favourably, a wide space will be seen behind the last molar tooth in each jaw occupied only by a covering of gum. When the second molar teeth of the temporary set cut the gum they are situated at the extremity of both jaws; but, between that time and the eruption of the permanent, the above space has been produced by the backward growth of the jaw. In this vacant portion are contained the germs of the two large grinding teeth more or less advanced, the first, or anterior one, most so; the second, or middle one, somewhat less; and the third or Wisdom Tooth still in a very rudimentary condition.

In addition to this backward prolongation of the jaw, the temporary incisors are often separated from each other, spaces having formed between

them preparatory to the appearance of the larger permanent teeth, which are shortly to succeed them. When these changes occur, dentition almost invariably proceeds in a favourable manner, and there needs little or no interference on the part of the dentist; unfortunately, these cases are the exception and not the rule, and it is rarely that we meet with instances in which dentition can be entrusted entirely to the guidance of nature.

There is probably no part of the body which offers a more interesting subject for the contemplation of the physiologist than the mouth of the child at this period. Each half of the jaw contains no less than eighteen teeth, or their germs, more or less advanced. First, there are the five teeth of the temporary set, which are shortly to be lost; then there are their successors, curiously lodged in sockets situated between their fangs; and, lastly, there are the germs of the grinding teeth belonging to the permanent set, all of which are more or less ossified, with the exception of the Wisdom Tooth, which is still in a soft and very rudimentary condition. This arrangement will be best understood by reference to Fig. 7 which represents the position and condition o, the two sets of teeth about the time when the first grinding teeth, belonging to the permanent set, ar e about to come through the gums.

Fig 7.



Temporary teeth, with portion of the jaws removed to show the germs of the permanent set.

In the upper jaw the permanent incisors are placed above and behind the fangs of the corresponding temporary teeth, but extend over the space occupied by the temporary canine. The germs of the bicuspids, the successors of the temporary molars, are placed immediately above them, between their expanded fangs. A knowledge of the relative position of these teeth teaches us how an abscess, situated around the fangs of the temporary molars, may injure their permanent successors.

The canines are seen placed deep in the jaw bones, which explains why these teeth are so often found protruding beyond the other teeth, although they may afterwards fall into the line of the

dental arch, as the jaws gradually increase in size; the position of the grinding teeth shows they have grown up in that portion which has been added to the jaw since the last temporary molar cut the gum.

It is very important to remember that the large molar or grinding teeth, Fig. 3 *m*, have no predecessors, nor are they ever reproduced when lost. It is the anterior or first of these grinding teeth, either that on the right or left side of the lower jaw, which is the first tooth, of the permanent set, to make its appearance, that on the opposite side coming about the same time. After an interval of some months the corresponding teeth in the upper jaw come through the gums. These teeth are usually cut between the sixth and seventh year.

These first double teeth of the permanent set are very liable to decay; thus, out of 3,000 teeth that were extracted from various causes, no less than 1,124 were first molars, or more than two-thirds of the entire number. It is very important that those who have the charge of children should be aware of this fact, because if taken in time the decay may be arrested, and the teeth preserved for many years. Unfortunately, from not knowing the period at which these teeth are cut, the parent mistakes them for one of the temporary grinders, and, believing that they will soon be shed and replaced by others, the decay is allowed to pursue

its course until an attack of toothache compels them to seek the assistance of the dentist, when they learn, to their dismay, that, instead of being a temporary tooth, it is one of the most useful of the permanent set that has been sacrificed from not being attended to sufficiently early. It frequently happens that a child is brought to the dentist on account of some slight irregularity in the front teeth, when, on examining the mouth, he finds one or more of the first grinding teeth already in a state of incipient decay, and by the timely application of the proper remedy, that is, by removing the decayed portion, and inserting a well-condensed gold stopping, he is enabled to preserve the tooth which a few months later would have been too far gone, or would only have admitted the application of an inferior kind of stopping.

These remarks are also borne out by the report given by Dr. Reid of the cases which came under his care in the Merchant Maiden Hospital, in Edinburgh, for the education of the daughters and grand-daughters of deceased burgesses of the city. The patients varied from seven to seventeen years of age. In eleven years Dr. Reid stopped 741 permanent teeth; and of these operations no less than 637 were performed on the first permanent molars. If it were not for this operation, the number of these teeth which would be lost,

large as it is, would be far higher. The importance of paying early attention to the condition of these teeth cannot be more forcibly illustrated than by the fact that of 1124 first molars which were extracted 681 were lost before the patients had attained their twentieth year.

The following Table shows the average time and the order in which the permanent teeth make their appearance, those of the lower jaw coming somewhat earlier than those of the upper :—

First molars	6½ years
Central incisors . . .	7 „
Lateral incisors . . .	8 „
First bicuspids . . .	9 „
Second bicuspids . . .	10 „
Canines	11–12 „
Second molars . . .	12–13 „
Third molars, or Wisdom Teeth	17–19 „

It is seen from the foregoing Table, that even after the first molar is cut that the remaining teeth do not come through the gums in the same order they are placed in the mouth, but that the bicuspids, which succeed the temporary grinders, precede the canines. It is in consequence of this late development of the latter teeth that, where the jaws are deficient in growth, the space they should have occupied has been encroached upon by the bicuspids, and the canines are thrust out of the dental arch. The after-growth of the jaw

will often do much to remove this defect, but more frequently the interference of art is necessary to remedy the result of the imperfect growth of the jaws. The means by which this can be accomplished will be noticed when speaking of irregularities of the teeth.

The remarks which have been made upon the frequent loss of the first permanent molar will also apply, in a less degree, to the second molar; thus, out of the 3,000 teeth extracted, 637 were second molars, and of these 196, or nearly one-third, were lost before the twentieth year; but if we extend the time to the twenty-fifth year, then the number mounts up to 325, or rather more than half. In both the first and second molars more are lost in the lower jaw than the upper; thus, of the 1124 first molars, 644 belonged to the lower jaw, and of the 637 second molars, 388 belonged to the lower jaw.*

The period at which the third molar, or Wisdom Tooth, makes its appearance is exceedingly variable; it is a common occurrence for it to be delayed until the thirtieth year, when, probably, either the first or second molar has been lost, and thus provided sufficient space to allow of the Wisdom Tooth coming through the gum, and assuming its

* For the numbers quoted in the above paragraph I am indebted to the valuable Statistical Tables published by Mr. Tomes, in his *Lectures on Dental Surgery*.

proper position in the mouth. In other cases, the eruption of one or more of the Wisdom Teeth does not occur until the person is fifty or sixty years of age, and it may be that they never emerge from the cavity in which they are developed. The eruption of these teeth is often attended with very considerable pain and annoyance to the patient, while occasionally it gives rise to very serious and even dangerous symptoms.

It is well known that the jockey and the dealer in horses can, up to a certain time, accurately determine the age of the animal by the number and condition of its teeth. The same means will enable us within certain limits to ascertain the age of the child; but the numerous circumstances which derange the proper course of growth and delopment in civilized man diminish the accuracy and value of the results. When the Factory Bill was passed, prohibiting the employment of children below a certain age, one difficulty in enforcing the law was the want of proper data for determining the age of the child; the parents, from ignorance or from interested motives, being either unable or unwilling to afford the necessary information. An inquiry was therefore instituted as to how far the age of the child could be determined by the condition of its teeth. The result of this investigation was published by Mr. Saunders, in his work entitled *The Teeth a Test of Age.*

The teeth selected for the above purpose were the first and second molars of the permanent teeth, and the following are the conclusions which were arrived at:—

First, that at nine years of age all the first permanent molars are developed. Second, that at thirteen years of age all the permanent teeth are developed, with the exception of the Wisdom Teeth. "Thus, then, it appears," says Mr. Saunders, "that, of 708 children of nine years of age, 389 would have been pronounced, on an application of this test, to be near the completion of the ninth year; that is, they presented the full development of that age. But on the principle already stated, that of reckoning the fourth tooth as present when the three are fully developed, a still larger majority will be obtained, and, instead of 389, the proportion will be as follows:—Of 708 children, no less a number than 530 will be fully nine years of age. What, then, are the deviations in the remaining 178? They are the following:—126 would be pronounced eight years and six months, and the remaining 52 eight years of age; so that the extreme deviations are only twelve months, and these only in the inconsiderable proportion (when compared with the results obtained by other criteria) of 52 in 708.

"Again, of 338 children under thirteen years of age, no less than 294 might have been pro-

nounced with confidence to be of that age. The remaining 44 would have been considered as follows:—36 in their thirteenth, and 8 near the completion of their twelfth year."

These facts have an important bearing in certain medico-legal cases where it is necessary to determine the age of the individual; they are also interesting in a scientific point of view, and on some occasions have enabled the inquirer to give a precise and definite answer to questions which would otherwise have remained in dispute. An instance of this kind forms the subject of a paper communicated by Baron Cuvier to the Academy of Science of Paris, in 1816. A human skull had been found, of extraordinary size and thickness, among the hills of the village of Lacy. M. Jadelot, who has given the most accurate account of it, regarded it as a monstrosity resulting from disease which had produced softening and swelling of the bone, while the thickness and density were due to the presence of carbonate of lime deposited after interment. Other writers regarded this relic as the evidence of the existence of an extinct race of giants having a stature of between ten and thirteen feet. Much discussion ensued upon this and some similar skulls which had been found elsewhere, but, while the disputants ranged themselves on opposite sides, none of them inquired into the actual age of the individuals to whom the skulls

had belonged, or doubted that they had attained maturity.

"I was most astonished," says Cuvier, "in this long discussion, that none of the eminent men who had taken part in it thought of ascertaining what might have been the age of this and of the analogous heads."

The great French anatomist at once perceived the importance of this question, and that, by determining it, the whole matter might be set at rest. "The first aspect of these heads," he observes, "gave me the impression that they did not belong to adults; and, feeling the importance of determining this question, I set to work to verify this first impression. The age of a skull, whatever deformity it may present in consequence of disease of the osseous system, may always be pretty nearly ascertained by the appearance and number of the teeth."

After giving some reasons why this should be the case, he continues:—

"Applying these considerations to the skulls in question, I found in that obtained from Darmstadt the alveoli of six teeth on each side, namely, two incisors, one canine, and three molars. In the lower jaw, of which only the left half was found, the alveoli of the third molar was not at all apparent."

This observation suggested at once that the

individual was of the age of six or seven years, and that the teeth which had occupied the alveoli were milk teeth; in fact, it is about the sixth or seventh year that the first permanent molar begins to make its appearance. And, at about the same period, the front teeth begin to fall, and give place to the permanent set.

After discussing minutely the condition of the teeth in the other skulls, Cuvier concluded that everything combined to prove that the crania under examination were the skulls of children who had died at the epoch of change of the teeth, and in whom the change was incapable of being accomplished. The children had, no doubt, been afflicted with water on the brain, which had produced an extraordinary distension of the bones of the skull. The thickening and other changes had been the result of interment.

Another application of these principles occurred somewhat recently in the case of the so termed Aztec Liliputians.

These unfortunate specimens of humanity were brought over to this country, in 1853, from America. They consisted of a boy and a girl, said to be aged respectively 17 and 11; they were represented as descendants of the ancient Aztecs, the dominant tribe in Mexico at the time of the arrival of the Spaniards. The height of each child was under 3 feet. Their figure

was slender and not ill-proportioned; that which was chiefly remarkable being their features. While the forehead and chin receded, the nose was so singularly prominent as to suggest the idea of the face of a bird, yet, with dark lively eyes, an olive complexion, and glossy long black hair, and a great fund of good nature, they were far from unpleasing. They spoke no intelligible language, but understood a few words of English, and seemed to have a taste for music. Shown to the public as curiosities, they were usually exhibited on a large table, on which they ran about amusing themselves. Their exhibitor told a very incredible story of how they had been obtained from the ancient city of Ixmiaja, where they were reverenced as gods. A certain Senor Velasquez, in company with a Canadian and an American, penetrated into the ancient city of Central America, where they made the acquaintance of one of the guardian priests of these undersized deities, who was so charmed with the accounts of the outer world, that he resolved to steal the gods of the people and escape with the strangers. One after the other, the Canadian, the American, and the priest were overtaken by disaster, and Velasquez alone was left to tell the wondering tale, with no attestation but such as the children themselves furnished.*

* *Chambers's Encyclopædia.*

Upon examining the mouth of these children, Dr. Reid found that, in the boy, the upper jaw contained eleven teeth, three of which were temporary teeth, namely—the left canine, and two molars, one right and one left. The remainder were permanent teeth, and included the central and lateral incisors, the first bicuspis on either side, and the *two first permanent molars.*

In the girl, dentition was not so far advanced, and the only teeth belonging to the permanent, which were present, were the first permanent molars and the central incisor on the left side of the lower jaw. In the upper jaw none of the temporary teeth were shed.

The conclusion arrived at was that the boy was about 12, and the girl 8 years of age, thus disproving the statement of the person who had charge of them, whose object was, no doubt, to increase the interest belonging to their diminutive stature by placing them as near adult age as possible.

Professor Owen, from examining the physical condition of their bodies, arrived at the same conclusion as Dr. Reid with regard to their respective ages. The children were, no doubt, stunted in their growth, and had probably belonged to some Indian tribe from whom the exhibitor obtained them.

CHAPTER VII.

ERUPTION OF THE PERMANENT TEETH—SUPERNUMERARY TEETH—CAUSES OF IRREGULARITY—EXAMPLES OF, AND MODE OF TREATMENT—IRREGULARITY OF THE WISDOM TEETH—DISORDERS OCCASIONED BY—CASES.

THERE is hardly any defect of the front teeth which attracts more general attention than crowding or irregularity. This imperfection is apt to give an unnatural expression to the countenance, which often mars the effect of the most pleasing features; it also alters the voice of the speaker, producing an indistinctness of utterance, which renders him liable to be misunderstood; and it unquestionably predisposes the teeth to the accumulation of tartar and to decay.

When we consider the complicated nature of the process by which the temporary teeth are shed, and the permanent brought forward to take their places, it is not to be wondered at if, under an artificial mode of existence, nature should sometimes fail in accomplishing this change with all the perfection that usually characterises her operations.

The six anterior permanent teeth are larger than their predecessors, and necessarily occupy a greater space, although this may, to a certain extent, be provided for by the smaller size of the bicuspids as compared with that of the temporary grinders, yet, as already remarked at page 46, this alone is not sufficient to furnish the necessary room.

In order that the permanent teeth should be perfectly regular, the jaws must have gradually increased, and the fangs of the temporary teeth must have been absorbed, so that these teeth may be ready to drop out at the proper time; the permanent teeth must have been properly placed in the several cavities or sockets provided for their reception in the jaw bones, and the teeth themselves must have been duly nourished and developed, or they will not be prepared to come forward at the appointed time, and other teeth coming through the gums will encroach upon the space they ought to have occupied.

The absorption of the fangs of the temporary teeth is accomplished by means of a small fleshy mass which arises at the bottom of the socket, and attaches itself to the extremity of the fang. In extracting one of these teeth when absorption has commenced, this fleshy mass is often brought away adhering to the tooth; examined by the microscope, it is seen to consist of a number of nucleated cells, which appear to be the immediate

agents by which the particles of osseous matter are removed. Besides the absorption of the temporary teeth the process involves a constant and progressive change in the surrounding parts; as the temporary teeth are removed, so must the socket be destroyed, partly by absorption, partly by the deposition of new bone, which fills up the space vacated by the teeth. Similar changes occur in the sockets where the permanent teeth are lodged, while, at the same time, the teeth continue to grow; as the latter come forward, the anterior portion of the socket must be removed, while, at another part, deposit of bone must be taking place, until at length, by the conjoint action of these several changes, the temporary tooth is removed from the mouth, its socket filled up, the permanent tooth brought forward and lodged immediately beneath the gum, which it finally pierces, and then gradually assumes its proper position in the mouth.

Irregularity of the teeth may arise from a contracted condition of the jaw, producing want of space, from misplacement of the germs of the teeth in the jaw, from a wrong direction having been given to the tooth during its growth, and from the presence of supernumerary teeth. We shall endeavour to illustrate the effects of these several causes, and then speak of some particular cases of irregularity.

The presence of a supernumerary tooth may be determined by examining the mouth, and ascertaining whether the proper number of teeth are present exclusive of the one under consideration.

In addition to this, as a general rule, the supernumerary tooth is both malformed and misplaced. The crown is of a conical form, sometimes deeply indented, the fang irregular, and the tooth misplaced; sometimes projecting from the outer surface of the jaw, and at others situated on the palatal surface.

Supernumerary teeth are met with more frequently in the upper than in the under jaw, and at the anterior than at the posterior part of the mouth.

Sometimes these supernumerary teeth appear in pairs, and are arranged symmetrically on either side of the mouth, and occasionally they are larger instead of smaller than the average size of the tooth they most resemble. Supernumerary canines, says Harris, rarely if ever occur, but supernumerary bicuspids are sometimes met with; he had seen three examples of the sort. In each case the teeth were very small, not being more than one-fourth as large as the natural bicuspids, with oval crowns, and placed partly on the outside of the circle, and partly between the bicuspids.

Very rarely a supernumerary tooth will make its appearance in the line of the dental arch, and so closely resembles one of the neighbouring teeth

that it is impossible to say which really is the additional one. I have seen this happen in the case of the lateral incisor of the upper jaw, and also in one of the bicuspid teeth.

The treatment of these cases is exceedingly simple, but depends upon the position of the tooth. In the last case referred to, the teeth being in the proper line and producing no inconvenience or injury to the person, it would of course be allowed to remain. In regard to the others, if the teeth are placed on the exterior of the jaws, and towards the anterior part of the mouth, they project, are unsightly, and, in the event of a fall or blow, would probably severely injure the lip. On the other hand, if they are placed on the palatal surface of the jaw, they come in the way of the tongue, impede the pronunciation, and very often injure the other teeth by causing them to be thrust out of place in closing the mouth. As a general rule, these teeth should, therefore, be extracted; and it is best to perform the operation as early as possible, first, because the sooner they are removed the less injury they cause to the other teeth; and, secondly, because their fangs not being so perfectly formed, are softer, more yielding, and not fixed so firmly in the jaw as they would be at a later period, when the teeth are more perfectly developed. I have never found any difficulty in removing either a permanent tooth or a super-

numerary as soon as ever the crown had made its appearance through the gum.

When the supernumerary tooth is situated far back in the mouth, and produces no inconvenience, it is not necessary to interfere with it.

These supernumerary teeth are seldom more than one or two in number. The most remarkable instance of a greater number, with which I am acquainted, is a case published in the *Quarterly Journal of Dental Science*. In that case there were no less than eleven teeth at the anterior part of the upper jaw, corresponding to the portion usually occupied by the six anterior teeth. Five of these teeth were supernumeraries projecting from the palate, and throwing the other six teeth very much out of place.

The opposite condition to the above, that is, the absence of one or more teeth, may also be productive of irregularity, but here the injury is rather of a negative than of a positive character, and at the most gives the appearance of a tooth having been lost.

A central or a lateral incisor, or, sometimes, both centrals or both laterals, may be absent. The same thing may occur with respect to the canines. With regard to canines in the upper jaw, I would observe, that sometimes this arises from these teeth being placed so deep in the naxillary bone, and the other teeth closing up the

dental arch, that nature seems to make no effort to bring them forward; but in after-life, when the other teeth have been lost, the canines become liberated from their long imprisonment and pierce the gum, leading the person to suppose that he is cutting a third set of teeth.

It would appear from the following case, that the absence of a tooth may become hereditary, nor does there seem any reason why this hereditary disposition should not occur with regard to the teeth as well as regards the absence of a particular finger or toe. We often see children possessing just the same irregularity or defect as that which is present in the teeth of one of the parents.

"A very interesting case," says Mr. Robinson, "came under my care, in a family I have attended for many years, and had, therefore, every opportunity of observing the development of the second dentition. In the mother, the left lateral was deficient, and, with one exception, the same deficiency exists in all her children. In another family a somewhat similar freak of nature occurred. In the father there was a deficiency of the lateral incisor in the upper jaw, and the first bicuspid in the lower jaw; the canines in the upper had arranged themselves by the sides of the centrals, leaving a space between the canines and the bicuspids. Of his two children,

one sixteen years of age and the other fourteen, the deficiency of the laterals and bicuspids in the lower jaw existed in the former, whilst in the younger the laterals only were missing. The maxillars in both the preceding cases were well and beautifully developed. The same remarks will apply to the parent of the children."

At one of the meetings of the Medico-Chirurgical Society, Dr. Thurnham described the case of two cousins, who were distinguished through life by the almost complete absence of the hair, by the teeth not being more than four in number, by the delicate and defective structure of the skin, and by the absence of sensible perspiration and tears.

Other instances are on record where the mouth was entirely devoid of teeth. Botallus gives the case of a woman, sixty years of age, who never had a tooth; and Beaumes, that of a man who was similarly circumstanced.

It is scarcely necessary to say that in such cases nothing can be done to remedy the defect, unless the space were sufficiently large, and the condition of the mouth such as to justify the insertion of artificial teeth.

When the temporary teeth are retained in the mouth beyond the proper period, they often give a wrong direction to the permanent teeth, thrusting them either backwards or forwards or to one side.

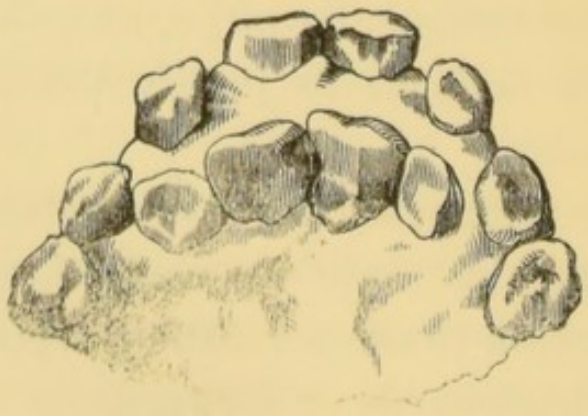
The extraction of the temporary teeth, which

formed the impediment, will greatly improve, if it does not altogether correct, this kind of irregularity. The extent to which the misplaced teeth recover their proper position when the obstructing teeth have been removed, is often very surprising.

It is a common occurrence to have the lateral incisors in the lower jaw misplaced by the retention of the temporary laterals, or more frequently of the canines, beyond the proper time. The permanent teeth may eventually partially recover their position, but they will always remain crowded, and the dental arch irregular.

In the lower jaw this misplacement is of slight importance compared with the irregularity which the same cause, viz., retention of the temporary teeth, occasionally produces in the upper jaw, when the child's mouth has been totally neglected. Naturally, the six front teeth of the upper jaw, when the mouth is closed, come in front of the corresponding teeth in the lower; but if they

Fig. 8.



The permanent teeth growing on the palate in consequence of the temporary not being shed.

come through the gum on the surface of the palate, as shown in Fig. 8, unless some means are taken to alter the position of the teeth before they reach the level of those in the lower jaw, a very unsightly condition of the mouth is produced, and one which is not easily corrected. The upper teeth, as they come down, passing behind the teeth in the lower jaw, the patient is what is commonly termed underhung; once the teeth acquire this position, the deformity is permanent, because, in the act of closing the mouth, the lower teeth, passing in front of the upper, must necessarily prevent them from ever coming forward.

This irregularity can only be cured by the patient wearing a plate, so constructed as to keep the teeth sufficiently apart to allow of those in the upper jaw being moved forward, until they pass in front of those in the lower, when the mouth is closed. Once this is accomplished, the cure is complete, and there is no fear of the irregularity recurring, since the lower teeth will now as effectually retain the upper in their proper position as they did previously in their irregular position.

The same kind of irregularity more frequently happens to one or two teeth; thus, one of the central incisors of the upper jaw may close behind the corresponding teeth in the lower, or the centrals may be in place, and the lateral in-

cisors close behind the lower teeth. Whether all the six front teeth are involved, or whether the irregularity is confined to one or two of them, it is still necessary that the patient should wear a similar plate to the one just mentioned, but the treatment will not require to be extended over so long a time in the latter as in the former case.

Another cause of irregularity is the want of space arising from a contracted condition of the jaw.

The teeth which suffer most frequently, from want of growth in the jaws, are the canines, especially those of the upper jaw. We have already seen that the teeth are developed high up in the maxillary bone (Fig. 7), and before they come into place, the incisors, the bicuspids, and the first molar, have assumed their position in the mouth. In consequence of this, if the jaw is contracted, the space which ought to be occupied by the canines is encroached upon by the neighbouring teeth, and the former are thrust out of the dental arch.

The treatment of these cases sometimes requires considerable judgment and experience, while at others they are amongst the most simple with which the dentist has to deal. The canine is a very important tooth, marking as it does the prominent angle of the mouth, and giving much of the expression which belongs to the mouth; it is also one of the last teeth to decay, and, conse-

quently, it should never be sacrificed if it can possibly be avoided.

When the canine only projects a little way beyond the other teeth, and the patient is young, all operative interference should be delayed, in the hope that as growth proceeds the jaw will become enlarged, and allow the canine to fall into the line of the other teeth. When time is thus given, nature will frequently correct the deformity, and an irregularity that, at twelve or thirteen years of age, was very unsightly, will be scarcely perceptible when the person has arrived at the age of fifteen or sixteen.

Where the projection is so great as to afford no prospect of the irregularity being remedied by the process of growth, a tooth must necessarily be extracted to make room for the canine to fall into its proper place, the choice lying between one of the bicuspids and the first molar. We have previously seen that the latter tooth is one of the first to decay, and is, therefore, more liable to be lost than any other. This being the case, if the first molar is decayed it should be removed in preference to either of the bicuspids; the latter teeth must then be pressed backwards, and the canine brought into position. This plan is only applicable to a limited number of cases, and in the majority it is necessary to sacrifice one of the bicuspids. It is very difficult to lay down any

precise rule as to which of these teeth should be selected, but it is evidently desirable to retain the first, or the one nearest the anterior part of the mouth, if possible; and I am of opinion that this can generally be done where the space between the lateral incisor and the bicuspis is equal to half the width of the canine, but where it is less than this, in the majority of cases, it will be desirable to remove the first. Some consideration must also be paid to the condition of the patient, particularly as to whether he is residing at a distance or near at hand, where he can be seen as frequently as required.

The removal of the first bicuspis is always the simplest and quickest mode of treating these cases, because when this is done, the canine naturally falls into the vacant space, and nothing more is required; but when the second is extracted, it will be necessary to see the patient at intervals, in order to press back the first bicuspis into its place, before there will be sufficient space for the canine. These remarks apply with still greater force to the plan of removing the first molar.

The canines are also liable to be placed too far in, so that when the mouth is closed, they pass behind the lower teeth. This irregularity is seldom met with, compared with the one which has just been considered. If there is room for the tooth to come forward, then the same treat-

ment will be required as was mentioned when speaking of the central teeth, passing behind the lower; if the space is too small, then one of the bicuspids must be removed.

Lastly, there are some cases where the canines are so far out of place, that there is no alternative but to remove them.

When a bicuspis is misplaced, it may project outwards towards the cheek, or inwards towards the tongue. If the irregularity is slight, it may be allowed to remain, but should it be otherwise, it is generally accompanied with a crowded condition of the jaw, and the misplaced tooth had better be removed.

Sometimes one or more of the front teeth are in their proper places, but badly arranged, being twisted in their sockets, so that the side of the tooth is turned towards the front of the mouth. These irregularities can generally be overcome, and where the misplacement is slight, without much trouble; but in extreme cases, where the tooth is twisted halfway round, so that the sides occupy the position that belongs to the front and back of the tooth, the case is very troublesome, and will require much patience and perseverance, both on the part of the patient and the dentist. Some practitioners boast that by a skilful twist of the tooth they can immediately restore these teeth to their proper position, and that no ill effects will

follow the operation. I neither disbelieve the possibility of such an operation, nor do I deny that it may have succeeded, but I am quite sure it is accompanied with considerable risk of inflammation, and even more serious results. Let the reader recall to his recollection what has been said at page 51, of the influence which the constitution or temperament of the patient exercises over certain operations, and he will readily understand the different results which may ensue in different persons from the same cause.

The operation of torsion, as it is termed, should certainly not be used until gentler means have been found to fail.

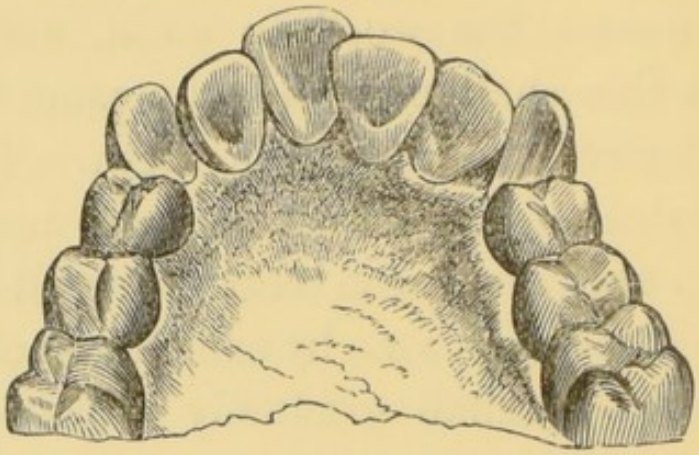
Two things are necessary in the treatment of irregularities of the teeth; first, room must be obtained where that is wanting, by the extraction of one or more teeth; secondly, a point of resistance must be provided, from which pressure may be exerted upon the misplaced teeth. To accomplish the latter, a frame is accurately fitted to the mouth, composed of gold or vulcanite, and brought up either behind or in front of the irregular teeth, according to the direction in which they are to be moved, whether inwards or outwards. The portions of the frame brought up against the misplaced teeth form the points of resistance; into these, are inserted pieces of hard wood, which are compressed before using them, and must be

perfectly dry; when placed in the mouth, the moisture causes the wood to swell, and care is taken that this shall occur in the same direction as it is desired to move the teeth. There are other contrivances by which pressure may be exerted upon the misplaced teeth, but all of them act in the same way, viz., by exerting such a force on the tooth as shall gradually move it in the direction which is necessary to bring it into its proper position.

It would be inconsistent with the character of the present work to enter into minute details of the manner in which the various cases of irregularity are to be treated, neither would it be possible to render the subject intelligible without the aid of numerous engravings. The object has been, first, to point out the means by which irregularities of the teeth may be avoided; and secondly, to describe the general principles upon which they are to be treated, and to show how far they can be overcome.

Fig. 9 represents a case where the central and lateral incisors on the right hand side of the drawing project considerably inwards, the lower teeth closing in front of them; the canine on that side is nearly in its proper place, but the bicuspids project somewhat inwards. On the left side the teeth are irregular, but the lower teeth did not close in front of them.

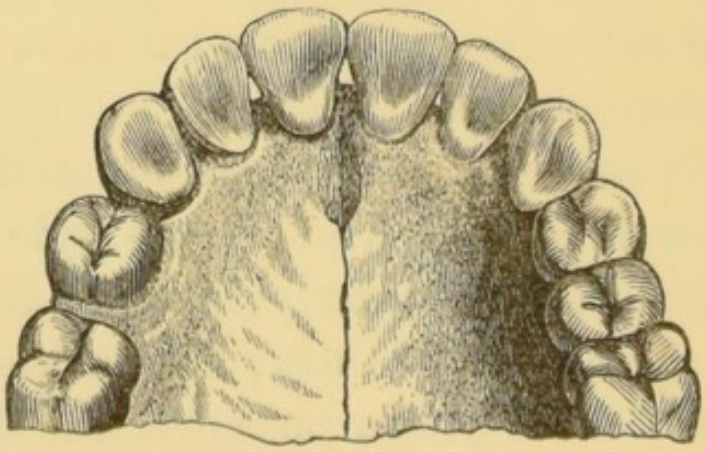
Fig. 9.



Case of irregularity in a female, aged 23.

Fig. 10 represents the same case after treatment. In order to obtain room, so as to allow the irregular teeth to come into position, it was necessary to remove a tooth. For this purpose the first bicuspis on the right side of the mouth was selected; in the drawing this comes on the right hand where there is only one instead of two of these teeth.

Fig. 10.



Represents the same mouth as in Fig. 9, after the teeth had been brought into place.

The length of time which the treatment of these

cases occupies, varies according to circumstances, from a few weeks to several months, but in all of them a successful result materially depends upon the perseverance of the patient. It is useless to undertake a difficult and tedious case of irregularity, unless we can rely upon the patient adhering strictly to the rules laid down for him. Even when the teeth are in place, it is often necessary for the plate to be worn for some time after,—certainly at night, if not in the day time,—in order that they may become securely fixed in their new position by the deposition of additional bony matter around them, before they are submitted to much pressure from the opposite teeth.

The wisdom teeth, especially those of the lower jaw, are subject to a form of irregularity which is often accompanied by great suffering, and may produce even dangerous symptoms. We have previously learnt that these are the last teeth of the permanent set to make their appearance; generally speaking, they have cut the gum by the twenty-fifth year, but in many cases this does not happen until the fiftieth or even sixtieth year of life.

Whenever the eruption of these teeth may take place, they ought to be arranged at the back of the jaw in a line with the other teeth, but sometimes they acquire a wrong direction, and the crown projects either outwards or inwards. In the one case the tooth becomes buried in the

cheek, producing more or less inflammation, while in the other it irritates and annoys the tongue; in either case it is necessary that the tooth should be removed; and in doing this great caution must be exercised, for if the tooth is broken and the fangs remain in the mouth, they may give rise to very serious symptoms and to great bodily suffering.

Another position in which the lower wisdom tooth presents itself is with the crown coming forwards against the back of the second grinder. When this occurs and there is want of space at the back of the jaw, the fangs being placed in the opposite direction, instead of passing downwards, produce very great pressure upon the jaw bone; in many instances violent inflammation has arisen, leading to the formation of abscesses and to the destruction of a portion of the jaw bone. The remedy is to extract, if possible, the wisdom tooth; but, if this cannot be effected, then the second grinder should be removed; and the pressure being by this means taken off, the inflammation will often subside of itself, but no treatment will avail until this has been done.

The two following cases are recorded in the *Medical and Surgical Journal* for 1841:—

A lady, 29 years of age, sought advice on account of a painful tumour on the cheek, which

had existed for several months. On examination, it was found to arise from the wisdom tooth projecting horizontally outwards and lodging in the substance of the cheek. So soon as the mouth could be opened sufficiently wide the tooth was extracted, and the patient quickly recovered.

A gentleman, 45 years of age, had suffered from an ulcer on the side of the tongue, near its base. For this the patient had been salivated, which only made it worse. It was afterwards found that the wisdom tooth on that side projected inwards, and had occasioned the ulcer on the tongue; the tooth was removed, and the ulcer healed in a few days.

Many persons have pain and swelling of the gum while the wisdom teeth are being erupted in some a simple incision of the gum, reaching down to the tooth, will give relief, or it may be necessary to remove a small portion of the gum. Unless the part is very much inflamed this operation really causes very little pain, for naturally the gum is not very sensitive, although it may become most acutely so when inflamed and ulcerated.

In cases of this kind the pain and swelling usually last for a week or two, and subside when the tooth has made its way through the gum; but in other cases the inflammation increases, and terminates in the formation of abscesses, which

extend along the jaw bone and open on the exterior of the face by one or more apertures, through which matter is discharged, and will continue to be so until the tooth is removed. It is very important that the patient should seek advice at the commencement of these disorders, not only because of the pain and inconvenience he suffers, but also on account of the difficulty attending their treatment at a more advanced stage, owing to the inability of the patient to open his mouth, in consequence of the increased swelling and pain in the parts around the joint and about the angle of the jaw.

These severe forms of disease more frequently come under the notice of the medical practitioner than of the dentist, and we must therefore avail ourselves of the records of medicine and of surgery to illustrate this portion of dental pathology. In a lecture upon the derangements produced by the wisdom teeth, M. Roberts refers to no less than three cases that were then in the Hôtel-Dieu, in all of which the patients were suffering from the impediment which existed to the development of one of the wisdom teeth, showing that these more serious complications, which sometimes accompany the process, are not so rare as would generally be supposed.

A man, aged 32 years, who was otherwise strong and in good health, had suffered for two years

from pain opposite the last molar tooth on the left side of the lower jaw. An abscess formed which opened on the side of the mouth, and afterwards by another opening near the chin. A surgeon succeeded in closing this up by an operation, but it soon re-formed, and has continued to discharge pus ever since. The patient then consulted a dentist, who for six weeks made use of iodine injections, probably misled by the situation of the opening and the fact of the teeth being sound, but of course the treatment was of no avail. He then consulted another dentist, and requested him to remove the tooth; this person however made excuses, and declined to operate. Lastly, the patient presented himself to an itinerant operator, who correctly referred the symptoms to the wisdom tooth, and recommended him to have the tooth in front of it removed. This was done, but did not answer, and the man remained in the same condition as before. He then entered the hospital, when it was found that a probe, passed in at the opening near the chin, close to the back of the jaw, struck against a hard substance which proved to be the wisdom tooth. The tooth was then removed, and in three days the patient was able to leave the hospital, cured.

It is astonishing how far the matter arising from one of these teeth will occasionally burrow,

instances having occurred where it has even opened as low down in the neck as the collar bone. In the last case, the extraction of the second molar failed because the wisdom tooth was extensively diseased; but if the operation is performed before this has taken place, as in the following case, recorded by Velpeau, then it may succeed :—

A lady, aged 22, had a dull aching pain at the angle of the jaw on the left side of the face, which soon extended to the adjoining teeth, but was distinct from toothache. As the pain continued to increase in intensity for several months, it was thought to be rheumatism, and was treated as such, but without any good effect; then blisters, and a seton at the back of the neck, kept open for a month, were tried, and opiates given, but all to no purpose. She went and resided at a watering-place for some time, but came back to Paris nothing benefited. All this time the teeth were sound in appearance, the gums healthy, and nothing denoted the eruption of a wisdom tooth. However, upon making a section into the gum, over the wisdom tooth, it was found to be arrested in its progress in consequence of the direction it had taken, the crown having come directly forwards against the posterior surface of the second molar. The second molar was extracted, and the patient immediately released from her suffering.

Other symptoms and disorders often arise from

the development of the lower wisdom teeth, such as enlargement of the tonsils, neuralgic pains, headaches, stuttering, epilepsy, and even insanity. Dr. Fricard, when a student, was attacked, in the summer of 1821, with pain in the throat, and in the following November with severe inflammation of the right tonsil. This was subdued for a time by antiphlogistic treatment, but the pain soon returned, and continued, in spite of every means, up to the year 1823. The teeth and gums appeared to be perfectly healthy, and the surgeon was about to extirpate the tonsil, when it was discovered that the wisdom tooth on the affected side was not through. The gum was now freely divided, but the portions of the divided gum inflamed, and had to be removed with the knife and caustic. The tooth was thus completely freed, and the obstinate inflammation of the tonsil soon disappeared.*

Dr. Ashburner attended a young woman, 19 years of age, of light hair, fair complexion, and rather stout, who for several months had perspired profusely at night; her breath was very offensive, the bowels costive, and she shouted, moaned, and talked in her sleep. One day she fell into a fit, for which a physician ordered her to be bled, and she recovered sufficiently to attend as an out-door patient at the dispensary. Three

* Velpeau.

weeks after she had another fit. It appeared she had been very odd and nervous in her manner, and often cried out from cramp in the legs, which was succeeded by her thumb being drawn in towards the palm of the hand, and her fingers being clenched upon it. The patient was in a state of tetanus, that is, the body was stretched out and the muscles were perfectly rigid. When the mouth was examined, the upper wisdom teeth were in place, but those in the lower jaw were covered with a hard cartilaginous substance; this was freely cut through with the lancet, and the young woman was relieved instantly.

M. Esquirol informed Velpeau that he had a case of mental derangement where the patient was restored to reason by a crucial division of the gum, which liberated the wisdom tooth.

CHAPTER VIII.

STRUCTURE AND ORGANIZATION OF THE TEETH—DENTINE, ENAMEL, CEMENT—CHEMICAL COMPOSITION—STRUCTURE OF PULP, BLOOD-VESSELS, AND NERVES—MEMBRANES OF THE TOOTH.

BEFORE describing the diseases to which the teeth are liable, it is necessary to glance at their structure and organization. A knowledge of structure forms the basis of all surgical and medical practice, and is equally necessary for those who desire to understand the nature and character of disease.

For the convenience of description, every tooth is mechanically divided into three parts, namely, the crown, the fang, and the neck.

The crown forms what is familiarly termed the body of the tooth; it is that portion which projects above the gum, and is distinguished by possessing a covering of enamel, that gives the white glistening appearance to the tooth.

The fang is the part received into the socket; this is also characterised by possessing an outer layer of bone upon its surface, commonly termed the cement, or *crusta petrosa*.

The neck marks the union of the crown with the fang; it is a narrow line immediately beyond

the termination of the enamel, and to which the gum is attached.

Anatomically the tooth consists of hard and soft parts. The hard parts constitute what is generally recognised as the tooth; internally, it is hollowed out, the cavity assuming somewhat the same form as the exterior; it is termed the pulp cavity, or the cavity of the tooth, and contains the pulp of the tooth with its nerves and blood-vessels.

The soft parts consist of the pulp, of a membrane covering the fang, termed the periosteum* of the tooth, and, lastly, of a kind of doubtful membrane placed on the enamel, named after its discoverer, Nasmyth's membrane. Each of these parts must be examined separately.

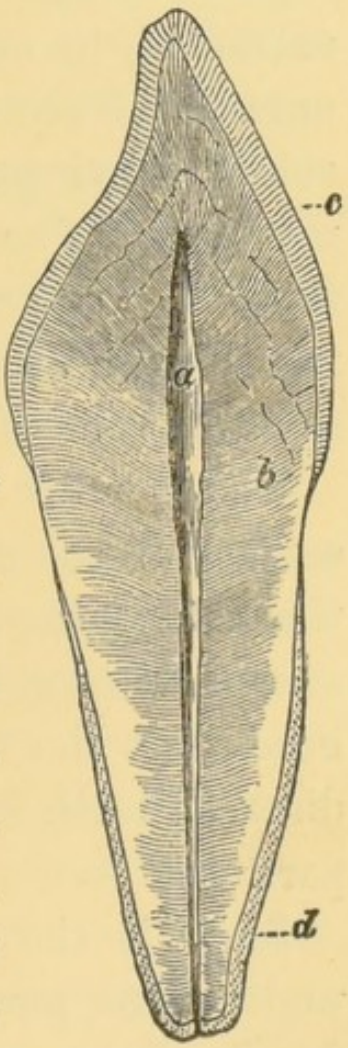
The real structure of the tooth has only been ascertained since the compound microscope was rendered available for the use of the anatomist. The mode in which the teeth are to be examined is by making thin sections of them, cut in different directions, and then grinding the sections down until they are reduced in thickness as far as possible. The surfaces of the section must be polished, in order to get rid of all scratches and irregularities, and it is then to be mounted on glass. The section may either be placed upon a plate of glass with another thin piece over it, or it may be saturated with Canada balsam, by

* *Periosteum*, around the bone.

means of heat. When the balsam has acquired a certain consistency, a piece of the thin glass is to be placed over the section as before, and carefully pressed down to exclude all air bubbles. The preparation should then be laid aside for the balsam to harden, and any that remains beyond the margin of the thin glass, removed by means of a knife, and by washing with ether or spirits of turpentine.

When a section is taken from the middle of a tooth as in Fig. 11, the pulp cavity (*a*) is seen occupying the centre, while around it is an opaque white substance (*b*), the dentine,* forming nearly the whole of the tooth; on the crown is a thick coating of enamel (*c*), and if the tooth has belonged to a person of middle age, a narrow line (*d*), having a different appearance to the opaque white mass in the centre, covers the surface of the fang. This structure has received the name of cement, because in some of the lower animals it cements or joins the different portions of the tooth together.

Fig. 11.



* Dentine, from *dens*, a tooth.

This is all that can be perceived by the unassisted eye, but on examining such a section with a magnifying power of seven or eight diameters, the central mass of the tooth, or the dentine, is seen as a beautiful clear white ground, with numerous fine dark lines passing from the pulp cavity to the exterior of the tooth, that is as far as the under surface of the enamel and the cement. The lines are perfectly black, and the general appearance of the section varies according to the age of the person from whom it was extracted, its condition at the time, and the thickness of the section. The enamel is of a brown colour, varying in intensity; in different parts it is marked by fine lines, which pass perpendicularly from the surface of the dentine to the exterior, running parallel to each other. These mark the separate rods of which the enamel is composed.

The narrow line of the bony matter on the surface of the fang is of a different character to the two former; it is very thin, and almost structureless at the neck of the tooth, but gradually becomes wider towards the extremity, and in some diseased teeth is of considerable thickness at this part.

Such is the general appearance of the tooth under a low power, but in order to bring out all the details of these three kinds of bone, the enamel, the dentine, and cement, the tooth must be examined

by a magnifying power of not less than two hundred diameters.

Under this higher power the dark lines of the dentine are found to be tubes, which pass in an undulating manner towards the outer surface of the tooth, giving off numerous branches in their course, until they terminate in fine lines immediately beneath the enamel and cement. If a section is made so as to cut across the tubes, they are seen to be surrounded by a distinct wall with a clear open space in the centre. The entire diameter of one of these tubes does not measure more than $\frac{3}{10000}$ of an inch, the cavity of the tube occupies $\frac{1}{10000}$. These tubes contain moisture derived from the fluid portion of the blood. M. Tomes has also shown that, minute as these canals are, there is a delicate fibre in their interior, which is conjectured to be a nerve filament, and enables us to account for the extreme sensitiveness of the dentine when in a state of disease. The tubes are held together by an intermediate substance, which has received the name of intertubular structure.

The enamel is seen to consist of slender rods placed side by side, and closely impacted together, so that there is no intervening structure. Besides being surrounded by a delicate membrane, each rod is crossed by a number of fine lines, which mark the successive deposits of the earthy matter of

which they are principally composed. If the enamel rods are cut across, they present a rounded or partially hexagonal outline.

The cement is that structure of the tooth which makes the nearest approach to ordinary bone; it grows in layers which are successively added around the fang by means of the periosteum, or investing membrane. Corresponding to those layers are a number of minute cells, from which numerous delicate branching and tortuous canals are given off; these communicate with each other very freely, and convey the fluid portions of the blood derived from the vessels of the investing membrane of the fang throughout the cement. It is very rarely that blood-vessels actually enter into the cement, but they do so occasionally, more especially in old or diseased teeth, where the cement exists in considerable quantity. The structure which holds these cells together is usually transparent, but under very high powers it is found to be granular.

The above description applies to the healthy, well-formed tooth; but both the enamel and the dentine are liable to certain imperfections, which render the tooth very liable to be attacked by decay, which proceeds with unusual rapidity when it has once commenced. It is unnecessary to enter into any details with regard to the nature of these imperfections; they are merely referred

to as accounting, in some instances, for the early decay and loss of the teeth.

We have previously seen that the germs of even the permanent teeth are present at a very early period, and are in the course of formation during the whole of childhood. If the child is attacked with a severe illness during this portion of his life, or if the ordinary diseases, to which he is liable, occur with unusual severity, it is not to be wondered at if the teeth should suffer with the rest of the body, and be imperfectly formed. The same effect may be produced by the want of proper nourishment, or by living in an unhealthy district. Although the child may afterwards rally from these disorders, and the body be restored to a healthy condition, yet the teeth, which were forming at those times, will still remain defective, so that when they cut the gum and are exposed to the fluids of the mouth, they will very probably soon pass into a state of decay.

Another point to be considered is the chemical composition of the teeth. All three of the bone tissues, the enamel, the dentine, and the cement, consist of organic and inorganic materials, but the two are combined in very different proportions. Thus the enamel does not contain more than three-and-a-half parts of organic matter in every hundred, while the dentine contains twenty-eight parts, and the cement rather more.

The following is the composition of human enamel and dentine, according to the analysis of Von Bibra:—

DENTINE.	MOLAR TOOTH OF A MAN.
Phosphate of lime and some fluoride of calcium	66·72
Carbonate of lime	3·36
Phosphate of Magnesia	1·08
Salts	0·83
Cartilage	27·61
Fat	0·40
	100·00
Organic substances	28·01
Inorganic substances	71·99

ENAMEL.	MOLAR TOOTH OF A MAN.
Phosphate of lime with some fluoride of calcium	89·82
Carbonate of lime	4·37
Phosphate of magnesia	1·34
Salts	0·88
Organic substance	3·39
Fat	0·20
	100·00
Organic substance	3·59
Inorganic parts	96·41

The relative proportions of these organic and inorganic materials differ according to the age of the individual, the inorganic existing in greater proportion in the old tooth, and the organic in the young.

It would appear, moreover, that there is a difference in the relative proportions of the earthy salts that constitute the inorganic ingredients, the carbonate of lime diminishing in quantity, while the phosphate increases. Thus in the tooth of a child, aged six years, Lassaigne found eleven parts of carbonate of lime and sixty of the phosphate of lime, while in a tooth taken from an old man, aged 81, there were sixty-six parts of the latter salt, and only one of the former.

The pulp, placed in the cavity of the tooth, is the agent originally concerned in the formation of the dentine; it continues to add to its thickness until a late period of life, so that in old teeth the cavity of the tooth (see Fig. 14) is sometimes nearly obliterated. A knowledge of this fact is very important in the treatment of caries, and will often enable us, by judicious treatment, to preserve teeth in which decay is even far advanced. The pulp is the principal agent by which the tooth is nourished, and is the part which becomes affected in true tooth-ache.

The pulp consists of numerous minute cells, held together by a peculiar, almost structureless substance, known as connective tissue; it is soft, but very tenacious, and of a delicate red colour, arising from the presence of numerous blood-vessels. It is also plentifully supplied with nerves, derived from one of the most important and ex-

tensively ramified of the nerves which issue from the brain. Both the blood-vessels and nerves pass into the jaw-bones, and, in their course, send off branches and filaments, which enter at the apex of the fangs of the teeth, and are then distributed throughout the pulp.

From three to ten fine arteries are distributed to the pulp of a single tooth, and seven or more nerve-filaments enter the canal of each fang, and afterwards break up into the numerous delicate fibrils of which they are composed.

The nerves are generally described as terminating in looped extremities, which turn back upon themselves. Raschkow gives a very different account, and asserts that each filament, at its termination near the surface of the pulp, forms an enlargement, which gives off a number of extremely delicate filaments like the fine hairs of a brush.

I am not aware that any other observer has confirmed this description of Raschkow's, but should it ultimately prove correct, it is certainly more in accordance with the supposition that the fibrils detected in the tubes of the dentine are nerve-fibres, continuous with those of the pulp. There would no longer be any difficulty in accounting for the sensitiveness of carious dentine, or of the exquisite pain so often produced by the cutting instrument without any exposure of the pulp.

The periosteum, or as it is also termed, the peridental* membrane, is a fibrous structure surrounding the fangs of the teeth; it is plentifully supplied by blood-vessels and nervesderived from the same sources as those which go to the pulp. It is the agent by which the cement is formed around the dentine of the fang, and also those osseous enlargements or exostoses which form on the fangs of old or of diseased teeth. When the pulp of the tooth is destroyed, and the crown lost through caries, this membrane is regarded as preserving a low amount of vitality in the tooth. It is liable to inflammation, which often leads to the formation of an abscess, forming what is commonly known as gumboil, or alveolar abscess.

Nasmyth's persistent membrane can only be shown by placing the tooth for a short time in very dilute nitric or muriatic acid, and then scraping the surface of the crown to which it is confined; it is sufficient to have indicated its presence.

* Peridental—around the tooth.

CHAPTER IX.

DISEASES OF THE TEETH—CARIES—CAUSES OF, PREDISPOSING AND EXCITING—CHANGES PRODUCED BY IN THE TOOTH—EFFECTS OF—INFLAMMATION OF PULP—GUMBOIL.

The disease which most frequently attacks the teeth is known as caries, or decay of the tooth. If it were not for this disorder, these organs would seem likely to fulfil what is expected of them, and last their possessor the full term of his existence. Next in order of frequency is inflammation of the membrane investing the fang, and this seldom occurs except as a consequence of caries; occasionally it arises from rheumatism, and sometimes from the administration of mercury. The injurious effects of this powerful medicine on the membrane of the teeth happen most frequently in the treatment of the diseases of hot climates; in Europe it is seldom administered in the present day so as to injure the teeth.

Caries or its results are therefore the diseases which the dentist is called upon to treat more frequently than any others; and if he can succeed in arresting the progress of the primary affection,

he will generally prevent the occurrence of the secondary effects to which it gives rise.

It has been one of the chief endeavours of the dentist to determine the nature of caries, and to establish correct principles to guide him in its treatment. The nature of the disease could only be understood when the true structure of the teeth had been discovered, and this has only been accomplished within the last few years. It was equally necessary that the physiology of the teeth should be known before correct principles of treatment could be established; without a knowledge of the laws governing the life of the part, all treatment is empirical. It is true, experience may sometimes enable us to treat successfully a certain disease under certain circumstances, but experience by itself leads to mere routine practice; a remedy is given because it has succeeded in what is regarded as a similar case. These practitioners never stop to inquire how the cure is really accomplished, and, what is still worse, they never deviate from one set course of proceeding, and whatever may be the condition of the part, or of the patient, their treatment remains the same. There are numerous instances in which this mode of practice will not only fail in effecting a cure, but will often injure instead of benefiting the patient.

Many intelligent and educated persons, who

would readily subscribe to the above doctrine with regard to general diseases, would nevertheless hesitate to admit that it is applicable to diseases of the teeth, yet these organs are as delicately constructed as any other part of the body, and, although possessing little or no power of directly resisting the ravages of decay, they are intimately connected through the nervous system with distant and important organs, and are able to extend the effects of disease to those parts.

Numerous theories and conjectures have been brought forward, from time to time, in order to explain the nature and treatment of caries. Many of these are of the most opposite, and some of the most fanciful, character. It is needless to detain the reader with an account of doctrines which are now exploded; it will be sufficient to lay before him the facts that have been ascertained as to the changes which caries produces in the tooth, and to point out in general terms the plan of treatment which is most likely to succeed in arresting its progress.

The causes of caries may be divided into predisposing and exciting. The first includes the various imperfections in the formation of the teeth, which have been alluded to when speaking of their structure, and likewise all long-continued or exhausting diseases. I have noticed several instances, where a long continuance of ill-health

having exhausted the powers of life, and others, where some acute disease having reduced the patient to a state of extreme debility, they have been speedily followed by extensive and rapidly spreading disease of the teeth.

In September, 1862, I was consulted, at the National Dental Hospital, by a patient whose case is a striking instance of the effect which a dangerous and exhausting disease may have in producing decay of the teeth.

T. C., aged 25, of a lymphatic temperament, pursuing the occupation of a grocer, had enjoyed good health up to April, 1854; his teeth were sound, and he had never suffered from toothache. At that time he was seized with an attack of typhus fever, lasting fourteen days, and from which he was not expected to recover. He had a long convalescence, and for nearly nine months he was so weak as hardly to be able to stand, but still he had not suffered from toothache. About three months after he had returned to his occupation one of the small grinding teeth of the upper jaw began to decay, gradually broke away, and caused him a good deal of suffering. Since then the other teeth have decayed away one after another, and he has been constantly tormented with toothache, so much so that, he says, for three months out of the twelve he has scarcely been able to attend to his business. In addition to

violent attacks of neuralgia, when several of the teeth had decayed, he began to suffer greatly from indigestion, and his general health became seriously affected. When I saw him every tooth, except the left central incisor in the upper jaw, was more or less decayed, and many of them reduced to mere stumps, which were however still firmly implanted in the jaws. The condition of the mouth was such that it was necessary to remove all the teeth except the one upper incisor. The patient was so weak and worn-out with continued pain, that he had not the courage to undergo the operation without the assistance of chloroform; under its influence I removed all the teeth in both the upper and under jaws at three sittings, a fortnight being allowed to intervene between each operation. I recommended him to live well, and prescribed some tonic medicine.

About three months after the removal of the teeth the patient paid me a visit; he had had no return of his neuralgia; in fact, he had been entirely free from suffering, and his general health and appearance were greatly improved. The only complaint he made was that he was troubled with indigestion from not being able to masticate his food. This man stated that his sister had been attacked by the fever at the same time as himself, and that after recovery many of her teeth had also decayed away, but not to the same extent

as his own, nor had her sufferings been so severe.

The principal exciting cause of caries is an acid condition of the fluids of the mouth, which causes them to decompose the earthy salts that enter so largely into the composition of the dentine and the enamel (See p. 114.) In a healthy state of the body the saliva is alkaline, but under many morbid conditions it becomes acid. Lactic acid is the one generally present, but acetic acid has been found in some cases. "I have frequently," says Simon, "seen the saliva acid in acute rheumatism and in cases of salivation." According to Donné, the saliva is also acid in all cases of irritation and inflammation of the stomach. The most common source of an acid saliva is dyspepsia, and every one knows how frequently indigestion and bad teeth accompany each other. Acid fruits, such as sour apples, gooseberries, etc., the various acid condiments and drinks, which some persons indulge in to an inordinate extent, are also a frequent cause of chemical action on the teeth. Another source from whence a free acid may be derived is the decomposing particles of food lodged in the crevices and depressions of the teeth; this may be obviated by care and attention, but is greatly increased by neglect, or where the teeth decay and become hollow.

These are some of the principal causes which

lead to a carious condition of the teeth; but are we to conclude from this that it is a purely chemical process, as some writers maintain. If this were true, then we ought to be able to produce a similar series of changes in a tooth out of the body by exposing it to the action of a dilute acid, which is not the case. There is, therefore, something in addition to the chemical action involved in caries;—what that is can only be ascertained by examining the changes taking place in the interior of the diseased tooth.

Writing upon this subject elsewhere, I have remarked:

"Much as physiologists differ with regard to the precise method by which the dentine is formed, yet all are agreed that it takes place through the agency of the pulp, and that, commencing on the apex and external surface of the germ, it then proceeds inwards until the tooth acquires its proper form and size, and the dentine has attained its usual thickness. When this is accomplished, the formation of the tooth is completed, and the same arrest of growth takes place as occurs in every other part of the body at the adult period of life. If the person enjoys good health, and the tooth remains free from injury or disease, it may continue for some years without any appreciable alteration, in either the osseous tissues which enter into its formation, or in the pulp itself.

Sooner or later, however, as years go on, a change takes place in the character of the nutritive process throughout the body. The proportion which the fluids bore to the solids in early or middle life is diminished, nutrition is accomplished more slowly, and the composition of the various tissues undergoes a marked alteration. There is a general induration of the parts, and a tendency to the deposition of ossific matter: ligament is converted into cartilage, cartilage into bone, the coats of the blood-vessels are often impregnated with calcareous matter, and the cartilage of the ribs becomes ossified. If we turn our attention to the teeth, or, more correctly speaking, to their pulps, we shall find that they also are liable to a similar alteration of structure. When a section is made through an old tooth, apart from the changes which may be noticed in the colour and transparency of certain portions of the original dentine, the pulp cavity will be seen to have been greatly encroached upon, and the entire mass of the tooth increased in thickness. The extent to which this filling-up of the pulp cavity can take place may be seen by comparing together Figs. 12, 13, and 14. Fig. 12 represents a section of a fully-developed molar in early life; Fig. 13 represents a similar section of a molar tooth taken from an elderly person, in which the pulp cavity is diminished to the extent of fully one-half of its

original dimensions, while in Fig. 14 the cavity is nearly obliterated. This change can only have taken place through the agency of the pulp, which, after a period of repose, must have returned to its original function, and have added fresh layers of dentine to the inner surface of the tooth."

Fig. 12.

Fig. 13.

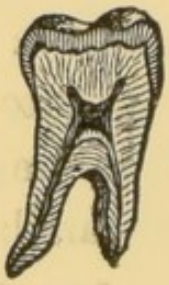
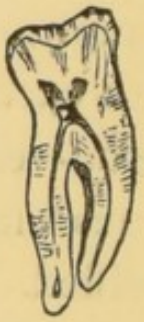


Fig. 14.



The formation of new dentine may be induced by any circumstance which affects the tubes in such a way as to excite slight irritation in the pulp, and induce increased action. The deposit of additional bone or dentine in the interior of the tooth is the means which nature takes to prevent the pulp being exposed. Thus old teeth are frequently met with where the opposite teeth have worn them away to such an extent, that half the crown is destroyed, but still the cavity of the tooth remains intact, and this can only arise from the formation of new bone in the interior of the tooth. A front and side view are given, in Fig. 15, of an old incisor, which has been thus worn away, and the same thing is shown in the canine, Fig. 16,

Fig. 15.

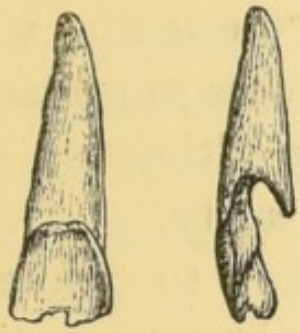
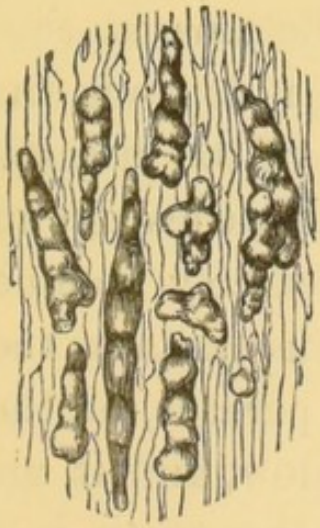


Fig. 16.

although the destruction of the crown is not so great as in the former case.

When such teeth, or those in which caries is not far advanced, are examined by the microscope, they are found to be more dense, the tubes being filled up with earthy matter, while the pulp has a number of minute nodules, or grains of new dentine, scattered throughout its substance. In Fig. 17 is shown a portion of the pulp of a

Fig. 17.



carious tooth, containing a number of these nodules.

In some cases the newly formed bone forms no union with the crown of the tooth; while in the other, the process, commences in contact with the original dentine, and may ultimately succeed in nearly filling up the pulp cavity.

These facts are sufficient to refute the idea that caries is a purely chemical action, it is, as Mr. Tomes has termed it, a chemico-vital act. The immediate or exciting cause is the chemical action of the fluids of the mouth upon the earthy salts of the tooth, but this is accompanied by, or superinduces such changes in the healthy portion of the crown of the tooth, and in the pulp, as can only occur in living organized structures.

A knowledge of the changes which caries produce in the organization and condition of the tooth is of considerable practical as well as theoretical value. It enables us to explain some apparent contradictions in the history of caries, and upon it often depends the skilful and successful treatment of the disease.

In some persons caries run an exceedingly rapid course; it has scarcely commenced before pain arises, and soon necessitates the extraction of the tooth. In other persons, on the contrary, its progress is just as slow, and it may go on until the entire crown of the tooth is destroyed, without ever giving rise to pain of any importance. The changes which have just been described as taking

place in the dentine and the pulp appear to afford a reasonable explanation of these differences. If the dentine is well formed and the caries advances but slowly, then it merely produces that amount of irritation and increased action in the tooth and pulp which lead to a filling up of the dentinal tubes by earthy matter, and the formation of new dentine in the cavity of the tooth; on the contrary, when it proceeds rapidly, and the dentine is somewhat defective, the irritation is greater, and, instead of producing a reparative action, gives rise to inflammation, which often proceeds to the formation of pus and the subsequent death of the tooth.

We come, now, to the still more important question, that of the principles which should guide us in the treatment of caries. We have seen that this affection consists of two separate actions—one which is purely chemical, and a second which is a vital action; the latter may be of such a character as tends to resist and ward off the ill effects of the disease, or it may become of an inflammatory nature, leading to the rapid destruction and death of the tooth.

The first object is, therefore, to protect the dentine from the chemical action, and the second to avoid inflammation of the pulp, to keep the increased action within such limits as lead to the deposit of bony matter around the diseased part and within the cavity of the tooth.

When the acid condition of the saliva depends upon the presence of some special disease, this must be cured before any permanent change can be effected in the fluids of the mouth. The most frequent source of acid saliva are certain forms of dyspepsia. After taking a meal, whether of vegetables or meat, or a mixture of both, the patient is troubled with eructations or vomits; the fluid which passes into the mouth has a strong, acid taste, and the teeth are set on edge just as they are by sour fruits or acid drinks, and if the vomited matter is passed into a copper vessel it becomes of a green colour, owing to the presence of lactic acid, which acts upon the copper. These cases come under the care of the medical practitioner, and are often amongst the most troublesome and intractable disorders he is called upon to treat. To obviate as much as possible the ill effects of such a state of the fluids of the mouth upon the teeth, a gargle should be used consisting of carbonate of soda four drachms, distilled water eight ounces, and aromatic spirit of ammonia one drachm.

When any of the strong acids are used as medicines the same precaution should be taken, and after every dose the mouth should be well rinsed with one of the above solutions. Care should also be taken that the acid itself is largely diluted, so that it shall not act upon the teeth

during its passage through the mouth, or even the precaution of washing the mouth may not avail. Mr. Jacob Bell, in the third volume of the *Pharmaceutical Journal*, mentions an instance where, from want of this precaution, in the course of two or three days after taking the medicine, the teeth were found to be seriously affected.

We shall reserve our observations upon the treatment of caries until the next chapter, when we shall speak also of the remedies to be applied in cases of toothache. At present we shall describe a case of caries, where it continues its course unchecked, ultimately giving rise to toothache, and producing an alveolar abscess, or, as it is commonly termed, a gumboil.

When caries has reached to near the surface of the pulp, and the dentine covering it has become softened, an attack of toothache generally comes on, but at other times this does not happen until the pulp is exposed. It is needless to describe the nature and intensity of a pain which few persons have escaped, and which is admitted to be one of the most severe that accompanies any of the minor ailments of the body.

The irritation caused by the presence of the diseased dentine, or the contact of the substances taken into the mouth as food, sets up inflammation in the pulp. The vascularity of the part is greatly increased, and the extra flow of blood,

causing it to swell while enclosed in the unyielding cavity of the tooth, it presses upon the nerves, and produces great pain. The continuance of the inflammation leads to the formation of pus and gradual destruction of the pulp. If there is an opening leading to the pulp cavity, the pus makes its way to the exterior through this, but if no such opening exists the pus goes on accumulating, and the pain and suffering become truly agonizing.

In the latter case the symptoms are not confined to the tooth, but sympathetic fever arises, the pulse becomes rapid, the cheeks hot and flushed, the tongue furred, and the whole system thoroughly deranged. This condition continues until relief is obtained either by the extraction of the tooth, or by the pus finding an external outlet through which to escape.

At other times, when the inflammation is not so intense, it often extends to the periosteum or membrane around the fang, and gives rise to the formation of gumboil; this condition will be considered subsequently, when speaking of the diseases of the periosteum.

CHAPTER X.

TREATMENT OF CARIES—PREPARATION OF THE TOOTH—PRESERVATION OF THE PULP—MATERIALS USED IN STOPPING—TOOTHACHE—REMEDIES FOR TOOTHACHE—SYMPATHETIC PAINS IN SOUND TEETH.

THE treatment of caries is one of the most important duties which the dentist is called upon to perform. A good stopping is the triumph of dentistry; while an extracted tooth, however skilfully removed, is its opprobrium. The first of these operations will often preserve a tooth for the whole period of life, that would otherwise have been lost, while the second, though it may give relief to suffering, henceforth renders mastication more or less imperfect.

In order that a tooth may be effectually stopped, the decayed part must be removed by means of sharp-cutting instruments made and adapted expressly for the purpose. This operation is frequently attended with little or no pain, while, at other times, it gives rise to the most unpleasant and acute sensation, so that the patient is unable

to submit to it. This depends upon two things: first, upon the extent to which the tooth is decayed, and, secondly, upon the sensibility of the individual.

Where the decay has advanced but a little way into the substance of the tooth, generally speaking, the removal of the decayed part gives rise to nothing more than an uneasy sensation, but, at other times, although the decay may be very slight, the surface of the dentine is exquisitely sensitive; the patient shrinks from the slightest touch of the instrument, and it is impossible to proceed with the operation until this tenderness is overcome. This can often be accomplished, at once, by the application of various caustic or sedative applications. The remedies most frequently employed as caustics, are arsenic, chloride of zinc and creasote. A small quantity of either of these materials applied to the surface of the dentine acts chemically on the part, destroys its vitality, and deprives it of its sensibility. The use of these materials will be again referred to, but, it may be remarked, that they should only be used with caution, and by those who understand the proper mode of applying them; they are not such as the patient should venture to apply for himself. The sedatives consist of the salts of morphia, and some of the essential oils, such as those of cloves or cinnamon. In cases where the sensitiveness can-

not be overcome at once, it will be necessary, after placing a portion of cotton-wool with one of the before-mentioned preparations in the cavity of the tooth, to direct the patient to renew the cotton every day for a week or fortnight, having first moistened it with camphorated spirits of wine. In this time the tenderness will probably have disappeared, and the tooth will be in such a condition as to allow of its being permanently stopped.

Very often, when cutting away the interior of a tooth, the first softened portion comes away without producing any pain, but when the operator arrives at the layer of dentine immediately below this, the patient complains of pain; after a while, when another portion has been removed, the pain ceases, and the cutting of the tooth produces scarcely an unpleasant sensation. It would appear from this that when the dentine is thoroughly softened it has lost its sensibility; but, immediately below this first layer is the part where the disease is going on most actively, and there the tooth becomes very sensitive; cut through this portion, and when the sound dentine is reached, the operation of cutting ceases to give pain.

In cases where the decay is further advanced, and there is only a thin layer of dentine covering the pulp, the tooth must be carefully prepared

before a stopping can be successfully inserted. There are two modes of proceeding by which this may be accomplished: *first*, by opening the pulp-cavity and destroying the vitality of the pulp, and, after removing it, to fill the cavity with stopping. The *second* consists in protecting the cavity from the entrance of the food or of the fluids of the mouth, so as to allow sufficient time for the formation of new dentine beneath the decayed part; to avail ourselves, in fact, of the efforts which, it has been shown in the previous Chapter, nature makes to prevent the decay from reaching the surface of the pulp, and when a sufficient time has elapsed to stop the tooth.

Of late years the attention of the dentist has been more especially turned to the best means of destroying the pulp in advanced caries, and then stopping the tooth, instead of endeavouring to preserve the integrity of the pulp, and thus retain, as far as possible, the vitality of the tooth.

There can be no question, if it is possible to preserve the pulp and then stop the tooth, that such a tooth is in a far healthier condition than one in which the interior of the crown and the fang is filled with gold or any foreign material. I am satisfied that many of the teeth which have been treated by destroying the pulp, might, under another plan, have been preserved without sacrificing this essential portion of the organ. So

long as there is a layer of dentine existing over the pulp, as a general rule it should never be removed. I have found, in many cases, that, by a palliative method of treatment, teeth which would otherwise have been sacrificed may, by this means, be preserved. If caries, so far as the actual destruction of the dentine is concerned, is a purely chemical process, it is, at all times, in our power to put a stop to these chemical changes by the application of proper remedies, and by protecting the decayed part from the action of the fluids of the mouth. Once these chemical changes have been arrested, there seems to be no reason why the remainder of the dentine, even if it is partially impaired, should become a source of irritation to the pulp. One case may be mentioned in illustration :—

The patient was a female, aged twenty-four, enjoying moderately good health. The first molar in the lower jaw was much decayed on its posterior surface, the caries reaching quite to the centre of the crown. There had been an uneasy gnawing sensation in the tooth, and pain in eating. The interior of the decayed tooth was very tender, and required great care in removing the particles of food. A temporary stopping, made of cotton, with a solution of mastic in spirits of wine, was inserted, and renewed two or three times in the course of a month. On each occasion, when the

cotton was removed, the tenderness had greatly diminished, and some of the decayed portion of the tooth was taken away. The cavity was afterwards filled with cotton and spirits of wine for some time, and, at the end of about two months, the tooth was permanently stopped. The first upper bicuspis on the right side was in a still worse state, and there appeared but little hopes of saving it; but after similar treatment for the same length of time, this also was permanently stopped. For a day or two, there was some tenderness in this tooth; but it subsequently subsided, and the tooth still continues an efficient agent in mastication. The lower wisdom tooth on the right side of the mouth, and the upper wisdom tooth on the left, were also decayed. The first of these teeth was not so far gone, and was readily stopped after a short preparation; but the upper wisdom tooth had lost nearly the whole of the central part of the crown, and, on one or two occasions, while it was under treatment, gave rise to a short and moderate attack of toothache; yet, at the end of three months, the tooth was also capable of being stopped. Any other mode of treatment in three of these teeth would, I believe, have necessitated either the destruction of the pulp or the extraction of the tooth.

A less favourable condition is where the decay has penetrated the cavity of the tooth and laid

bare the surface of the pulp, yet, even here, the resources of art are not entirely exhausted for the preservation of the pulp. If the opening is very narrow, and the surrounding dentine firm, a small piece of horn, quill, lead, or other material may be placed over the aperture, and then the stopping inserted as if there was no opening.

There are, however, cases in which the only prospect of preserving the tooth depends upon destroying the pulp, clearing it away, and then stopping. In these cases the tooth is retained as a living portion of the body through the instrumentality of the periosteum or membrane placed around the fang of the tooth, which continues to supply it with a certain amount of nutrition.

Either of the caustics before mentioned may be used for this purpose. Arsenic might be objected to by some persons on account of its well-known poisonous properties, but the quantity required for destroying the pulp of the tooth is so small that there is no fear of any ill effects arising. A more valid objection to the use of arsenic is, that every now and then it sets up inflammation and causes the death of the tooth; for this reason I generally prefer the chloride of zinc; a small piece of this substance when placed in the tooth immediately becomes liquid, and acts as a powerful and effectual caustic wherever it spreads. With regard to employment of creasote, I would re-

mark that the kind usually met with, only acts as a moderate astringent, while the German creasote is a powerful caustic, destroying the part with which it comes in contact just as effectually as nitric acid; it is therefore unnecessary to add that great care is required in using it. Creasote is best applied by means of a piece of cotton-wool rolled up, dipped into the fluid, and then pressed upon folds of blotting-paper to remove any superfluous creasote; the piece of cotton should then be placed in the cavity of the tooth, and a small portion of dry cotton placed over it. In this way the creasote is completely confined to the cavity of the tooth, and cannot injure the soft parts of the mouth.

Having prepared the cavity of the tooth, the next point to be decided is, what is the material to be employed for filling it? Without entering into any discussion as to the relative merits of different substances which have been proposed from time to time, it is sufficient to say that, generally speaking, wherever gold can be employed, notwithstanding its bright and glittering colour, it is to be preferred to every other material.

The great perfection to which the manufacture of gold-leaf is now brought enables the dentist to employ it in many cases where, formerly, it would have been quite impossible to use it. Gold-foil is produced in two different conditions, one in which

two portions show no tendency to adhere to each other, and another in which two leaves will cling together, small particles stick or adhere together, and when a slight amount of pressure is applied to a number of separate pieces, they may be made to cohere, and, if properly manipulated, welded into a solid, compact mass.

It is this latter kind of foil, generally known as adhesive gold-foil, that first established the superiority of the American gold stoppings, but now, that the material has been introduced into this country, and the mode of using it better known, it is in the power of the English dentist to produce equally clever stoppings with those of his American brethren. There are, however, certain drawbacks to the employment of adhesive gold, which must always confine the use of it to a select number of cases. Any moisture coming in contact with a portion of the stopping will certainly prevent adhesion from taking place at that part; now, in certain mouths, where there is a great flow of saliva, and in certain parts of every mouth, it is quite impossible to prevent this. The next objection to its use is the length of time required to complete the operation; stopping a tooth in this way often occupying from one to two hours; apart, therefore, from every other consideration, it becomes, in many cases, a question of time and money both to the patient and the

operator. Notwithstanding these drawbacks, adhesive gold is a very valuable and important addition to our stopping materials, and will often produce a beautiful result where the ordinary gold-foil could not be employed. On the other hand, there are a large number of decayed teeth to which adhesive gold could not be applied, but which may be very securely stopped with the old non-adhesive gold, and, in these cases, it is equally durable and successful as is adhesive gold in the former. It should not be forgotten that the old operators, who were celebrated for their gold stoppings, all made use of the ordinary gold-leaf, and where one meets, as we occasionally do, with a tooth that has been stopped thirty or forty years ago, it was this kind of gold-leaf that was employed, a pretty certain proof that, when properly manipulated and the cavity of the tooth is a favourable one for stopping, that no better material can be made use of.

There still remain many cases which must be treated without gold, and the question arises, what is the next best material in the absence of the precious metal? The object is to obtain a stopping that can be inserted in the tooth in a soft state, one which shall afterwards harden, resemble the colour of the tooth, not shrink, and will not be acted upon by the fluids of the mouth. It is hardly necessary to say that this has never been obtained.

Some years ago it was proposed to employ an amalgam of mercury and silver, this compound possessing two of the properties required, viz., that it can be used in a soft state and hardens afterwards. Great outcry has been raised, from time to time, against the employment of amalgams because they contain mercury, and many vague statements have been made of the injurious effects it has produced. It is sufficient to say that, out of the millions of teeth that have been stopped in this country with amalgam, I am not aware that any single instance has ever been produced where the peculiar constitutional effects of mercury have been traced to this cause. If ill effects have been produced upon the mouth, it has been from the careless and improper manner in which the amalgam has been used, but, even in these cases, the injury is not to be attributed to the mercury; any other soft material pressed in between the teeth and gums, which afterwards became hard, would give rise to a similar spongy, vascular, and ulcerated state of the gums, as happened in the cases referred to.

The following cases are instances of the improper use of this material, and of the kind of injury it produces, but in neither of the patients was there any complaint of constitutional derangement, nor of the peculiar effects characteristic of mercury.

A lady advanced in years, whose lower front teeth were very loose, was induced to trust herself in the hands of a person who advertised that he could securely fasten all kinds of loose teeth. From the appearance the teeth afterwards presented, a quantity of amalgam had evidently been pressed, by means of the finger and thumb, between the loose teeth and over the gums. The amalgam had hardened into a rough irregular mass, and produced extensive inflammation of the gums and neighbouring parts. It was impossible to remove the amalgam, and the only alternative was the extraction of all the teeth, or to allow things to remain as they were. Not long ago I saw a very similar case, only, in this instance, the patient had no one to blame but herself, her own ingenuity having devised this notable plan for fastening some loose teeth in the lower jaw.

The great objection to the old amalgam of silver and mercury was its being acted upon by the fluids of the mouth, and becoming intensely black. At present there are several amalgams supplied to the dentist in which these objections are removed, and I have seen stoppings of this kind that, after being in the mouth ten or twelve years, were as good as when first inserted.

Within the last few years a kind of white stopping has been introduced, which is principally composed of the chloride and oxide of zinc. The

chloride is exceedingly deliquescent and speedily liquefies when exposed to the air; the oxide, when recently prepared, is a dry white powder which also readily abstracts moisture from the air, but when the two are mixed together they form a tenacious plastic mass, which soon becomes very hard. It is applied to the decayed cavity while in the soft state, and must be carefully preserved from moisture until the mass has set and become firm, it should then be trimmed off to the surface of the tooth, rendered perfectly smooth, and covered with a small piece of wax, which should be allowed to remain until the next day, when it may be removed; the reason for this precaution is that the hardening process goes on for some time after the mass first becomes solid. In some cases this compound is exceedingly useful, but its durability is not sufficiently proved that it can be relied upon with the same confidence as amalgam.

Other materials are occasionally made use of in stopping teeth, but the foregoing may be taken as representing the means which are usually employed and the manner in which they are applied. I ought, perhaps, to mention the use of tin-foil, this metal is used in the same way as gold-leaf, and is sometimes substituted for it on account of its cheapness, which is the only reason for preferring it to the more costly metal. It is said to make a tolerably durable stopping, but, in many

mouths, it is apt to turn black, this, no doubt, depends, in a great measure, upon the impurity of the metal. A recent analysis of different samples of tin-foil, showing the presence of a large amount of lead, thus a specimen of what was termed ordinary commercial tin-foil contained eighty-six parts of lead in the hundred, and what was designated as pure tin-foil contained as much as thirty-four per cent. The latter is most probably the kind that would be furnished to the dentist; such a compound would be quite unfit for stopping teeth, as the lead would be readily acted upon by the fluids of the mouth.

In concluding these remarks upon the substances used in stopping teeth, I would caution my readers against placing any belief in the superior efficacy of the stoppings that are daily puffed off in the public papers by the advertising dentist. In the matter of materials, the dentist is in the same position as the medical man with regard to drugs, just as there are establishments devoted to the preparation of the various compounds of the pharmacopeia, so there are houses from whence the dentist obtains the various preparations required in stopping teeth, and, I may add, in every other department of dentistry.

After the previous description of the resources at the command of the dentist to obviate the injuries inflicted by caries, the reader may not

unreasonably ask, when this is the case how does it happen that so many teeth have to be removed from the mouth, and rise up in judgment against your boasted skill? Apart from those causes and conditions of the mouth and teeth which we have already referred to as the exciting and predisposing causes of caries, there is one circumstance which, perhaps more than any other, renders its results so fatal, and that is the secret and insidious manner in which the disease makes its approach. Caries often attacks a part of the tooth that is quite out of sight, it goes on slowly, but steadily, and gradually makes its way to the pulp cavity, when, all at once, a sudden attack of toothache gives the first intimation that the tooth is diseased. Many persons seem to labour under the fatal impression that it is quite unnecessary to apply to the dentist until pain arises in the tooth, whereas the case is exactly the reverse, and when this happens it is often too late to save the tooth. Once decay has commenced and made its way into the dentine, the diseased portion should be removed, and a gold stopping inserted; in fact, it is impossible to perform the operation of stopping too soon. At all events, whatever may be the ultimate fate of the aching tooth, the first object must be to relieve the pain which the patient is suffering.

What is to be said of the numerous remedies

which have been recommended as specifics for the toothache, all of them equally infallible, and guaranteed by a hundred testimonials in their favour? In a work written nearly three hundred years ago, in which the general pretension to medical knowledge is ridiculed, the following tale is told of a person named Gonelle, "Jester" to Alphonse d'Este Duke of Ferrara. The duke had asked what profession or calling was most followed; the jester maintained that it was the practice of medicine, and wagered the duke that he would make good his assertion in less than twenty-four hours. The next morning, Gonelle left his house with his head covered with a large nightcap, a handkerchief tied over his face, and a cloak wrapped round his shoulders. The first person he meets asks him what is the matter; he tells him he is tormented with the toothache. "Ah, my friend," says the other, "I can give you the best remedy in the world." Going a little farther, he meets two more of his acquaintances, who each recommend him a certain cure. And so he goes on until he arrives at the entrance to the palace, where he finds a crowd of people, each of whom proposes to him a different, but at the same time infallible, remedy. At length, he entered the duke's chamber, who no sooner sees him than he makes the same inquiry as the others had done, and, on receiving his answer, immediately declares

he is acquainted with the very best remedy that had ever been invented, and one that would give him instant relief. Upon this Gonelle threw off his disguise, exclaiming, "Then you also, my lord, are a doctor! See, here is my list; between my house and your highness's palace I have met with two hundred doctors, and if I had traversed the entire city I should have found ten thousand."

The world seems hardly to have altered in this matter since Gonelle, the jester, won his wager of his highness Alphonse d'Este Duke of Ferrara; everybody knows a certain cure for this terrible pain, and yet dentists live and prosper, and people loose their teeth. The fact is, there is no specific for the toothache; it arises from different causes, it exists under different conditions, and these must be taken into consideration before we can decide what is most likely to give relief; this, at least, is certain, that no one remedy will answer in all cases alike, and hence the absurdity of trusting to any of the nostrums vended by the dealers in quack medicines.

The term toothache, properly speaking, should be confined to the pain which depends upon irritation or inflammation of the pulp, or, as it is commonly called, the nerve of the tooth, but which we have seen is composed of blood-vessels, nerves, and cells, held together by a peculiar dense, gelatinous tissue. Such a structure is

liable to all the changes produced by inflammation, just as they occur in any other part of the body. The blood sent to the pulp may be increased in quantity, fluid may be poured out of the vessels, matter may be formed, and followed by mortification or death of the pulp. It is not difficult to understand the intense pain which may arise under these circumstances, in consequence of the pressure exerted upon the nerves, through the swelling of the part confined, as it is, within the unyielding bony cavity of the tooth. The pain has an acute, darting character; confined to the crown of the tooth, it comes on in paroxysms, which, while they last, are almost unbearable. These pains often extend to the neighbouring parts, spreading over the side of the head, neck, and face, following the track of the nerves.

The tooth may, however, be touched without the patient complaining, nor does it come in the way of the opposite teeth in mastication, feeling, as it were, too long for its socket. It is just the reverse when the inflammation has extended to the membrane of the fang.

With regard to the causes of toothache, unquestionably caries is the most common, but it may arise from cold, or from mechanical violence. Toothache may also occur in teeth which apparently are perfectly sound; these cases will require to be spoken of separately; at present we

are referring to that kind of toothache which depends upon decay of the tooth, and where the pulp is either exposed, or the surrounding bone is so far softened as to allow of fluids reaching the pulp.

Toothache may be treated by means of antiphlogistics, or remedies which reduce the vascularity of the pulp; by astringents, which also check its vascularity and diminish its secretion; by caustics, which destroy its vitality; by sedatives, which diminish its sensibility; and by chemical agents, which alter the condition of the fluids of the mouth. It is sometimes advantageous to combine two or more of these classes of remedies, their conjoint action having more effect than either of them singly.

When there is intense throbbing in the crown of the tooth, the application of a leech to the gum opposite the aching tooth will sometimes afford relief, by diminishing the quantity of blood. The best mode of applying a leech is by means of a leech-glass. Care should be taken that the leech does not fix itself on to the loose tissue of the lips or cheeks, as these parts are apt to swell, and, although by the use of warm fomentations this subsides in the course of twenty-four hours, it produces considerable disfigurement while it lasts. The bleeding from the bite should be encouraged by the use of warm water. It may

be as well to remark that, in the case of young children leeches should not be applied, except under the direction of a medical man, the bite sometimes causing a dangerous hœmorrhage at this age.

Another means of reducing the inflammation is by exciting increased action elsewhere. This may be done by the use of sialogogues, or substances which produce an excessive flow of saliva. Amongst the lower orders, chewing a piece of tobacco is a very common remedy in toothache, and no doubt it owes part of its efficacy to the increased flow of saliva which it produces. The best sialogogue is the pellitory root of Spain, the Anthemis Pyrethrum. A small piece of this root should be bruised, and then placed between the tooth and the cheek.

With regard to all remedies which are applied to the interior of the tooth, it is necessary that the decayed cavity should first be cleared out, and the particles of food removed. When this has been done, the mere filling up the cavity with some material which shall exclude the entrance of the food, and of the fluids of the mouth, will often effect a temporary if not a permanent cure.

Wax or gutta-percha will sometimes answer the purpose, but a better material is cotton-wool which has been moistened with a solution of gum-mastic

in spirits of wine. The advantage of this preparation is, first, the softness of the cotton, which allows of its adapting itself to the cavity of the tooth, while the mastic, losing the spirit of wine on coming in contact with the saliva, forms a hard mass which will often remain for two or three weeks without any material change. Whenever this is the case, there is no doubt the tooth could be permanently stopped, and the patient should not delay applying to the dentist to have the temporary stopping removed, and one of a more permanent kind inserted in its place as soon as the pain has subsided and shows no indication of returning.

A long list might be given of astringents that have been recommended for the cure of toothache; but as they all act in a similar manner it will be sufficient to mention two or three of those most generally employed, and most easily procured. From amongst these substances may be enumerated alum, tannin, and nitrate of silver.

Alum is sometimes employed alone, and when that is the case the preparation termed burnt alum is the best. The mode of preparing this substance is by exposing common alum to heat, by which the water of crystallisation is driven off and the salt becomes more astringent. A small piece of the alum may be placed in the cavity of

the tooth, but a more efficient plan is to make a solution of the alum in spirits of nitric ether:

Alum	two drachms.
Spirit of nitric ether . .	half-an-ounce.

Another preparation, which will sometimes succeed when others have failed, is—

Nitrate of silver . .	one grain.
Distilled water . . .	two drachms.

These solutions must be applied upon a piece of cotton, after carefully clearing out the cavity. The solution of the nitrate of silver will not keep long if exposed to the light, in consequence of the silver being thrown down in the form of an oxide; it is also necessary to employ distilled water to dissolve the salt.

Amongst the caustics which are used may be enumerated creasote, arsenic, and chloride of zinc.

Creasote is a very common, and sometimes a very useful application in toothache. The remarks which were made at page 140 upon the difference between ordinary creasote and that known as German creasote should be borne in mind, and the same precautions are necessary in applying the latter, which is the most efficacious, to the interior of the tooth as were then mentioned; that is, all the superfluous creasote should be pressed out of the cotton, so that it may not come in

contact with the other parts of the mouth. One objection which exists to the employment of this useful remedy is its strong odour; this may be very much overcome by mixing with the creasote an equal quantity of the oil of cloves.

The use of arsenic has already been spoken of when speaking of the treatment of caries, and I have only to add, that it is not a remedy which the patient should use himself.

The chloride of zinc may be applied in solution or in the solid state. It is an exceedingly delequescent salt, and very quickly dissolves on exposure to the air; it is most easily applied in the fluid state:

Chloride of zinc . . .	one drachm.
Distilled water . . .	three drachms.

The cotton should be dipped in the solution, and the same precautions employed to remove any superfluous fluid as were recommended in the case of creasote.

In respect to sedatives, the one most generally employed in the present day is chloroform, applied on cotton wool; tincture of opium may be used in the same way.

There are certain substances which, in their primary action on a part, act as stimulants, but eventually diminish its sensibility, and therefore may really be regarded as sedative. Amongst these are some of the essential oils, such as those

of cinnamon, cloves, and allspice, &c. A drop or two of any of these oils on cotton-wool will occasionally afford relief to the aching tooth.

Toothache sometimes arises from an acid condition of the saliva, in consequence of this fluid reaching the pulp through the carious cavity of the tooth. This kind of toothache especially occurs in the dyspeptic patient, who is troubled with acid eructations arising from the extreme acidity of the stomach. In these cases a small quantity of carbonate of soda, by neutralizing the acid condition of the saliva will frequently afford relief. It must, however, be fully understood that such relief can only be temporary, and will cease so soon as the soda ceases to neutralize the acid. To effect a permanent cure it will be necessary that the patient should apply to his medical attendant to remedy the disorder of the stomach, and, at the same time, the cavity in the tooth should, if possible, be stopped, in order to prevent the access of the saliva to its interior.

It is evident, therefore, that although toothache almost invariably depends upon the presence of decay in one or more of the teeth, which has either exposed the pulp of the tooth or rendered it liable to the action of external agents, yet it is clear it may arise under very different circumstances, and will require to be treated accordingly.

Toothache may often arise in consequence of

common cold, and the treatment adopted for the latter will also give relief to the pain in the tooth.

Pains will frequently occur in decayed teeth, especially in agueish districts, which may be relieved by the administration of quinine, in two-grain doses, two or three times a-day. We meet with the same thing in our large towns and many districts which are not agueish, at certain periods of the year, when there are sudden changes of temperature, or during a long continuance of east winds.

Lastly, we meet with cases where the patient complains of pain in one or more teeth which are perfectly sound. Some of these cases occur in young hysterical females, and the dentist must on no account allow himself to be persuaded to extract the teeth, nor must the friends permit themselves to be deceived by the extreme pertinacity with which these patients will sometimes insist upon the teeth being the source of their suffering. The general appearance of the person, and the history of her complaints will afford a clue to the real nature of the disorder, which should be transferred to the care of the medical man.

Sympathetic pains sometimes arise in sound teeth during pregnancy, and are occasionally very severe and uncontrollable. It has been suggested that relief might be obtained by injecting beneath

the mucous membrane of the mouth a solution of one of the salts of morphia. A case is recorded by Dr. Storer, in the *American Journal of Dental Science*, for 1860, where this plan succeeded. Even if pregnancy is not present, when the womb is deranged we sometimes meet with sympathetic pains in the teeth, which can only be relieved by proper medical treatment. It is scarcely necessary to say that in these cases it is unjustifiable and useless to extract the teeth.

It is, however, necessary to remark that pain occasionally arises in apparently sound teeth, that is, teeth free from caries, in consequence of enlargement of the roots; this might occur during pregnancy, and then relief would be obtained by extracting the tooth.

When the teeth are closely impacted together the pressure they exert upon each other is liable to give rise to pain in a particular tooth, although it may be perfectly sound; in some of these cases relief has been obtained by passing a file between the aching tooth and the one next to it.

CHAPTER XI.

DISEASES OF THE DENTAL PERIOSTEUM—GUMBOIL, OR ALVEOLAR ABSCESS—DISEASED STUMPS, EFFECT ON THE HEALTH—RHEUMATIC INFLAMMATION OF PERIOSTEUM—EFFECT OF MERCURY—EXOSTOSIS.

In describing the structure of the tooth, it was mentioned that a fibrous membrane, plentifully supplied with blood-vessels and nerves, termed the periosteum, covered all that part of the tooth which is contained in the socket.

The periosteum of the tooth is liable to several affections, of which the most common is inflammation. When caries has advanced so far as to produce inflammation of the pulp the disorder constantly spreads to the membrane around the fangs. When this happens a new series of symptoms arise, which at once informs us that there is inflammation of the periosteum.

Pain is present, but it is different from that which occurs when the pulp of the tooth is affected; it is of a dull, heavy, aching kind, and is temporarily relieved by pressing upon the tooth; the tooth itself is somewhat loose,

and from the swelling of the membrane it soon feels as if it were too long for the socket, and comes in the way of the opposite teeth. This is the first stage of the disorder; in the next, all the symptoms are aggravated, and the pain, instead of being relieved by pressure, gradually becomes so great that the patient cannot bear to press his tongue against the tooth; the gum opposite the tooth becomes red and swollen, and there is a sensation of heat and throbbing in the part. If the disease goes on unchecked, the membrane becomes separated around the fang, pus is poured out into the socket, the outer wall of which gradually expands, carrying the gum with it, and producing a swelling which is commonly known as a gumboil. After a time the wall of the socket opens at its most prominent part, the gum over it becomes absorbed, and a small opening is thus formed through which the pent-up matter escapes and the patient obtains relief.

Such are the changes which take place in the formation of an alveolar abscess, or gumboil, when it is allowed to pursue its course unchecked. With regard to the treatment of gumboil, this varies so essentially with the circumstances under which it occurs that no general rule can be given as to what is the best course to pursue. In the majority of cases it is the result of caries, and when this is the case, the tooth is often so far

gone, that the only proper or efficient remedy is extraction.

Supposing, however, that the case was seen in an early stage, and there was a prospect of preserving the tooth, a leech should be applied to the gum, and the bleeding afterwards encouraged by bathing the mouth with warm water. A mild aperient should be given at bedtime, and stimulants avoided.

In applying a leech to the gum care should be taken that it does not fix itself on to the loose mucous membrane of the cheek or lip, where it is apt to produce considerable swelling and disfigurement, which, although it speedily disappears by the use of warm fomentations, is very disagreeable while it lasts. The best mode of applying a leech to the gum is by means of what is called a leech-glass.

When the inflammation is further advanced, and there is no prospect of preventing the formation of matter, warm fomentations are the best applications. A piece of soft bread, soaked in warm water or warm milk, may be laid between the cheek and the tooth, and frequently renewed. Two poppy heads broken up and boiled in two pints of water forms an excellent fomentation, which, besides hastening the formation of the matter, serves to relieve the pain in consequence of the anodyne properties of the poppy.

The application of warm fomentations requires some care, especially in the upper jaw, as instances have occurred where the matter has come to the surface in such a manner that, instead of opening between the gum and the cheek, it has made its way to the outside of the face, producing what is called a fistula. This is one of the most unpleasant results that can arise from the presence of a diseased tooth. When such a misfortune happens to a patient there is no prospect of the wound healing up until the tooth or its remains have been removed from the mouth; when this has been done, the discharge is almost sure to cease, and the opening closes up without any further treatment. A case of this kind is given in the chapter on "the teeth in relation to disease."

As soon as the matter comes near the surface, and can be felt beneath the gum, an opening should be made by means of the lancet. Many persons have a great dread of this operation; but, as relief is obtained much sooner by it, and is also more permanent than when nature is left to herself, it should encourage them to overcome their natural timidity. When an abscess is left to open of its own accord the aperture through which the matter passes out is so small that it soon closes up, the matter re-accumulates, and the patient has again to go through the same round

of suffering as that from which he has just received only a temporary relief.

Acute inflammation of the dental periosteum is very apt to be followed by a chronic form of inflammation, which is either accompanied with a constant discharge of a thin watery matter, or by repeated attacks of more acute paroxysms, which injure the health of the patient, incapacitate him for the duties of life, and eventually terminate in the loss of the teeth.

Sometimes there is a number of teeth or stumps of teeth left in the mouth, in which there is this kind of chronic inflammation. Nothing can be more injurious to the general health; the constant discharge issuing from the teeth necessarily passes into the stomach, and interferes with healthy digestion. The pain and annoyance produced by the teeth render the person irritable and desponding, while every now and then more violent paroxysms occur, or a cold is caught, which, falling upon the decayed teeth, induces an attack of illness. Many of these patients are also frequently liable to neuralgic pains about the head and face, which they vainly endeavour to persuade themselves are of a rheumatic character.

It is the duty of the dentist strongly to urge upon the patient the absolute necessity of having such diseased teeth removed, and of assuring him of the hopelessness of any permanent improve-

ment in his general health so long as they are allowed to remain. Unfortunately, instead of honestly declaring the ill effects which are likely to arise from such a condition of the mouth, the advertising dentists pander to the weakness and wishes of the patient, and by their offers of inserting artificial teeth without the extraction of stumps or loose teeth, perpetuate a very injurious practice, which the educated and honourable practitioner has to contend against.

Let me once more warn the reader against supposing that these promises are founded upon any peculiar mode of practice, by which the ill effects alluded to can be avoided; this is certainly not the case. The boasted patents for improvements in the manufacture of artificial teeth, that are daily inserted in the public papers, if inquired into, would in most cases be found to be mere shams. It is true some alteration is devised, and a plan registered, so as to enable the advertiser to place after his name, "By letters patent;" but, in practice, these persons are found to pursue precisely the same plan as other practitioners.

I would almost venture to say that, so far as the fixing of artificial teeth is concerned, it is never necessary to extract a stump. It is not on account of the artificial teeth that I advocate the removal of diseased teeth and stumps, but

on account of the health and comfort of the patient.

I would also observe that the remarks I have now made refer only to a particular class of stumps. There is almost as much difference between what are termed *healthy* stumps, and those which come under the title of *unhealthy*, as there is between a sound tooth and a decayed tooth. The stumps of which I have advocated the removal are soft in the centre, and gradually decomposing from the accumulation of food and the fluids of the mouth in their interior, while an unhealthy discharge issues from around them. On the other hand, we often meet with stumps that are perfectly firm, and solid, and not the slightest discharge comes away from them; such stumps give rise to no ill effects, and there is not the slightest necessity for their extraction. Even if the person refuses to have the teeth removed, that is no reason the dentist should not render him the best assistance in his power; but it is his duty honestly to place before the patient the nature of his case, and to explain the risk, or rather certainty, of suffering which he entails upon himself by retaining such diseased teeth in his mouth.

The periosteum is liable to be attacked by a chronic form of inflammation, connected with a rheumatic taint of the blood. This was first

pointed out by the late Dr. Graves, of Dublin, and I cannot better illustrate it than by quoting his description of the case.

"The progress of the disease," says the writer, "is accompanied by extreme pain; and as a puriform discharge oozes out between the gums and inflamed periosteum, many limit their attempts to local means, and often succeed in effecting a cure by frequent applications of leeches to the inflamed gum, and, in very obstinate cases, by incisions made freely through the gums and periosteum. Last year a patient of mine was thus affected, and thus treated; and although under the care of a most skilful surgeon, and of an eminent dentist, he lost successively a left bicuspis and molar of the upper jaw. His sufferings were for a short time relieved by the extraction of each tooth, but in a few days became as agonising as ever, when, finding all the neighbouring teeth loose, and being told that they also must soon be drawn, he had recourse, in despair, to a celebrated homœopathic doctor, whose infinitesimal doses completely failed, for the patient's sufferings were produced by a direct physical cause, which lay far beyond the limits to which the influence of even the most powerful imagination can possibly extend. Happening to mention his wretched state to me, I immediately recollected that a year before I had successfully treated him for a periostic affection

of the sternum and ribs, and that hydriodate of potash was the medicine which served him most. I recommended him to use ten grains of it three times a day, and had the satisfaction of perceiving a daily improvement, so that pain and inflammation soon ceased, and in about ten days the teeth were all fastened.

"The periostitis to which this gentleman was liable was of a rheumatic nature; otherwise his constitution was sound, and he was only thirty-four years old."

When mercury is administered to any extent, it produces a peculiar condition of the mouth, which is accompanied by inflammation of the gums and dental periosteum, giving rise to an unpleasant discharge, a peculiar fœtor of the breath, and looseness of the teeth. The history of the case, the odour of the breath, and the peculiar condition of the gums serve to explain the nature of the complaint. The first thing is to stop the administration of the mercury, if that has not already been done. Mild aperients to eliminate the mercury from the system, combined with a generous diet and fresh air, are the general means to be relied upon. The local applications should consist of astringent or detergent gargles.

Dr. Watson recommends, in these cases, a gargle composed of one part of brandy to four of water.

It is, however, perhaps better to add some astringent substance, such as tannin, to the brandy and water. The following formula would serve for this purpose:—

Tannin	twenty grains.
Brandy	half-an-ounce.
Camphor mixture . .	five ounces and a-half.

The addition of the camphor serves to disguise the unpleasant odour of the breath.

Great benefit has been derived, in cases of mercurial salivation, from the use of the chlorate of potash, which may be given internally, and used also locally as a gargle. This medicine may be taken in pure water, or mixed with some vegetable bitter:—

Chlorate of potash . .	three drachms.
Water	six ounces.

Of this a sixth part may be taken three times a day.

Chronic inflammation of the periosteum often produces a thickening and increased growth of the membrane, which causes the tooth to be loose and tender to the touch, and consequently of little use in eating. When the teeth are in this condition they are liable to sudden and violent attacks of pain, accompanied by a discharge of matter from their sockets; these attacks last for five or six days, and then subside, only, however, to return after a

longer or shorter interval. There is no cure for this state of things except extraction, and the sooner the teeth are removed the less will be the sufferings of the patient.

A slighter degree of chronic inflammation gives rise to the formation of bone around the fangs of the teeth, which is known as exostosis. The new bone is either formed in layers over the whole surface of the fang or in nodules. This kind of osseous growth generally occurs in old teeth, but sometimes it forms on the teeth of persons who are in the prime of life, and causes pain in teeth which, to all external appearance, are perfectly sound. These cases are very difficult of diagnosis, and require to be watched some little time before one would feel justified in removing the tooth.

CHAPTER XII.

SALIVA—SALIVARY GLANDS—COMPOSITION AND QUANTITY OF SALIVA—TARTAR, COMPOSITION OF; EFFECTS OF, ON THE TEETH AND GUMS—TREATMENT—LOTIONS FOR THE GUMS—TOOTH-POWDERS.

THE saliva, which lubricates the mouth and moistens the food, is a mixed fluid, consisting of mucus and saliva mingled together. Mucus is a thickish viscid secretion, derived from small glands placed on the inner surface of the lips and cheeks, and on the upper surface of the tongue; it has an acid reaction, and when poured out in excess may cause the saliva to have the same.

The true saliva is produced by three pairs of glands, called the salivary glands, placed in the immediate vicinity of the lower jaw. The largest of these, the parotid, is placed between the external ear and the angle of the jaw. The secretion formed by this gland differs in its physical and chemical properties from that produced by the other salivary glands; it is conveyed by a duct into the mouth, where it is discharged opposite the second molar tooth in the upper jaw; it is, in consequence of this, that the second molar and the one in front of it are more liable to become

coated with tartar than any of the other teeth in the upper jaw. This incrustation is sure to take place if the person does not use these teeth in mastication.

The saliva obtained from the parotid gland is a limpid, colourless fluid devoid of smell and taste, and is distinctly alkaline in its reaction.* It is poured out in great abundance during the act of mastication, and is mixed with the food, over certain portions of which it exerts a chemical action, which will be referred to when speaking of digestion.

The other salivary glands are the sub-lingual and the sub-maxillary. The fluid derived from these glands is more viscid than that obtained from the parotid; it does not appear to excite any chemical action on the food, and is constantly being discharged into the mouth, whether the person is fasting or masticating his food. The ducts of these glands open on either side of the frænum of the tongue, the sub-lingual by a number of minute openings, and the sub-maxillary each by a single duct, from which a little jet of saliva is sometimes seen to shoot out during mastication. It is in consequence of these glands opening behind the lower front teeth, and this part being also the lowest portion of the mouth, that the

* *Chemistry in its relations to Physiology and Medicine.* By G. G. Day, M.D., F.R.S., p. 144. London, 1860.

tartar accumulates on the backs of these teeth more than upon any others.

Bidder and Schmidt estimate the total amount of saliva secreted during the day by an adult man at about 48 ounces. Such calculations can only be regarded as approximations to the truth, since the quantity will vary in the same individual from many circumstances.

The following is an analysis of human healthy saliva as quoted by Day :*—

Water	994·10
Solid constituent	5·90
Epithelium and mucus . . .	2·13
Fat	0·67
Ptyalin, with a little alcohol extract .	1·41
Sulphocyanide of potassium . . .	0·10
Fixed salts	2·19

Tartar is an earthy deposit, which accumulates around the necks and crowns of the teeth, derived from the solid constitutents of the saliva. Examined chemically, it is found to consist, according to Wright, of:—

Carbonate of lime	81·3
Phosphate of lime	4·1
Soluble salts	6·2
Animal matter	7·1
Water and loss	1·3
	100·0

* *Opus. cit.* p. 14.

The tendency to this formation varies greatly in different persons, and also in the same person, according to the state of his health and his mode of living.

We have seen, for reasons already stated, that tartar accumulates principally on the backs of the lower front teeth, and on the outer surface of the upper molars, especially if the person, from any circumstance, is prevented from using the latter teeth in mastication. In other cases there seems to be such a general tendency to the accumulation of this deposit, that every tooth is more or less coated with it.

A deposit of tartar not only renders the teeth unsightly, but, if not removed, will eventually cause the expulsion of the tooth. The deposit generally commences at the neck of the tooth, where the gum is attached. The tartar irritates the gum, which becomes vascular and spongy; it gradually recedes, and, at the same time, the margin of the socket is removed by absorption. The deposit then occupies the part of the tooth from which the gum and socket have receded; and this process is repeated until, at length, nearly the whole of the socket is absorbed, and the teeth are really only held in the mouth by the mass of tartar which has accumulated around them.

There is great difference in the consistency of

the tartar; sometimes it is soft and friable, while, at other times, it is exceedingly hard. Whether, however, it is hard or soft, once it has accumulated it is seldom in the power of the patient to remove it, but when this has been done for him by means of proper instruments, he can generally prevent its re-accumulation by care and attention.

The treatment of these cases, therefore, consists in first removing the tartar from the crowns and necks of the teeth, but, as it often happens that the gums have been brought into a very spongy, vascular, and tender condition, it is necessary that these should also be attended to. In order to relieve the over-distended vessels, the gums should be freely lanced, and the bleeding encouraged by the use of warm water. After this the application of either of the following astringent gargles, twice a day, will serve to constrict the vessels, and restore the relaxed tissues to a healthy condition:—

Tincture of bark . .	two ounces.
Sulphate of zinc . .	two drachms.
Water	four ounces.

Or,

Tannin	twenty grains.
Brandy	half-an-ounce.
Camphor mixture . .	five ounces and a-half.

When the gums have been brought into a better condition by these means, a useful and pleasant

application consists of a small quantity of eau de Cologne or lavender water mixed with a wine glass full of water, with which the mouth should be rinsed night and morning.

In order to prevent the re-accumulation of the tartar, the patient must carefully clean the teeth, night and morning, with a moderately hard brush, and use, at least once a day, a tooth-powder sufficiently coarse to remove mechanically any fur that may have become deposited in the course of the twenty-four hours, care being taken that the active ingredient of the powder is not so coarse as to injure the enamel. Nothing should be so strongly condemned as the employment of any chemical agent for the purpose of removing the tartar, since whatever acts chemically upon the tartar is sure to injure the tooth.

A very favourite kind of tooth-powder consists of camphorated chalk, and when there is little or no tendency to the formation of tartar it may answer the purpose; it may be made as follows:—

Camphor	one ounce.
Precipitated chalk . . .	five ounces.

The camphor must be pulverised by means of a few drops of spirits of wine, and then gradually mixed with the chalk. Some years ago it was asserted that camphor acted injuriously on the teeth, but I am not aware that this statement has

been confirmed. The only objection to the use of this tooth-powder is, that where fur accumulates on the teeth, it does not exert sufficient mechanical action to remove it.

Mialhe considers it is essential that a tooth-powder should not only exercise a mechanical action in cleaning the tooth, but that it should also be perfectly soluble, and for this purpose recommends the following:—

Sugar of milk . . .	three ounces.
Pure tannin . . .	three drachms.
Lake	one drachm.
Oil of mint	eight drops.
Oil of aniseed . . .	eight drops.
Oil of neroli . . .	four drops.

I have given the above as the formula of a distinguished French pharmaceutist and physiologist, but there are many persons in whom such a powder would be altogether inefficient in keeping the teeth free from tartar. It is necessary that some more powerful mechanical agent should be employed than the foregoing.

Charcoal is a very common ingredient in tooth-powders. This substance has been employed for two reasons: first, on account of its grittiness or mechanical properties; and, secondly, on account of its antiseptic properties, which may help to neutralise any unpleasant odour of the breath arising from decomposing particles of food

which may have lodged in the crevices and intervals of the teeth :—

Charcoal	one ounce.
Powdered cinchona bark .	half-an-ounce.
Magnesia	eight grains.
Otto of roses . . .	two or three drops.

The objection to the use of charcoal is that the particles are apt to lodge in between the teeth and produce an unsightly appearance.

There are two other powders, either of which are, I think, preferable to charcoal: these are very finely powdered pumice-stone, or bone of the cuttle-fish; the first is the coarsest of the two, and should, therefore, be used more sparingly.

A good tooth-powder should combine several properties; thus it ought to have a mechanical action, but not so much as to affect the enamel; it may be somewhat astringent in order to give tone to the gums; it may be made to neutralise any acidity of the saliva by the addition of alkalies; and, lastly, these properties must be properly diluted by the addition of some impalpable vegetable powders, which shall, at the same time, impart to it an agreeable taste and odour.

The following formula appears to fulfil these conditions, and will answer better for general use than precipitated chalk and camphor, where there is any tendency to the deposit of tartar :—

Bone of cuttle-fish . . .	3 ounces.
Precipitated chalk . . .	6 „
Powdered orris root . . .	4 „
„ cinnamon . . .	½ ounce.
Tannin	½ „
Castile soap	½ „

Where a coarser powder is required, the following may be used :—

Pumice	1 ounce.
Precipitated chalk . . .	6 ounces.
Powdered orris root . . .	6 „
„ dragon's blood . .	1 ounce.
„ cinnamon . . .	½ „
Tannin	1 „
Castile soap	1 „
Oil of cloves	20 drops.

After being well mixed, the powders should be passed through a fine wire sieve, to get rid of any coarse particles, and in order that the whole may be thoroughly intermingled. The oil of cloves should be added afterwards.

It would seem almost superfluous to give any directions as to the manner in which the tooth-brush should be used, yet experience tells me that it is not so. Many persons merely brush across the surface of the teeth, and, in consequence, the ends of the bristles never reach in between the crevices of the teeth, where their services are most required for the purpose of dislodging particles of food, and any fur that may have collected in these recesses.

The brush should, therefore, be used not only across the surface of the teeth, but in their length, that is, up and down, when the ends of the brush penetrate in between the teeth and clear their interspaces. When the teeth are at all irregular, and some of them stand back out of the dental arch, if the brush is not used in the manner directed, the instanding teeth are sure to become discoloured by the gradual accumulation of fur.

A good tooth-brush should neither be very hard nor very soft; in the one case it may tend to produce absorption of the gums, and, in the other, it has not sufficient firmness to remove the foreign particles that accumulate between the teeth and on their surfaces.

CHAPTER XIII.

EXTRACTION OF TEETH—HŒMORRHAGE AFTER EXTRACTION—THE EMPLOYMENT OF ANÆSTHETICS.

Although it is not my intention to enter into a description of the operations performed upon the teeth, a few general remarks upon extraction may not be considered as misplaced.

There is, probably, none of the minor surgical operations that create such a disproportionate dread as the removal of a tooth, yet a pain which rarely lasts a minute can hardly be said to offer any extreme trial to the fortitude of even the most timid. It is rather the want of that physical courage which enables us to submit to voluntary pain, in order to avoid some greater or future evil than the operation itself, that excites the general feeling of dread with which the extraction of a tooth is so often contemplated.

The pain of the operation is not greater than what the patient suffers from a severe attack of toothache, and certainly does not produce that exhaustion and injury to the health which arises from broken rest and continued suffering.

In former times the instruments employed for the extraction of teeth were of such an imperfect description, that the marvel is how a firmly implanted molar was ever removed from the jaw. The old French surgeon, Ambroise Paré, gives such a description of tooth drawing in the sixteenth century, as might well make one hesitate a considerable time before submitting to such a terrible ordeal.

"Therefore," says Paré, "for the better plucking out of a tooth, observe these things which I have mentioned: the patient shall be placed in a low seat, bending back his head between the tooth-drawer's legs; then the tooth-drawer shall deeply scarifie about the tooth, separating the gum therefrom, and then, if spoiled as it were of the wall of the gum, it grow loose, it must be shaken and thrust out by forcing it with the three-pronged levatory; but if it stick too fast and will not stir at all, then must the tooth be taken hold of with some of these toothed forcipes, now one, then another, as the greatness, figure, and site shall seem to require. I would have a tooth-drawer expert and diligent in the use of such toothed mullets, for unless one knows readily and cunningly how to use them, he can scarce so carry himself, but that he will force out three teeth at once, ofttimes leaving that untoucht which caused the pain."

After the toothed mullets of Ambroise Paré, came the key instrument, so long the principal resource of the operator. The key is unquestionably a very powerful instrument, and, in unskilful hands, it is also a very dangerous one. I have in my possession a specimen in which the three upper molars and the surrounding jawbone were brought away by the improper application of this instrument in an attempt to remove either the first or second molar. Formerly these accidents were far from uncommon, but, happily, as the forceps has been improved and taken the place of the key, they have gradually disappeared, and it is rarely that we now hear of any injury arising from the extraction of a tooth by competent persons.

Apart from these occasional disasters from the use of the key, it is a badly contrived instrument, inasmuch as it exerts an unnecessary degree of violence upon the parts, and removes a tooth from its socket by a force which is not applied in the most advantageous manner; the consequence is that more power is employed than is absolutely necessary for the extraction of the tooth.

The instrument now almost universally employed is the forceps, which possesses several advantages over the key. The beaks of the instrument can be so shaped as to correspond very exactly to the form of the tooth to be removed, giving the

operator a firm and secure hold of the tooth without exerting extreme pressure upon any one spot. This is exceedingly important in the case of teeth which are much decayed. Again, the blades can be made so thin that they pass readily between the tooth and its socket. This not only gives the operator a firm hold, but also enables him to grasp the tooth beyond the decayed portion, and thus avoid the risk of crushing or breaking the hollow part of the crown. Both the fangs of the teeth and their sockets are more or less elastic, especially in the young, and there is no instrument which enables us to take so much advantage of this elasticity as the forceps; the operator being able to direct the extracting force to the right or to the left, so as to move the tooth in the direction in which he finds the socket yields most readily.

People often dread having the fangs of teeth removed when the crowns are destroyed, believing that the old plan, of what was termed punching, must be resorted to. This is not the case in the present day, for the numerous forms of forceps with which the dentist is provided often render it no more difficult to remove these stumps than if they were sound teeth. I do not say that there are no cases in which the difficulty is not increased by a tooth being decayed low down in its socket, but it is certain that, in the majority of

cases, this can be overcome without exposing the patient to any very great amount of additional suffering, and very often with even less than accompanies the extraction of a tooth. When we consider how often a number of decayed stumps are the cause of inveterate headache, of neuralgia, or of indigestion, this is an improvement of no slight importance in the practice of dental surgery.

When the key instrument was used, it was always the practice to lance the gums; this operation consisted in passing the blade of the lancet between the gum and the inner and outer surface of the tooth, so as to separate the gum and prevent it from being lacerated. Patients still occasionally inquire whether the operator is not going to lance the gums before extracting a tooth, supposing that it facilitates the operation. There is, however, no necessity, as a general rule, for this proceeding, as it in no way facilitates the removal of the tooth, and even if it did, with the instruments that are now employed, the very placing of their blades upon the crown of the tooth accomplishes, at the same time, the separation of the gum.

There are only a few instances in which the separation of the gum, as a distinct operation, is necessary. In some teeth which stand alone the gums become rather firmly attached to the sides of the teeth, where the blades of the instrument do not reach, and then it is desirable

first to separate the gum in order to prevent its being torn. The other cases consist of stumps which have become covered over by the growth of the gum, and here it is very necessary carefully to pass a thin instrument around the entire circumference of the stump, not only to prevent laceration of the gum, but to enable the blades of the instrument to be properly applied to the remains of the tooth.

A question of some importance is that which relates to the propriety of extracting a tooth while there is inflammation in the fang and the surrounding structures. Amongst the older surgeons we find it laid down, as a rule, "that, though it is often absolutely necessary to remove or extract teeth, yet you ought not to perform the operation while the patient's gums, and parts adjacent, remain inflamed and tumefied." This is one amongst many instances in which we can trace a popular opinion of one age to the teachings of the learned in a former age. Like many other doctrines which have been retained in the popular mind long after they have been rejected by the class from whence they originated, this doctrine is false in principle and injurious in practice. If a nail happens to be run into any part of the body, no one would think of waiting until the inflammation which it would necessarily excite in the surrounding structures had subsided before they attempted to

remove it. Now, although the tooth is a portion of the body, yet, when the inflammatory condition to which I have referred is present, it has become almost as much a foreign body as the nail, that has been introduced by some accidental circumstance. The pulp of the tooth is destroyed, or is in a state of violent inflammation, and the periosteum has separated from the fang, and produced an alveolar abscess, or gumboil. The removal of the tooth would soon terminate this condition, and give relief to the sufferings of the patient. What, then, it may be said, is the objection to the operation? The objection is the tenderness of the parts, and the greater amount of pain the patient suffers in consequence from the operation, added to which, the pain does not immediately subside, as in the case of ordinary toothache. The arguments in favour of the operation is the certain, if not instantaneous, relief which the patient obtains, and the avoidance of all risk of the serious mischief that sometimes ensues if these cases are allowed to run their natural course. Lastly, we may observe that, although the pain is greater, the tooth is really more easily removed, and the peculiar wrench accompanying the extraction of a firmly implanted tooth is avoided.

With respect to the pain following the extraction of a tooth in the condition referred to, it usually subsides in the course of twenty-four

hours, and may generally be alleviated by anodyne applications, while the patient invariably obtains a night's rest, instead of tossing to and fro in a state of sleeplessness and torment.

Another popular notion, not altogether uncommon even in the present day, is, that the operator has not properly completed his duties unless he closes the gums. John Hunter, in his work on the *Teeth*, speaking of this point, remarks—"It is also a common practice to close the gum, as it is termed; this is more for show than use, for the gum cannot be made so close as to unite by the first intention," etc. It sometimes happens that when the fangs of a molar tooth are very divergent the walls of the socket are subjected to more than usual violence in its removal. When this has happened, it may be advisable to press the wall of the socket into its natural position.

The best application after the extraction of a tooth is warm water, of such a temperature as is most agreeable to the feelings of the patient. Frequently bathing the mouth with tepid water, supposing all hœmorrhage has ceased, is generally sufficient; if the pain continues, a decoction of poppy heads may be employed with advantage.

The extraction of a tooth is always followed by a certain amount of bleeding, which, however, usually ceases in ten or fifteen minutes. At other times it may continue slightly for an hour

or two, gradually getting less, and then ceasing. Occasionally the bleeding not only continues for this length of time, but comes away as freely at the end of it as at the commencement; when this happens, no further delay should take place, but the operator, or a neighbouring surgeon, should be consulted.

If the patient, on returning home after the extraction of a tooth, finds that the bleeding continues, cold water should be substituted for warm to wash the mouth with, and if this does not succeed, then some ice should be obtained, and the water applied as cold as it can be borne; a piece of ice may also be put in the mouth and sucked, and in many cases this will succeed in arresting the bleeding. If the patient is so circumstanced as not to be able to obtain ice, then the mouth should be well washed out with cold brandy and water, and, afterwards, a piece of cotton-wool, soaked in brandy, pressed into the socket from whence the tooth had been removed. Above all things, the patient should not go to bed while the bleeding continues, although, when applying the remedies that have been mentioned, perfect quiet and the recumbent position will assist in arresting the hœmorrhage. During the past year, in two cases, both females, from whom I had extracted a tooth, the bleeding continued until they retired to rest, and both of them were

awoke during the night with the mouth filled with blood. The bleeding stopped in the course of the next day, but left the patients weak and exhausted; had assistance been called within two or three hours of the operation the further loss of blood might no doubt have been prevented.

The proper mode of treating these cases is, first, to clear out the socket so as to remove the clots of blood, and then taking a narrow strip of lint, and dipping the end of it into some astringent fluid, such as brandy or spirits of wine—but best of all the tincture of the muriate of iron,—it should be carefully pressed down by a suitable instrument to the bottom of the socket; another fold should then be laid upon the first, and so on until the socket is plugged up. If the lint can be arranged so as to rise up and meet the teeth of the opposite jaw, they will act as a compress, and thus afford additional security against a return of the bleeding.

Rarely, indeed, does any danger arise from bleeding after tooth extraction, unless what is termed the hœmorrhagic diathesis is present. This is a peculiar state of the system, in which the slightest scratch or wound is followed by an uncontrollable bleeding: this tendency is often known to exist beforehand, and the operator should therefore be informed of it, and such a case should never be lost sight of until the bleeding has ceased.

A most important question, which has often to be decided in the present day, is the propriety of a patient inhaling chloroform before the extraction of a tooth. We all naturally shrink from pain, and would, if possible, avoid suffering, however short its duration. It was a grand discovery of the American dentist, Wills, when he obtained the means of depriving the person of sensation under the knife of the surgeon. Thousands of human beings have been spared an incalculable amount of suffering, and not a few lives have been preserved by the use of chloroform.

Unfortunately, however, this great alleviator of human suffering is not without its drawbacks, and every now and then we are shocked by hearing that, instead of preserving, it has suddenly destroyed life. It is this uncertainty in the result which makes the surgeon and the dentist hesitate as to its indiscriminate and universal application. Although it has been calculated that where chloroform is administered a fatal case does not happen once in ten thousand, yet, even this teaches us the great lesson of caution in its application, and also that it should not be used unnecessarily.

I hold, then, that, as a general rule, the use of chloroform should be avoided in dentistry, first, for the reasons above mentioned, and, secondly, because there are some special objections to its

use in operations on the mouth; amongst these is the upright position of the patient, which is not so favourable to the action of the remedy as the recumbent position. Another objection is the firm closing of the mouth, which sometimes occurs, and renders it difficult to apply the instrument, unless the chloroform is administered to the full extent of relaxing the muscles.

Where, however, the patient has not the courage to undergo the operation, or where it is of such a nature as to call for the use of chloroform, the following rules should be adopted.

First, the medical attendant, or a physician, should examine the patient and approve of the administration of the anæsthetic.

Secondly, it is desirable that the chloroform should be administered by a second person, and not by the operator.

Thirdly, the patient should not have taken food for at least a couple of hours before inhaling the chloroform.

Fourthly, in the case of females the dress should be loose, so as to offer no impediment to free respiration.

By thus selecting our cases, by taking the above precautions, and by carefully administering the chloroform by means of an inhaler, it will be very rarely that any unpleasant results will ensue.

CHAPTER XIV.

THE TEETH IN RELATION TO DISEASE—NERVOUS SYSTEM—NERVES SUPPLYING THE TEETH—DISEASES OCCASIONALLY PRODUCED BY DECAYED TEETH — DIVIDED INTO LOCAL, CONSTITUTIONAL, AND NEURALGIC—CASES IN ILLUSTRATION.

When describing the anatomy of the teeth no reference was made to the connection which is established between these organs and the rest of the body by means of the nervous system. Yet, it is necessary that this should be taken into consideration, in order to account for the effect which diseased teeth may produce upon the general health, and upon certain local disorders.

Even when this connection has been pointed out, the information produces the most vague ideas upon the minds of those who are totally ignorant of the physiology of the nervous system; that is to say, of the special offices belonging to its several parts, and of the laws regulating their action.

One great aim of the writer has been to convince his readers that the teeth must be regarded as something more than mere mechanical organs

adapted to crush and grind our daily food, and it is especially with respect to the relation existing between these organs and the diseases of other parts that this fact requires to be impressed upon the popular mind.

At the risk, therefore, of being charged with introducing irrelevant matter into a popular work on the teeth, I shall endeavour to give a brief outline of the physiology of the nervous system, before speaking of those special relations which it establishes between the teeth and the rest of the body.

The nervous system consists of numerous delicate threads forming a complicated and intricate net-work over the entire body, and of certain enlarged masses, as the brain and the spinal cord, constituting, in the language of the physiologist, the nerve centres. These central masses are the regions from or to which the nerves issue forth or return, from whence they convey the mandates of the will, or to which they communicate the various sensations arising from within or impressed upon the body from without. Connected with the brain and the spinal cord are two sets of nerves, one bestowing the power of motion upon the parts to which they are distributed, while the other warns the mind of approaching danger by giving rise to the sensation of pain; they are, in fact, nerves of motion;

nerves of sensation; divide the one, and the part is deprived of the power of moving; divide the other, and feeling is lost.

This is all that is required to be said of the nerves connected with the spinal cord; not so, however, with respect to those emanating from the brain. In addition to motor and sensitive nerves, the brain gives off nerves of special sense to the eye, the ear, the nose, and the tongue, enabling these organs to fulfil their several functions.

So far we have spoken of things familiar to all: motion and feeling, and the special senses of hearing, seeing, smelling, and tasting. Over these we have more or less control, or can at least summon them into action at our pleasure. But in the wonderful phenomena which are daily and momentarily performed by the living man there are movements and actions over which he has little or no control; he may, indeed, injure and disturb them, but he cannot arrest them, except at the cost of life; the constant action of the heart, by which the blood is propelled over the body, and the vermicular movements of the intestines, may serve as examples. Although these movements are not under the control of the will, they require a nervous system to regulate them and to bring them into harmony with the other functions of the body. The same remark applies

to the various secretions of the body, amongst which are included the saliva, the gastric juice, the bile, and the fluid of the pancreas. Governing, therefore, these functions we have another system of nerves quite distinct from, yet intimately connected with those previously mentioned, they form a bond of union and of sympathy between the most remote parts of the body, and hence this has been called the sympathetic system of nerves.

This sympathetic system is composed of nerve filaments and of enlarged masses termed ganglia, which are present in every part of the body, and are not only connected with the nerves of their own system, but also with those emanating from the brain and the spinal cord. As an instance of the manner in which this sympathetic system influences the function of secretion may be cited the flow of saliva during mastication. The presence of food in the mouth is recognized by the nerves of the fifth pair, which are derived from the brain, through a plexus of the sympathetic, with which the fifth nerve is associated, the stimulus is conveyed to the salivary glands, exciting them to pour out their secretion into the mouth. Dentition in infants and affections of the teeth in adults afford many examples in which the irritation produced in the dental nerves is communicated through the sympathetic to other organs.

Turning then to the teeth, we have to inquire what are the relations existing between the nerve filaments we have seen distributed through the pulp of the tooth (p. 116) and those belonging to the other parts of the body.

The teeth are supplied with nerves from one of the most important of those which arise from the under surface of the brain. This large nerve, known as the fifth pair*, originates by two roots, the smaller of which bestows the power of motion upon the parts to which it is distributed, while the filaments derived from the larger impart sensation. Before the nerve issues from the skull it divides into three branches.

The first passes into the orbit and gives off filaments to the ball of the eye, to the gland secreting the tears, to the lining membrane of the nose and eyelids, to the skin of the nose and forehead, and to the muscles of the upper eyelid and of the forehead; lastly, some of its branches communicate with those of the great motor, or facial nerve, distributed to the muscles of the face, and others with a small ganglion of the sympathetic situated within the orbit.

The second division, known as the superior maxillary nerve, passes to the upper jaw, and,

* All the nerves coming from the brain are arranged in pairs; in describing them, that on one side only is spoken of, the corresponding nerve on the opposite side being symmetrical.

after traversing a canal situated in the upper part of the bone, emerges upon the cheek, where it gives off its terminal branches, which are distributed to the side of the nose, to the eyelid, and to the upper lip. Soon after its exit from the skull this division communicates with an important ganglion of the sympathetic in conjunction with which it supplies the integument on the side of the head, the muscles and integument of the lower eyelid, the side of the nose, and the upper lip. It also gives off branches to the teeth, to the membrane lining the cavity of jaw-bone, to the gum, to the mucous membrane covering the roof of the mouth, to the upper part of the gullet, and to the soft palate tonsils and uvula. Another branch is sent off which enters the orbit, and not only communicates with the branches of the first division, but also with filaments coming from the ganglion of the sympathetic, that has been mentioned as being placed in the orbit; it also communicates with the filaments of the facial nerve.

The third division, or inferior maxillary nerve, immediately after it has emerged from the skull, is joined by the smaller root of the nerve, and thus, while the two previous divisions only bestow sensation, the present division gives motion to some parts and sensation to others. The motor filaments are given off near the commencement of

the nerve, and supply the muscles which move the jaw, and many of those belonging to the upper part of the throat; it then divides into two large branches. One, termed the gustatory, is distributed to the side of the tongue, and bestows upon this organ the sense of taste; thus, the lower maxillary nerve is not only a nerve of motion and sensation, but also a nerve of special sense. The other, the inferior dental nerve, enters a canal in the lower jaw, passes beneath the fangs of the teeth, to each of which it gives off two or three filaments; near the first small grinder, or bicuspid tooth, a branch passes out of the canal to supply the muscles and skin of the chin and lower part of the face. Branches are also supplied to the side of the head, the external ear, the mucous membrane of the mouth, the gums, the salivary glands, and to the articulation of the lower jaw. Lastly, the inferior dental nerve communicates with two of the ganglia belonging to the sympathetic, one of which sends off filaments to the largest of the salivary glands, the parotid; with the other divisions of the fifth pair, with the facial nerve, and with nerves coming from the internal ear.

Intricate as this description may appear to the general reader, it gives but an imperfect idea of the complicated character of the connection existing between the nerves that supply the teeth and those belonging to the surrounding structures.

One circumstance must be borne in mind, and that is, that the sympathetic ganglia which have been referred to form but a portion of a continuous chain of ganglia, distributed throughout the head, neck, chest, and general cavity of the body.

Having endeavoured to give a succinct account of the true position in which the teeth stand to the rest of the body, we shall proceed to consider those constitutional and local disorders which may occasionally be traced to a diseased condition of these organs.

The agony produced by a decayed tooth during a paroxysm of toothache is so unmistakeable that even the most timid and sceptical patient is compelled to admit the true source of his suffering. Such, however, is not the case when there are a number of decayed stumps in the mouth, or when there is a considerable portion of the crowns of the teeth remaining, and the patient does not experience any tenderness or pain in the teeth themselves. It is often difficult to persuade those who have had no experience in these matters to regard the teeth as the cause of pains about the head and face, of repeated headaches, or of impaired digestion, when neither probing or striking the teeth with a steel instrument produces pain. Sometimes, indeed, there is a lurking consciousness that if the diseased teeth were away the aches

and pains would vanish, or the digestion be improved, but the dread of the operation of extraction, particularly when a number of teeth require to be removed, induces the patient to turn a deaf ear to the dictates of his reason, so seldom are we prepared to submit to voluntary pain where it can possibly be avoided, yet it is quite certain there are many cases in which no permanent cure can be effected so long as the diseased teeth are suffered to remain.

Unfortunately, these views are not altogether confined to the patient, there are still some medical practitioners who, to a certain extent, appear to participate in them, or if they have their doubts upon the matter, nevertheless yield to the wishes of the patient, and flatter him with the idea that his disease is a nervous affection, that it arises from rheumatism, or is the result of impaired digestion. Quinine, tonics, stomachics, a carefully regulated diet, or a change of residence is recommended in the hope that relief may be obtained by these means, or that some change in the condition of the teeth themselves shall put an end to the complaint.

In the following cases I shall endeavour to point out some of the disorders that occasionally arise from the presence of diseased teeth. These disorders may be divided into local, constitutional, and neuralgic, reserving for a separate chapter

the consideration of the special relation in which the teeth stand to the function of digestion.

Sir Astley Cooper, in his *Surgical Lectures*, has recorded the following cases as illustrating what he terms sympathetic irritation :—

"A lady, in Essex, had for a long period been afflicted with a fungoid granulation, which protruded through an ulcerous opening in the cheek, and which had resisted the use of every means. Upon stating one day that a tooth near the part was occasionally painful, she was recommended to get it drawn; the tooth was extracted, and the fungus quickly disappeared."

"A gentleman of my acquaintance," says Sir Astley, "had, for many years, been exceedingly annoyed by an ulcer on the chin; every attempt to heal it having proved ineffectual, it was considered incurable. At length, one of the teeth opposite the wound becoming painful, it was extracted, when, to the delight and astonishment of the patient, his malady disappeared."

A somewhat similar case came under my own notice.

The patient, a female, consulted me on account of an unhealthy-looking abscess situated on the left side of the face, between the angle of the mouth and the inferior margin of the lower jaw. The skin was puckered, in some parts very thin, and with several minute apertures, through which

a thin watery pus was constantly discharging, producing great disfigurement and annoyance.

She stated she had some diseased teeth in the lower jaw, and that the opening in the cheek had existed for more than two years; during this time she had applied various remedies, and had frequently been under medical treatment. The discharge had varied in quantity from time to time, but had never entirely ceased. On examining the mouth, I found the stumps of two molar teeth, but there was no appearance of an alveolar abscess, and I satisfied myself there was no communication between the sockets of these stumps and the abscess on the cheek. The patient said that formerly there had been a troublesome discharge from these teeth.

I extracted the stumps of the molar teeth, and finding the abscess contained a good deal of matter pent up, I made an opening, with a fine lancet, at the most dependent part. A piece of lint, dipped in cold water, was placed over the abscess, the patient being directed to renew it frequently and to cover it with a piece of oiled silk, or thin gutta-percha, so as to keep the part constantly moist. She was to let me see her in a couple of days.

On her second visit the abscess had almost ceased to discharge; the same treatment was continued, and in about ten days the opening was entirely healed up.

The curious point in this case was the absence of any communication between the abscess and the stumps. This implies one of two things; either there never had been any communication, and if so, the abscess must have arisen independently of the teeth, but the latter acting as a source of irritation prevented its healing up. If, on the other hand, a communication did at one time exist, then it must subsequently have closed up, but the irritation arising from the stumps still prevented the abscess from healing.

Mr. Hilton, in his valuable *Lectures on Mechanical and Physiological Rest*, as a means of curing disease, gives the following case, which bears directly upon the point under consideration:—

"In last year's lecture I mentioned that a professional friend of mine had suffered from a condition bearing on the subject of the influence of nerves upon the structure supplied by them. That friend, unfortunately, is no more. It was Dr. Addison to whom this happened. The case is one of some interest, and I will repeat it in a few words. Some years ago Dr. Addison had a very offensive discharge from the auditory canal of one of his ears, which annoyed him very much; and below the external ear was a small gland enlarged in the upper part of the neck. He had tried various remedies for this discharge, and had gone, I believe, to some surgeons who attended

specially to the ear; but, as far as I could learn, no good resulted from any of the applications. Before examining the ear from which the offensive discharge proceeded, I found a slight ulceration upon the floor of the auditory canal. On arguing the question out between us, we came to the conclusion that the ulceration probably depended upon a diseased molar tooth in the lower jaw, on the same side. We had the tooth extracted, and in a very short time the ulcer healed, the discharge and morbid secretion disappeared from the auditory canal, and as soon as this ulceration was cured the enlarged gland subsided."

The same writer has called attention to the circumstance of one-half of the tongue being frequently furred on the side where there is a diseased tooth, while the opposite half is perfectly clean. Since reading this remark I have noticed several cases where this has happened, I think most frequently when the diseased tooth was in the lower jaw.

In a lecture on some of the effects produced by carious teeth, by Mr. Samuel Smith, of Leeds, published in the *Lancet* for 1857, the following interesting cases are recorded:—

"Elizabeth H., aged 40, was sent from some distance in the country to this infirmary, Dec. 12th, 1856, to be treated for what she was told by a medical practitioner was a cancerous tumour.

On examination a tumour of the size of a small chesnut was found, with an ulceration of the mucous membrane, just fitting the sharp edge of one fang of a carious molar tooth of the lower jaw, which was making its way from the gum. Being fully assured, from former experience of many cases of a similar kind, that this was the sole cause of the tumour and ulceration, I removed the tooth, and promised her it should be well in a few days. A little lotion was ordered for the mouth. She appeared again on the next out-patient day, December 17th. The ulceration was healed, the tumour gone, and she was discharged cured.

"More than thirty years ago, one out-patient day, my senior colleague (Mr. Hey) informed me that a few days previously he had treated a malignant-looking tumour from the tongue of a young country woman, who was a private patient of his; that, to his surprise, in a few days the tumour had sprouted out as large or larger than before the operation. On examining the patient there was a foul, dark, fungoid tumour, which occasionally bled, and from which she suffered much pain during every attempt to speak or masticate food; it was the size of a small walnut. On examining it with the finger I detected two broken incisors (the middle and left lateral of the lower jaw), leaning inwards, and, with sharp pointed edges,

fitting into the centre of the tumour. I was immediately convinced that these two teeth were the cause of all the mischief, and stated that opinion to Mr. Hey, who appeared doubtful. I said that he would not be justified in applying the ligature, or using any other means, without first waiting to see the effect of the removal of the two broken carious teeth. I never saw the young woman again, but I was informed by Mr. Richard Hey that the teeth were drawn and soon afterwards the tumour entirely disappeared without any other means being resorted to.

"Soon after I commenced practice I frequently met a young gentleman of fortune walking about with a piece of black plaster on his left cheek as large as a dollar. I often wondered what could be the matter, but not being his attendant I had no business to inquire. After suffering the annoyance of his black plaster for a very long time, and being in London, a friend persuaded him to consult Sir Astley Cooper. He made very short work with him, took his fee, and sent him to a dentist to have a certain upper molar tooth removed, informing him that he would be well in a few days after. His prognosis was verified by the result. This young gentleman is now an old one, and I occasionally meet him; he has never worn his black plaster since, but he has the appearance of a Peninsular veteran, who had received a musket-ball in his cheek."

In this case there had been an abscess produced by the carious tooth which had penetrated the cheek.

Instances have occured where an abscess originating from decayed teeth has burrowed amongst the muscles of the neck until it has opened close to the sternum, and no amendment was obtained until a number of carious teeth and diseased stumps were removed.

In September last I was consulted by a patient with a jagged unhealthy-looking fissure in the tongue, about the middle of the left side. The patient was a young man, 25 years of age, who, although he had no specific disease, was evidently out of health. On examining the teeth on that side of the mouth the second bicuspid and the first molar were wanting, the second molar was sound, but immediately behind it was the wisdom tooth very much decayed, and on its inner surface several rough, sharp points. I proposed the removal of the diseased tooth, for, although it was situated at some distance from the fissure in the tongue, I suspected that this was the cause of its not healing up. The patient consented, and at the end of a week the fissure had nearly closed up, when he went out of town for the benefit of his health.

The upper jaw bone is peculiar for being hollowed out into a large cavity called the antrum,

placed immediately above the fangs of the grinding teeth, it has an opening leading into the nose, and is lined by a thin membrane secreting a small quantity of fluid. The layer which covers the fangs of the teeth and separates them from the cavity is seldom thicker than a piece of writing-paper, it may, therefore, be easily understood that if matter forms around these teeth it may make its way into the antrum. When this takes place the matter goes on accumulating in the interior of the bone, and sometimes discharges itself by the opening leading into the nose, more frequently, however, this passage becomes closed up, and the bone is gradually distended by the quantity of matter which collects; this causes a dull, heavy, aching pain in the cheek, and is very liable to produce disease of the bone.

The following case, reported in the *Lancet* for 1857, is a good illustration of the disease, it shows the ill effects resulting from the want of proper treatment, and how speedily they may be overcome when the true cause is detected:—

"A young woman, of rather strumous habit, complained of a dull aching pain under the orbit. The pain lasted from three to four months, attended by a gradual elevation of the orbital surface of the maxillary. The eye above the surface at length became so much affected as entirely

to lose its functions. At this stage of the case the young woman, who was attended by a general practitioner *who ignored dental surgery and pathology*, resorted to leeches, blisters behind the ears, and drastic purges, I need not say ineffectually. After two or three months' loss of the sight, the young woman first perceived a discharge from the right nasal fossa, of a thick purulent fluid. This discharge had existed for eighteen months when I first saw her, even in spite of the aforesaid remedies. An examination of the mouth at once revealed the cause of so much misery, and the removal of three roots in a state of periostitis was the simple means by which two most important organs regained their proper functions."

The organs of sight and hearing are subject to certain disorders, which are occasionally produced by diseased teeth.

In the *Lancet* for Jan. 23rd, 1859, Mr. Hancock has recorded the following instances in which sight was affected:—

"J. K., aged 11, was admitted, under the care of Mr. Hancock, into Charing Cross Hospital, Nov. 11th, 1854. About a month previously, upon waking one morning, he found he was entirely blind. Previously he had nothing the matter with his eyes, and when he went to bed he could see perfectly. After being treated unsuccessfully for a month he was sent to the hospital.

His pupils were dilated, fixed, and uninfluenced by light, which he could not distinguish from darkness. The suddenness of the attack and the absence of the usual premonitory symptoms led Mr. Hancock to examine the teeth. The teeth were found much crowded and wedged together, the jaws not being sufficiently large for them. Mr. Hancock ordered two permanent and four milk molar teeth to be extracted. On the same evening the boy could distinguish light from darkness, and on the following morning could make out objects. From this time his sight rapidly improved, and he was dismissed, cured, on November 28th, the only treatment beyond the removal of the teeth being two doses of aperient medicine.

"A man from the country applied at the Royal Westminster Ophthalmic Hospital for total blindness of the right eye of eight months' duration. The attack came on quite suddenly, not having been preceded by any of the usual precursors of amaurosis. He could not distinguish light from darkness. The various remedies for amaurosis had been employed in the country without success. Attention was directed to his mouth, when the second molar tooth on the right side in the upper jaw was found to be much decayed. This was extracted, and the patient desired to attend again in two days. At his next visit he could see, and

was able to distinguish objects though not very clearly. In the course of a few days he returned to the country quite well. He had no other treatment beyond the extraction of his tooth.

Mr. Harvey, in his valuable work on *The Ear in Health and Disease*, speaking of ear-ache says:—

"The author has very recently attended a case of this severe affection attacking the left ear; it had been complained of for upwards of twelve months; he had the opportunity of examining the ear during a paroxysm, but nothing could be discovered satisfactorily to account for the intense agony; not a vestige of inflammatory action could be traced; the external meatus was moist, and the ceruminuous circle perfect. On directing attention to the teeth, both the dens sapientiæ and first molar on the affected side were tender, and were extracted accordingly, after which the pain ceased."

Mr. Catlin has recorded a very singular case of a lady who consulted him concerning a diseased right lower molar. For three months she had suffered acute pains in the tooth, ear, and side of the neck. When he saw her she had been deaf for four days. The inflamed tooth was extracted, and hearing returned within an hour after the operation.

Writers on epilepsy have recorded several cases where the disease has been traced either to the

process of cutting the teeth or to a diseased condition of these organs.

Dr. Bennett, in *Tweedie's Practical Medicine*, article, "Epilepsy," says:—"The disease is often brought on in children by the irritation of dentition during the first or second period; in the latter case the disease is occasionally severe and of long duration."

Dr. Ramskill has recorded, in the *Medical Times and Gazette* for 1862, a case of epilepsy which depended upon the presence of a decayed molar tooth:—

"The patient, J. D., aged 13, had had epilepsy for eighteen months. The first attack occurred after eating some crab-fish for supper, the second came on two months afterwards, the third in the course of fourteen days, and after that the attacks occurred at intervals varying from one to three weeks. They always happened during the night. Latterly his mother noticed that some days he rubbed his left cheek, complaining of face-ache, after which the fit followed. The boy was healthy looking, tolerably well fleshed, although the muscles felt somewhat flabby. He was intelligent, and did not appear to have suffered in his memory; he had no headache or vertigo. On examining his mouth, a molar tooth was seen to be much decayed, with the gum around it swollen and partly growing into the cavity; it was not very tender

to the touch, and the examination did not give rise to toothache. The sensation which the boy experienced before a fit did not seem to be one of pain, but rather an indefinite uneasiness. He always had a fit the night on which the uneasiness came on; he never felt it during the day but always about seven or eight o'clock."

Dr. Ramskill ordered the tooth to be extracted, and prescribed a simple saline with a quarter of a grain of belladonna. The tooth was extracted the next day, and the boy seen once a fortnight for four months, but he had no recurrence of the fits.

Headache is frequently caused by diseased teeth, and no permanent relief can be obtained so long as they are allowed to remain in the mouth. Dr. Copland, in his *Dictionary of Medicine*, and Dr. Bennett, in *Tweedie's Practical Medicine*, both refer to diseased teeth as one of the causes of that particular form of headache known as nervous headache. Dr. Wright, in his work on *Headaches*, observes: "In all cases of nervous headache, and especially where it is periodic, the mouth should be carefully examined, as the presence of decayed teeth often serves to keep up the irritation."

A lady, aged 54, had long suffered from continual attacks of headache, in every other respect her health was perfectly good and there was nothing to account for the pains in the head excepting a number of diseased teeth, which her

physician desired her to have removed. The lady's reply was very straightforward, and somewhat characteristic of a class of patients, who imagine that a dose of medicine is to cure all their ailments from whatever cause they may arise. "If you cannot cure me," she said, "without the teeth being removed it is no use my coming to you." Afterwards, however, the advice was followed and the teeth extracted, when the headaches entirely disappeared. In this case various remedies had been tried but without any relief being obtained, nor is it at all probable that the headaches would have ceased so long as the diseased teeth remained in the mouth.

With respect to neuralgia these cases are of such daily occurrence that I shall only mention one or two, and those rather for the purpose of showing how little a patient is able to determine out of a number of decayed teeth which is the true source of his suffering, than for the purpose of proving that neuralgia may, in the majority of cases, be traced to diseased teeth.

A patient, who had suffered greatly from toothache and neuralgia on the left side of the head and face for some time, came to me for the purpose of having the tooth extracted, which she regarded as the cause of her suffering. The tooth, to which the patient referred and wished to have removed, was the second molar in the upper jaw.

Upon examining this tooth I found it was perfectly sound, but the wisdom tooth in the lower jaw on the same side was very much decayed, yet, although I tried this tooth in every way with the instrument, the patient assured me it did not give her the slightest pain, and I had some difficulty in persuading her to allow me to remove it instead of the sound tooth in the upper jaw; so thoroughly convinced was she that the latter was the real source of her suffering. I ultimately obtained the patient's consent to the removal of the wisdom tooth, and afterwards had the satisfaction of learning that her neuralgia had disappeared.

A short time back, a female consulted me at the Dental Hospital, requesting me to remove a bicuspid on the right side of the upper jaw, on account of neuralgic pains on that side of the head and neck from which she had been suffering for some time. Seeing that the tooth was in such a condition that it was very likely to have been the source of her sufferings, I had no hesitation in complying with her request. I noticed, however, that in the lower jaw, on the same side, the second molar was much decayed, and had been very imperfectly plugged with a piece of gutta-percha. I suggested to her that this tooth might also be the source of the neuralgia. The patient assured me that it never caused her the slightest uneasiness. If that were the case,

I advised her to have it properly filled, and proceeded to remove the stopping; but, no sooner did I touch the interior of the tooth than the patient sprung from the chair as if she had been electrified, and was seized with a violent neuralgic paroxysm. It was, therefore, quite evident that this molar tooth, which the patient declared to be perfectly free from all pain, was, after all, the true source of her suffering.

The patient wisely consented to the extraction of the tooth, and was afterwards free from neuralgia. Now, had the patient gone away after the removal of the one tooth, she would, probably, have been convinced that her sufferings had nothing to do with her teeth, but depended upon some affection of the nerves, and would have gone on trying various remedies, which must have been perfectly useless so long as the diseased tooth in the lower jaw remained.

A lady, residing in the country, had been suffering for some time from neuralgic pains in the head and face, frequently obtaining no rest, as the pains were more severe at night time; in every other respect her health was perfectly good. The medical attendant, although informed that there were some decayed teeth in the upper jaw, rejected the idea that they were the source of the patient's suffering, and advised her not to have them removed; he pronounced the disorder to

a case of neuralgia, and ordered quinine. After this plan of treatment had been pursued for some months without any benefit, I removed the upper wisdom teeth, which were badly decayed, and from that time all the symptoms vanished.

The cases I have related serve to illustrate some of the more frequent forms of disease arising from the presence of decayed teeth, but there are many others which are occasionally dependent upon the same cause. For example, in November, 1863, I was consulted by a patient with a loose central incisor in the upper jaw, that had dropped down some distance below the other teeth, and was gradually being expelled from the mouth; the gum was vascular, spongy, and inflamed for some distance around the tooth. This patient had been troubled with irritation about the nostrils, accompanied with a slight discharge. After the tooth was removed the affection of the nose disappeared. Dr. Tanner informs me that he has had under his care some cases of hypochondriasis, in which he could refer the condition of the patients to no other cause than the presence of a number of diseased teeth.

It may occur to some of my readers that if the teeth are capable of acting in the manner I have described upon tissues and organs that are remote from them, so in their turn they must be subject to similar influences from disease in other parts

of the body. This, in fact, does happen, as we have already seen exemplified in the instances I have given of sympathetic toothache; it is, however, only occasionally that we meet with direct evidence of such influence. One of the most frequent instances of this reflex action on the teeth arises from disease of the ear. A decayed wisdom tooth often causes pain in the ear, and so, on the other hand, Mr. Wilde remarks: "In severe inflammation of the ear, pain in the teeth of the affected side is no uncommon accompaniment."

The following case, recorded in the *Lancet* for May, 1859, is an interesting example of the teeth being affected by an operation performed on another part.

"A boy had a piece of slate pencil, $1\frac{3}{4}$ inches long, lodged in the orbit, into which it had been driven by a fall. In removing the pencil," says Dr. F. D. Jones, "there was but a trifling amount of hæmorrhage during the operation, which was performed without chloroform, and the greatest complaint the patient made during the performance was that I was making his tooth ache. On being asked which tooth was aching, he referred the pain to one of the grinders in the upper jaw. This pain was no doubt caused by the pressure of the pencil on a nerve connected with those distributed to the teeth.

I have mentioned these latter cases to guard

against the supposition that I am seeking to attribute any peculiar action to the teeth in producing disease in other organs. All I have endeavoured to show is that the teeth are organized in a similar manner, and subject to the same laws as those which regulate every other part of the living body, and that the treatment of their diseases must be based upon a knowledge of medicine and of surgery.

CHAPTER XV.

THE TEETH IN RELATION TO DIGESTION—DIGESTION AND NUTRITION—ACTION OF SALIVA UPON THE FOOD—USE OF ARTIFICIAL TEETH—CASES IN ILLUSTRATION—CONCLUSION.

HITHERTO we have considered the teeth in their diseased rather than in their healthy condition, we have spoken of them more as a source of pain and annoyance than as organs assisting in the performance of that most important function, the nutrition of the body. We will, therefore, now examine them in their healthy condition, and endeavour to ascertain what part they are destined to perform in the general economy of the body, and whether their presence or absence materially affects the health and well-being of the individual.

The stomach is the great chemical laboratory wherein the elements of the food are transformed into a substance from whence the materials are derived for the nutrition of the body. In this cavity the food undergoes a complicated series of changes, brought about by the action of the gastric juice, by which it is converted into what is called chyme. From the stomach the chyme

passes into the intestines, where it is mixed with the bile, the pancreatic fluid, and the secretions of the glands imbedded in the intestines.

The products of digestion are absorbed by a special set of vessels connected with the small intestines, termed lacteals, because after a meal they are found filled with a milky kind of fluid; this, which in the stomach was termed chyme, is now called chyle. The lacteals, commencing on the surface of the intestines, unite together until they form one large trunk, which conveys the chyle into the veins emptying themselves into the heart; mingled with the blood, the chyle passes to the lungs, where the act of respiration completes its transformation into blood, and thus the supply of new material for the nourishment of the body is completed.

Such is a general outline of the manner in which new blood is formed. Before, however, the food is received into the stomach, it undergoes a preliminary process in the mouth, which consists in its being masticated and mixed with the saliva. It is the changes produced in the food by this preliminary process that we have now to inquire into.

In man the anterior teeth, the incisors and canines, take a comparatively small share in preparing the food for digestion, the use of the knife in civilized life superseding their office of

effecting the first separation or division of the food. However this first step may be accomplished, the food next passes between the bicuspids, or small grinders, where it is further sub-divided. Although we think but little of these teeth so long as we are in possession of them, yet, if we lose one of them, we soon perceive that the food escapes this stage of mastication, by lodging in the vacant space, and it is not until we become accustomed to the void that mastication is performed as easily or as perfectly as when the full complement of teeth is present.

From the small grinders, the food is carried by the tongue to the large grinding or molar teeth, where the true act of mastication is principally performed. It is here, as we have seen (p. 170), that the largest of the salivary glands pour their secretion into the mouth. It is into the portion of the lower jaw corresponding to these teeth that the principal muscles of mastication are inserted, while the jaws themselves are considerably strengthened to support the powerful action exerted in crushing the food.

If the chemist desire to dissolve a piece of metal in acid, he is well aware that by reducing the metal to a state of minute division he will greatly hasten the process, as he thus exposes a much larger surface to the operation of the acid than if the metal had not been divided. In the

same way the sub-division of the food by mastication, and its softening by the saliva, cause it to be more easily and rapidly acted on by the gastric juice than when these preliminary operations are either omitted or imperfectly performed.

Every stage of the chemical changes which the gastric juice of the human stomach produces in the food has been examined and experimented upon in the living man. These remarkable investigations were performed by Dr. Beaumont, upon a Canadian hunter, of the name of Alexis St. Martin.

This man, when eighteen years of age, was accidentally wounded by the discharge of a musket, which, besides other injuries removed a portion of the anterior walls of the stomach. Dr. Beaumont, who attended St. Martin during his illness, afterwards retained him in his service, in order that he might avail himself of the artificial opening in the stomach to perform a series of experiments on the process of digestion, and on the dietetic value of different articles of food.

One fact ascertained by these experiments was the importance of the food being perfectly masticated. Digestion was found to take place more rapidly according as the food was more minutely divided, whereby the extent of surface with which the gastric fluid came in contact was proportionately increased.

Another effect produced by prolonged and careful mastication is the thorough mixing of the saliva with the food. This fluid is generally regarded as merely serving to moisten the food and prepare it for the action of the gastric juice. The researches of modern physiologists have, however, shown that the secretions of the three pairs of salivary glands possess different properties. The fluid discharged into the mouth from the sublingual and submaxiliary glands serve only to moisten the food, but that which issues from the parotid glands, opposite the molar teeth, where mastication is chiefly performed, not only moistens but chemically alters certain portions of the food.

If the starchy matter contained in many vegetables, especially potatoes, is not properly mixed by mastication with the saliva from the parotid gland it is not digested in the stomach, but must first pass into the intestines and become acted on by the fluid from the pancreas. On the other hand, if the saliva of the parotid is thoroughly mixed with the food, it produces such a change in the starchy matter that the gastric juice is enabled to exert its solvent power upon it, and convert it into chyme.

The loss of the grinding teeth, therefore, not only retards digestion, throwing more work upon the stomach, and rendering it more difficult for this organ to digest the food, but it causes certain

portions of the food to pass into the stomach in such a condition that it is not digested at all.

Upon this point, I cannot do better than quote the following passage from Dr. Leared's excellent treatise on *Indigestion*:—

"Under the head of the relation of food to the organs may be placed the effects of insufficient mastication. It is a fruitful source of dyspepsia, and is more frequently the result of haste or carelessness than inevitable from the state of the teeth. The great prevalence of dyspepsia in the United States has been attributed to the rapid but characteristic manner in which meals are there dispatched. In some employments the insufficient time allowed for meals is, for the same reason, a cause of disturbed digestion, and too often gives rise to permanent disease.

"Besides actual loss of teeth, soreness of them, or of the gums, sometimes attended by unhealthy and even fetid secretions, greatly interfere with mastication. It is most important that solid food should be duly prepared, by chewing, for the action of the stomach; and it is also important that the starchy elements of the food be sufficiently submitted to the action of pure saliva."*

With respect to the use of artificial teeth the same writer remarks:—

* *The Causes and Treatment of Imperfect Digestion.* By A. Leared, M.D.; p. 35, 3rd Edit., London, 1863.

"The perfection with which false teeth can now be adapted makes them a most useful substitute for the natural organs, and, if requisite, the dyspeptic should not neglect to avail himself of the dentist's art. Let it be remembered, however, that in no instance is economy more futile: badly fitted teeth only increase the evil they were destined to remedy, and the base metal sometimes employed for their support has been known to effect the health most injuriously."*

Without being able to explain the reason, or to say how it is brought about, we know that one individual is physically strong, and another physically weak; that one person has a strong constitution, and another a feeble one; and that some persons are endowed with strong digestive powers, while in others the slightest circumstance will derange the whole process of nutrition and lay the foundation of ill-health.

The strong man can go through exertion that would prostrate the weaker; the person with a vigorous constitution may come out harmless from watching by the sick bed of the fever patient, while a transient visit lays the weak constitution prostrate with the disorder; so with regard to digestion, the healthy and the strong can indulge in a variety of foods, or submit to the loss of the masticating teeth without perceiving any percep-

* *Opus cit*, p. 163.

tible alteration in their general health; but let those with weak digestion indulge in a similar manner, or be subject to the loss of the grinding teeth, and their health soon begins to suffer. In the first instance the change is very slight; they cannot be said, indeed, to be ill, but at the same time they are conscious that there is something wrong, they do not feel as active and energetic as formerly, and they soon perceive that their uneasy sensations are most marked after their meals. In other cases the ill-effects assume the form of imperfect digestion, accompanied by all the various symptoms which this protean disease gives rise to. In one person the leading symptoms are oppression of the chest, or a feeling of fulness, often accompanied by pyrosis, or water-brash, as it is termed, consisting of the discharge of a limpid, tasteless fluid from the gullet into the mouth. Heartburn, consisting of a peculiar, disagreeable, burning sensation in the throat, commencing from the stomach, is another very common accompaniment of imperfect mastication.

In more severe cases there are acid eructations, or even vomiting; shortly after a meal the countenance becomes flushed, the patient feels heated, and then comes on headache. Of course, there are many of these cases where the disorder depends upon something more than the mere want of mastication; these cases must be placed under

the charge of the physician, and can only be cured by proper medical treatment. At the same time, I am sure every medical practitioner will bear me out in saying that when the food is imperfectly masticated it adds to the difficulty of curing every case of indigestion.

The number of examples which might be brought forward as illustrating the previous remarks are very numerous, but I shall content myself with describing two cases that have come under my own notice, where the benefits derived from the use of artificial teeth were so well marked that the improved state of health could not be attributed to any other cause. In one of these cases no medical treatment was adopted, and in the other it was of the simplest kind.

A gentleman, aged 46, had long been troubled with constant headaches at intervals of two or three days, coming on after his dinner. The pain was frequently so intense as to compel him to retire to bed. The next morning the food having passed out of the stomach the headache had disappeared, and the lighter meal of breakfast did not reproduce it. This state of things had lasted for three or four years. On consulting his physician he was ordered some alterative medicine, and a small portion of pepsine, to have a number of stumps of teeth removed, and artificial teeth inserted to assist him in mastication.

On examining his mouth I found that all the grinding teeth on both sides of the lower jaw were lost, but several fangs remained from which an unhealthy discharge issued into the mouth. In the upper jaw several teeth were decayed, and only imperfectly stopped, the crowns of all the four front teeth were destroyed, but their fangs remained in the jaw over which some artificial teeth had been placed upon a gold plate.

The treatment consisted in first removing every one of the stumps. After the operation I did not see the patient for nearly three weeks, who, in the interval, had unfortunately had an attack of quinsy, and from which he was only slowly recovering. The headaches had, however, nearly disappeared, and I now proceeded to make some artificial teeth for the lower jaw to assist him in masticating his food, these were inserted shortly afterwards and completed the cure.

In this case two causes were in operation at the same time to produce the ill health of the patient, namely, a weak digestion and diseased teeth, the former being no doubt mainly dependant upon the latter circumstance. The extraction of the diseased teeth, in the first place, removed a source of irritation to the nerves distributed to the head and face, and, secondly, it did away with an unhealthy discharge which must necessarily have passed into the stomach; lastly, the artificial teeth

served to reduce the food to that condition which is most favourable for the action of the gastric juice.

The next case was one which I had under my observation for several years, and am therefore fully acquainted with its history :—

A lady, the mother of five or six children, had for many years been in a bad and delicate state of health ; that is, as I have previously remarked, she had no positive disease and yet she had no real enjoyment of life, she was ailing but no one could say precisely what was the matter with her. She had suffered much from toothache, her teeth being attacked with that kind of soft creamy pultaceous decay which forebodes but little good from the process of stopping. One by one, in the course of years, she had gradually lost all the back teeth, and, as a necessary consequence, mastication had become more and more imperfectly performed, just in the same proportion the general ill health had increased, but had never proceeded to what constituted disease.

At length, when only a few teeth were left in the front of the mouth, the patient was herself convinced that the time had arrived when she must avail herself of the use of artificial teeth. This patient stated that she had no relish whatever for her food, that the mouth was constantly in a heated, dry, and uncomfortable state, and every

meal was followed by a feeling of oppression and indigestion.

The decayed teeth had been removed for successive attacks of toothache; the gums were in a tolerably healthy state, and nothing was necessary but to supply the lost teeth by artificial ones. This was done without any difficulty beyond the two or three interviews, which are almost invariably necessary, for the purpose of adjusting artificial teeth where both the upper and under jaws have been supplied with them. From the time that this lady became accustomed to the use of her artificial teeth her health began to improve, she recovered her relish for her food, the heated and unpleasant condition of the mouth and gums rapidly disappeared, she was no longer troubled with indigestion, the general health was completely re-established, and these beneficial results have continued up to the present time, which is nearly four years since the artificial teeth were first inserted.

The perfection at which mechanical dentistry has arrived during the last few years renders it the most perfect of all those arts which have been applied to the restoration of lost portions of the body. The artificial leg or arm can never rival the complex movements of the original members, while the artificial eye serves only to hide a deformity.

The time was when artificial teeth were no better than the glass eye; they kept up appearances, but in other respects were useless. This arose from the imperfection of the art, and not from the nature of the function performed by the teeth. The act of mastication is purely mechanical, although, in consequence of its causing the saliva to be mixed with the food, it is accompanied by chemical changes, which materially alter the nature of certain foods before they pass into the stomach. It is the grinding teeth, the most important of all in relation to digestion, that are most frequently lost.

So long as the front teeth remain, persons pay but little attention to the condition of those at the back of the mouth. This neglect often lays the foundation of ill health, in consequence of the imperfectly formed blood which is derived from imperfectly masticated food. As regards the general health, the restoration of the grinding teeth is far more important than that of the front teeth. When properly constructed, artificial teeth are efficient agents in mastication, and can effect all those changes in the food which are accomplished by the natural organs.

THE END.

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