A popular treatise on the teeth : containing a history of the dental art ... also a full ... account of the history of ether or lethean ... / By Mayo G. Smith.

This Plate represents the same face restored to its original and youthful appearance, by the aid of artificial teeth, as supplied by the author.

A

POPULAR TREATISE

ON

THE TEETH:

CONTAINING A

HISTORY OF THE DENTAL ART,

WITH

ANATOMICAL DESCRIPTIONS OF THE MOUTH AND ITS APPENDAGES,
AND ACCOUNTS OF CHEMICAL AND PHYSIOLOGICAL
EXPERIMENTS ON THE TEETH,

ALSO A

FULL AND ACCURATE ACCOUNT

This Plate represents the face of a lady deprived of her teeth; the approximation of the nose and chin, so characteristic of old age, being produced by loss of teeth.

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HISTORY OF ETHER OR LETHEAN,

FOR THE PREVENTION OF PAIN,

WITH DIRECTIONS FOR USE.

DESIGNED FOR THE USE OF FAMILIES, AND AS A MANUAL FOR THE STUDENT AND THE PRACTICAL DENTIST.

By MAYO G. SMITH,
DENTAL SURGEON.

ILLUSTRATED BY NUMEROUS ENGRAVINGS.

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PREFACE.

We offer this work to the public without apology or confessions of incompetency. We thought *such* a work needed, and we have prepared it.

We are not aware of the existence of any mistakes, but presume the critic may find many; for though it was prepared with all the care which the author deemed a work on this subject required, yet, as it has been written during years of constant professional engagements, from which but a few moments could be snatched at intervals, and at times when both body and mind were fatigued by the labors of the laboratory and office, we trust that lenity will be shown, if some errors have crept in and been overlooked.

Those who may look into this volume for minute and laborious anatomical dissertations, or perfect and entire directions for the performance of every possible operation in dentistry, need look no farther; — such is not our object. We design —

First, To disseminate correct information on the subject of dentistry, in such a form as will interest the general reader.

Secondly, The elevation of the profession, by an expose of dental empiricism, and by affording such information upon the subject of dentistry as will give the non-professional reader the means of practical self-protection.

Thirdly, To furnish the student and the practical dentist with useful facts and observations on the principles and practice of their profession.

The author is well aware that valuable works on dentistry have been already published; but those which are really of great value are for various reasons unsuitable for general circulation; — first, they are too expensive; second, they are too professional, and abound too much with unexplained technical terms, to be acceptable and useful to the mass.

Whether we have produced a *readable* book, we leave for the public to judge.

For some facts and observations on dentistry, we are indebted to Drs. Harris, Goddard, Elliot, Cutter, and others.

M. G. S.

Newburyport, Jan. 1848.

INDEX.

INTRODUCTORY REMARKS.

"The proper study of mankind is man."

POPE.

IT is a truth, though most strange and unaccountable, that, while we expect our children and youth, in schools and academies, to become acquainted with mental and moral philosophy; with many of the abstract and natural sciences; with mineralogy, geology, zoology, conchology, botany, and astronomy; while we teach them to trace with exactness the outlines of remote continents, islands, and rivers, with which they may never have the most distant connection; while we direct their attention to the course of the planets, the satellites of Jupiter, and the rings of Saturn; to the composition of the tails of comets, and the wonders of the "milky way;" while we explain to them the doctrines of fractions, cube roots, and the *infinite* importance of compound interest, — the variations of the needle and course of the trade winds, the theory of storms and the cause of tides, the principle of gravitation and the laws of motion; while we compel them to spend years in the study of the dead languages, till Greek and Latin

verbs become the most momentous objects of their thoughts; while all this and much more is demanded, we yet permit them to remain in ignorance of the structure and economy of their own bodies, the means of preserving health, and the causes of disease;—certainly the most important and useful study that man can pursue.

It was not always so. In every well-regulated ancient government, in Athens, Rome, and Sparta, there was a regular system of physical instruction provided for by law. "This system prevailed for ages, and only went into disuse when monasteries were established, and literary men drew on their monkish cowls, divorcing themselves from practical life, from usefulness, from realities; turned bookworms; crawled into cloisters; wrapped themselves in theories and hypotheses; wove around their bodies the web of sluggishness and torpor; and, much like other worms, stagnated, dozed, and died in them."

"Such was the worthy parentage of that system of education which refuses a knowledge of the human system, its wants and diseases, and the means of its preservation in health, and which consumes the usually appointed time for study in the perusal of subjects unnecessary to life, health, or happiness. Fit progeny! legitimately begotten!—its home, the dark ages; its birthplace, a convent; its cradle, superstition; authority its nurse, aristocracy its advocate, and effeminacy its apologist; while disease stood sponsor, and sloth drawled out its 'lullaby.'"

Shall it ever be thus? We trust not. We hope to

see the day when *physiology* shall be made a prominent branch of study in all our public schools; when a portion of the time now consumed in studies that will never be of any *practical* benefit will be devoted to the study of the laws of life, the mechanism of the human body, the preservation and enjoyment of health.

Till this is done, we can never hope to see that attention paid to the *teeth*, which their importance, in connection with the general health, demand. We have been astonished at the ignorance displayed by many persons, otherwise intelligent, in regard to the structure of the teeth, and their connection with the rest of the body. Indeed, many persons, who know their teeth to be diseased, seem to think it of not the least consequence, provided they do not ache. Yet not only the head, but almost every member of the body, participates in the health of the teeth. Usually, as the teeth are found firm, sound, and healthy, so will be the general constitution; and in proportion as they are diseased, the rest of the body is enfeebled and unhealthy.

The eyes have not unaptly been denominated the "mirrors of the soul." We think, that after the perusal of this volume our readers will admit that the teeth may be regarded as the thermometer of health.

This subject does not concern *any particular class* of individuals. The causes which induce disease of the teeth, the effects produced by these organs in a diseased state, are not confined exclusively to the rich or the poor, to the professional man or the day-laborer. The

delicate lady that dares hardly trust her frail body in contact with the gentlest breeze of heaven, and the rough, hardy sailor that has weathered every cape from Greenland to Cape Horn, are alike liable to disease of the teeth, and must submit to the same remedies in order to effect a cure. Every one, from the infant of a few brief months to the old man of three score years and ten, is interested in this subject. From the first appearance of the teeth, until their decay and loss, they are instruments of pain or of pleasure. While they remain sound, and their number is unbroken, they are immensely valuable for mastication and also for articulation. No person can give perfect utterance to the various sounds used in speaking, if the beautiful arch which nature has formed, and partially by means of which these sounds are emitted, is broken or irregular. If we add to entireness the elements of strength, regularity, and beauty, we have one of the greatest ornaments to the countenance which nature ever gave.

It seems impossible that purity of character can exist where deformed, discolored, and filthy teeth exist, without an attempt at alleviation. To those who regard personal appearance as of consequence, it is of the highest importance that strict regard be paid to the symmetry and cleanliness of their teeth; for no other beautiful feature, nor *all other* beauties and graces of body combined, can hide from view, or recompense the unsightly appearance of neglected, diseased, and offensive teeth. Though a person be formed in "nature's finest mould," in stature and nobleness of mein, like the gods; with a complexion which is the min-

gled hue of the rose and the lily; with hair as fine as the web of the silkworm, and flowing as the locks of Apollo; though the eye be "beaming, bright, and blue," or dark and lovely as the "sweet gazelle's;" yet, if under all this array of beauty, there is seen a mouthful of rotten, unsightly bones, emitting a never-failing stream of diseased and putrid breath, how quickly is our admiration changed to disgust, and our love to loathing!

In addition to the disagreeable appearance, the loss of teeth (as we have before hinted, and as we shall yet say more fully in another place) affects the speech — the tone of voice.

How the charm is dissolved, when you have been gazing at the face of some fair daughter of earth, whom you had well nigh fancied to have been left here by some roving band of angels, if, on addressing her, she replies in such a "mitherable lithp," that you can hardly comprehend her meaning!

Every lady is desirous, and reasonably so, of appearing interesting and agreeable as well as intelligent in conversation; but how difficult it is so to appear, if, through the loss of teeth, the words are either lisped or mumbled out in such a manner as to render them scarcely intelligible!

A most unpleasing effect is often observed to follow the loss of teeth, in regard to the voice. In some cases, a kind of indistinct, mumbling sound is produced, requiring frequent repetition to be distinctly understood. Certainly this is enough to spoil the effect of the most beautiful and regular features.

The teeth, when white and well-formed, have always been regarded as very ornamental to the face. That greatest of physiognomists, Lavater, says, "that the countenance is the theatre on which the soul exhibits itself;" and then adds, "As are the teeth of man, so is his taste;" referring more particularly to his intellectual and moral tastes. Heeder says, "It is exceedingly necessary to observe the arrangement of the teeth, and the circular conformation of the cheeks" (which are entirely dependent upon the teeth). And Chesterfield, acknowledged to be the most finished gentleman of his day, observes in his "Letters to his Son," that "fine and clean teeth are among the first recommendations to be met with in the common intercourse of society."

Indeed, it is impossible to imagine a beautiful face divested of teeth, or whose teeth present an irregular and discolored appearance. The poet Flagg, in his description of a Saxon beauty, says,

> "And, like two cornelians, pure and bright,
> Shine with a row of pearls of purest white."

We turn from the worshipper of the graces to the *utilitarian.* He, perhaps, thinks that if his teeth do not positively ache, or only occasionally, if he can just manage to give his food one bite, and then bolt it, it is all he needs of his teeth. But let us examine a little farther. In the first place, as to the mere economy of time and money. A man would be the gainer to have good sound teeth; for though it might take some little time to put and keep them in repair, yet it would

take much less than he now spends idly, or worse than idly, while enduring the toothache, the pains of indigestion, or the lethargy and stupidity arising from headache, after swallowing his half-chewed meat.

Again, in public speakers, singers, &c., the complete arch formed by the teeth is absolutely necessary to their speaking or singing with correct enunciation; the loss of teeth, by altering the tone of voice, sometimes producing the most ludicrous effect.

Clergymen, while advocating the claims of religion; lawyers, while pleading the cause of their clients; the politician, while descanting on the policy of nations, party measures, and *his own pure* patriotism; the merchant, while explaining the superior quality and enormous cheapness of *his* goods; all find their ends more easily attained, if, added to other graces and accomplishments, they possess a perfect and agreeable enunciation.

We recollect, on one occasion, attending a political meeting in New York, during a season of great excitement (1840), when a gentleman was introduced to the chairman, as "the eloquent and distinguished orator from B——." He was immediately invited to address the meeting, and was introduced to the audience in the same terms of eulogium with which the chairman had received him. Expectation was on tiptoe to hear the renowned Mr. ——. But the first sentence dissipated the allusion. "Mithter thpeaker, I rithe at the earnetht tholithitation," &c. Poor man! we pitied him, especially when, at his frequent and earnest addresses to the chair, "and you, thir," all the

more juvenile portion of the audience repeated it after him most audibly. We were wondering how he had gained the reputation of being such an interesting speaker, when a friend at our elbow let us into the secret. Some time previous, he had, by a fall, been deprived of several of his front teeth, and had artificially supplied their places; but in trying to effect an entrance into the hall through the crowd, they became loosened, and fell out, and in the excitement he forgot the circumstance (as his friend supposed), when he consented to address the meeting. The effect was too ridiculous to be soon forgotten.

Having rapidly glanced at some of the disadvantages of defective teeth, we trust the reader will give us a patient and attentive hearing, while we proceed to their history, diseases, and the means of cure.

A

TREATISE ON THE TEETH

AND THE

USE OF ETHER.

CHAPTER I.

HISTORY OF DENTISTRY.

CONTENTS.—Herodotus. Hippocrates, his recipe for tooth-powder. Aristotle. Homer. Celsus. Pliny. Galen. Ætius. Vesalius. Eustachius. Aretæus. Artenese. Paré. Leuwenhœck, his discoveries, &c. John Hunter. Bichat. Blake. Fox. Bell. Cuvier. M. Serres. Present state of the science. Dr. Calvin Cutter's work on Anatomy and Physiology. Obstacles to elevation of the science. Qualifications required by law of Dentists in Germany, France, and Prussia. Itinerant Dentists.

As the subject of dentistry is every day assuming more importance in the public mind, it may not be uninteresting to the general reader to trace, so far as we have any knowledge on the subject, the History of the Dental Art, and the practice of ancient and remote nations in regard to the teeth.

Herodotus, who was born 484 B.C., the oldest Greek writer whose works are extant, and whom Cicero calls the "father of history," is the first of the ancient writers who makes any allusion to the teeth, as connected with the healing art. Speaking of the Egyptians, he says, that the care of the teeth was assigned to particular sets of persons, that there is an individual healer for each distemper: some take charge of the eyes,

others of the ears, the *teeth*, the stomach, liver, &c.; hence the whole country is filled with healers."

Dr. S. G. Morton has a large collection of Egyptian skulls; and from the fact that there is no loss of alveoli apparent, we infer that their mode of operation was by no means unskilful. It is generally conceded that dentistry, as a distinct branch of medical science, took its rise in Egypt.

Hippocrates, who flourished 460 B.C., a native of the island of Coos, and was the most eminent of ancient physicians, devoted much attention to the teeth, as we find by his frequent allusions to them in the remains of his writings that have been preserved. His description of the origin and growth of the teeth is indeed rather more whimsical than scientific; but it was the custom of those times to depend more on theory, and less on observation and experiment. He says, "There is a glutinous increment from the bones of the head and jaws, of which the *fatty part is dried by heat and burnt up;* and the teeth are made harder than the other bones, *because* there is nothing cold in them." He extracted teeth "when rotten or loose;" but he does not tell us with what instruments. He made artificial teeth, prepared from the bones of animals. His recipe for tooth-powder is too good to be lost; we therefore record it for the benefit of such of our readers as are fond of antiquities:

"Take the head of a hare and three mice;
Burn and reduce them to powder;
Add an equal weight of powdered marble."

Aristotle, the Stagyrite, and a disciple of Plato, in writing on the subject of teeth, makes this among other absurd statements — "that the male sex possess more teeth than the female."

Homer thought that the teeth were partly intended as a wall of defence against the too frequent outbreaks of the tongue, to curb that unruly member; in fact, to prevent the too great use or abuse of "liberty of speech"! and other such like fanciful ideas.

Celsus, the author of a valuable and elegant treatise on medicine, in eight books, is the first that pretends to give explicit directions for the extraction of teeth. He always recommended "shaking" the teeth destined for extraction, to loosen them; or "the application of boiling oil or hot iron, to cause exfoliation"! So we perceive that there has been some advance in the *humanity* of dentists, at all events, since his day.

Pliny, the Roman naturalist, first discovered the indestructibility of the teeth, as compared with the other bones of the human body.

Galen, 131 A.D., who wrote on the teeth, asserted that they were "possessed of sensibility."

Ætius supposed they were open at the roots. He used galbanum and wax for filling. He also recommends the use of the file for irregular teeth.

Andrew Vesalius, an eminent anatomist of Brussels, chief physician to Charles V. and Philip II., believed the deciduous teeth to be germs of their successors; while

Eustachius (the discoverer of the Eustachian tube), another celebrated anatomist, who flourished about the

same time, describes the two sets, and compares their connection with the gums with that between the nails and fingers.

Aretæus declared that "the cause of toothache was known only to God." And

Artenese, one of the most learned of his times upon this subject, says, "that with all his philosophy he could not account for the toothache."

Paré (in 1579), a native of France, and an eminent surgeon, remarks, "that the adherence of the teeth to the jaw is occasioned by a ligament, which is attached from the jaw to the root of the tooth." Both he and Ætius taught that the teeth grew during the life of the individual; supposing that, if they did not, they would wear away by the constant friction upon them. Paré used the same mode of curing toothache as Hippocrates, viz. the red-hot iron, and constructed and secured his artificial teeth in the same way — by means of flax-silk ligatures, gold or silver threads. So that the modes of practice 400 B.C. and in the sixteenth century were not essentially different.

Leuwenhœck, the most scientific writer on the subject that had yet appeared, gives, in the Philosophical Transactions for 1678, some interesting accounts of his experiments on the teeth. He says, "I have some time since applied a glass (esteemed by several of the gentlemen who had tried it, a very good one), to observe the structure of the teeth and other bones; which, both to them and myself, then seemed to consist of globules; but since then, having drawn out one of my teeth, and for further observation applied better

glasses than the former, the same gentlemen, with myself, agreed from what we plainly saw, that the whole tooth was made up of very small, straight, and transparent pipes. Six or seven hundred of these pipes put together, I judge, exceed not the thickness of one hair of a man's beard. In the teeth of a cow the same pipes appear much bigger; and in those of a haddock, somewhat less."

The discoveries of this writer excited but little interest at the time, though the tubular structure of the teeth will be the subject of admiration and wonder to succeeding generations.

Passing over some minor discoveries and less important writers, we come to the celebrated

John Hunter, a native of Long Calderwood, Scotland. He published his "Treatise on the Natural History of the Teeth," in 1778. Although his anatomical and physiological researches are admitted to have been of great value, so much so that his anatomical museum was purchased for the use of the public, and given to the College of Surgeons, yet on the subject of the teeth, his practice, in many cases certainly, was very objectionable. He advocated the use of the actual cautery to the nerves of the teeth, and to the ear; the extraction of teeth, boiling them, and then returning them to the socket; the transplantation of human teeth, &c. &c. Yet it must be admitted that his examinations were both scientific and minute, though not always successful. He tried a number of experiments to prove the vascularity of the teeth, by feeding growing animals on madder; and strangely enough came

to the conclusion that they were not vascular. There is much worth studying in his writings; but, until lately, he has been too implicitly followed.

Bichat, a French physiologist and physician, may be considered as standing at the head of modern improvement in dentistry. Indeed, France has contributed her full quota of scientific writers on this subject. The most eminent modern writers in Great Britain are

Blake, *Fox*, and *Bell*. Dr. Blake's work, though considered valuable at the time of its publication, has been superseded by Fox's, and more generally still by that of Bell.

Mr. Fox was a practical and very successful dentist. He did not, however, discern any difference between the teeth and other bones. In part of his practice he must have been incorrect; for he recommended drilling the teeth to let out the matter — supposing that decay always arose from *internal* inflammation, and terminated in mortification. Yet it is well known that the most efficient agents in the destruction of the teeth are external.

Mr. Bell, a native of Edinburgh, and successor of Mr. Fox in the lectureship of Guy's Hospital, made considerable additions to the stock of knowledge now collecting on the subject of the teeth. He was in general a correct observer. His opinions, however, on many subjects, have been controverted with success.

Cuvier, in his work on Fossil Remains, has many valuable remarks on the nature, organization, &c. of the teeth; but our prescribed limits will not admit of our extracting them for the use of the reader.

M. Serres, another French writer, in a work on "the Anatomy and Physiology of the Teeth," goes into a minute disquisition on the origin, growth, and nature of the teeth. The columns below give the result of his observations on the difference that exists between bones and teeth.

A BONE	A TOOTH
Passes through a cartilaginous stage.	Passes through no cartilaginous stage, but is a transudation from the surface of the pulp.
Has a periosteum.	Has no periosteum.
Is affected by rachitis, and other diseases of the oseous system.	Is not affected by rachitis, or other diseases of the bones.
Is destroyed by concentrated nitric acid.	Is not affected by concentrated nitric acid.
When calcined, leaves a white residue.	When calcined, leaves a bluish residue.
Is destroyed in extra-uterine conception.	Remains untouched in extra-uterine conception.
Is vascular.	Is not vascular.

His pathology, however, has not been confirmed by more recent observations.

Within a few years we have had *Maury*, *Defoulon*, *Delabarre*, *Brown*, *Parmly*, *Goddard*, *Harris*, and others.

There is also published in Baltimore, the "Journal of Dental Science," which has done much to dissem-

inate correct information on this subject. It is published quarterly, and supported by the best dental talent in the country. Its senior editor, Prof. Chapin A. Harris, has probably done more to elevate the profession of dentistry in this country than any other single individual.

Recently, in Philadelphia, has been published Stockton's Dental Intelligencer, which bids fair to be very serviceable to the profession. [Its publisher, Samuel W. Stockton, is favorably and extensively known as the manufacturer of superior mineral teeth.] It is issued monthly at the low price of $1 per annum.

The "College of Dental Science," established some years since in Baltimore, has done much to circulate correct information respecting the dental art.

The principles of this art should not be exclusively confined to the dentist. Every family should take some good periodical containing information on this subject. The utility of this plan is illustrated by the following occurrence, which took place in this vicinity only a few weeks since.

A peregrinating dental quack called at a house in which the Quarterly above alluded to was taken, with an *amalgam* to fill carious teeth, and was proceeding with great volubility to dilate upon the virtues of his *panacea*, when the lady of the house handed him a No. of the "Journal," and asked him "if he was acquainted with that work." "O yes, madam," said he; "good morning," muttering, as with marvellous celerity he made his exit, "*I've waked up the wrong passenger.*"

Though much has been accomplished within a few years, much more still remains to be done before dentistry in this country shall take that position among the professions which its importance demands.

Some recent works on general anatomy and physiology have gone more particularly into descriptions of the dental apparatus than has hitherto been considered necessary. One of the best works of this sort is that of Dr. Calvin Cutter, of Boston. He has taken much pains to illustrate, by engravings and other means, the connection of the nerves, arteries, &c., of one portion of the system with another. His remarks, under the caption "bones of the head," give a very correct idea of the formation and growth of the teeth. We would earnestly recommend Dr. Cutter's work to the private anatomical and physiological student, and likewise as an excellent text-book for schools. We think that for the latter purpose it stands unrivalled.

The greatest obstacle in the way, and that which has hitherto degraded the name of dentist in the public mind, is the intrusion into its ranks of men wholly unfitted, both by nature and education, for the practice of the art.

The facility with which, in this country, not only young men, but those who have been years in other kinds of business, adopt dentistry as a profession, would astonish a citizen of the old world.

Many seem to think that if they have read one volume on dentistry, and spent a few weeks in attendance in a dentist's office, they are amply prepared to go forth and practise *secundem artem*. Indeed, many do

not take even this bird's-eye view of the subject; but witnessing the success of some who have earned a reputation, and perhaps wealth (after years, it may be, of unrewarded study and toil), they immediately, *sans cérémonie*, "turn dentist," to the disgrace of the profession and the misfortune of their patients.

Not long since, a young man called upon an eminent dentist to procure some instruments. The gentlemen, wishing to discover what knowledge he possessed of the art, requested him to select such as he should require for certain operations, when the young man very frankly told him that he did not exactly know what he should want; that he had just commenced, and only intended to practise a few of the more *simple* branches, such as *extracting*, *plugging*, *filing*, and so forth; and concluded by requesting the gentleman to select some for him — which, however, he very properly refused to do, and advised him, for the sake of humanity, to return to his former calling.

It is a source of regret, that there is no obstacle in the way of any individual's entering the profession, however ignorant or unfitted for it, and thus mercilessly preying upon the health and pockets of the community.

In Germany, it is necessary for a dentist to have a regular medical education. The law requires this before he can obtain a license. After the year 1700, a similar ordinance was passed in Paris.

In Prussia,* a government order, dated April 29,

* Rust's Mag. B. 45, Heft 1, 1835.

1835, was directed to the different governments and medical colleges of the kingdom, decreeing that no person should be admitted to *examination* for a license to practice as a dentist, who, in addition to his testimonials of having acquired practical dexterity in his art with a licensed and practising dentist, should not also adduce proof of being in one or other of the following conditions:

1st, Of being a licensed physician or surgeon.

2d, Of having served three years as surgeon in the army.

3d, Of having attained such knowledge and skill as are necessary for a surgeon in regular attendance at places of public education.

In reference to this last condition, he must bring testimonials of having attended, during a curriculum of two years, lectures on anatomy; the theory of medicine; general, special, and operative surgery; a chirurgical clinic; and, when practicable, particularly on dental surgery."

It is impossible, under our *free and enlightened* government, to have such regulations as these; but what *law* cannot here effect, *public opinion may*. And though the community may not be able to judge of a dentist's qualifications without submitting to operations at his hands, which, if ignorantly or unfaithfully performed, may permanently injure their teeth; yet they can protect themselves by employing only such as are permanently located, and who can be called to an account for ignorant or careless errors.

Above all things, avoid itinerant dentists: they are

just as likely to be tin pedlars (meaning no disrespect to that numerous and honorable body), who have sold out their stock, purchased a box of instruments, and are on their way home; practising upon the teeth of their too willing dupes, as a means of paying their travelling expenses.

CHAPTER II.

CUSTOMS OF VARIOUS NATIONS IN REGARD TO THEIR TEETH.

CONTENTS.—Hebrews. Romans. Ancient Poets. East Indians. Inhabitants of Java, Sumatra, Siam, and Tonquin. The Chiritmanos, or travelling doctors of Peru. Tribes of Western Africa. Natives of Prince Williams Sound and Sandwich Islands.

Among the most ancient nations, and in those particularly where dentistry is not practised as an art, various and singular customs have prevailed, and still prevail, in relation to the teeth. They have generally been regarded as ornamental, as well as useful additions to the human face.

The *Hebrews* placed great value on their teeth. They were considered of so much importance, that, in the first set of laws promulgated to the Israelites after the giving of the ten commandments on Mount Sinai, it was expressly enjoined, that if a man should "smite out the tooth of his man-servant, or the tooth of his maid-servant, he should let him go free for his *tooth's* sake." (Exod. xxi. 27.)

Surely, the Hebrews must have valued their teeth more highly than we do, when they released a man or woman from slavery for life for his *tooth's* sake. Thrice

happy the lot of that slave in our country, who, by the loss of ALL his teeth, should become entitled to his freedom.

David, in the Psalms, while praising God for his protection against his enemies, exclaims, "Thou hast broken the *teeth* of the ungodly." (Ps. iii. 8.) Again, in calling down God's judgments on the wicked, he says, "Break their *teeth*, O God! in their mouth." (Ps. lviii. 6.) Thus we see that David must have regarded the loss of teeth as a great calamity indeed, when he looked upon their destruction as an instrument of God's vengeance.

The Hebrews also regarded them as peculiarly ornamental. *Solomon*, in his Song of Songs, describes his bride as having *clean*, *even*, *white* teeth: "Thy *teeth* are like a flock of sheep, that are *even* shorn, which come up from the *washing*." (Sol. S. iv. 2.)

And the patriarch Jacob, in his blessing on Judah, says, "Thy *teeth* shall be *white* with milk."

Indeed, the teeth are often mentioned by the writers of the Holy Scriptures, as adding to the beauty of the countenance.

True, those old patriarchs, who had to use their teeth for four or five hundred years, ought to have taken good care of them; but in these days of physical degeneracy, it is equally necessary, though the average length of human life is but thirty years; notwithstanding many think their preservation hardly worth the effort, until some obstinate grinder occasionally gives its possessor the "*jumping*" toothache.

The *Romans* very early had laws relating to the

replacing of teeth when they were destroyed, as may be seen by reference to the *Leges Duodecim Tab. Illustratæ a I. N. Funcie.*

They were in the habit of using various dentifrices for polishing the teeth. *Marcellus* has recorded one which was used by Octavia. But of whatever ingredients these dentifrices were composed, they were almost invariably reduced to powder by burning, which would of course assimilate them to charcoal.

Bontius, another Roman writer, relates (*De Medicina Indorum*) that teeth of gold were frequently substituted for the natural ones. But *Martial* says that the Roman ladies resorted to artificial teeth of bone or ivory, as a means of increasing their personal charms.*

In the works of *Dioscorides*, the Sicilian physician and botanist, afterwards physician to Cleopatra, may be found recorded the names of many articles used for cleaning the teeth, and no doubt employed by that illustrious queen.

The ancient poets, in their descriptions of ideal beauty, often referred to the teeth, as constituting a peculiar charm when white and regularly formed.

Catulus, a Latin poet, whose biographer says, "his verses breathe the very soul of poetry, and are almost *faultless*," speaking of Panthea, observes, "Her teeth resemble a sparkling necklace of pearls, from their regularity and polish."

Ovid, the friend of Virgil and Horace, seems to have

* "Thaïs habet nigros, niveos, Lecania dentes
Quæ est ratio? Emptos hæc habet, illa suos,
Dentibus atque comis, nec te pudet uteris emptis," &c.
Lib. xii. *Ep.* 23.

perfectly comprehended the connection between internal purity of character and clean teeth. He says, addressing a beautiful lady, "I perceive your attention to the graces, by the *whiteness* of your *teeth*."

The inhabitants of the East Indies, particularly the Brahmins, are scrupulously clean in regard to their teeth. It is even commanded in their sacred books; and it is no uncommon thing to see them repeating their prayers, and at the same time cleaning their teeth:* this they do by means of fibres of the radmiferous fig-tree, which they draw between their teeth, sometimes spending an hour in the operation. They likewise practise separating their teeth with a file; and there is no nation that excels them in the whiteness, purity, and regularity of their teeth.

The inhabitants of Java are in the frequent habit of applying the file for the sake of producing regularity in the teeth.

The inhabitants of Sumatra, particularly the women, often file them away to the gums; for what purpose we cannot imagine.

The people of Siam and Tonquin frequently color their teeth black; and the inhabitants of several of the East India Islands gild the front teeth, and color the rest black. Many of the chiefs gild the lower teeth, and dye black the upper ones. This is said to produce a beautiful appearance, when the sun shines upon them.

The *Chiritmanos*, or travelling doctors of Peru, are

* Nat. Hist. Human Teeth, by J. Murphy.

in the habit of chewing the "coca" (leaves of the *Erythroxylon Peruvianum*, with a strong alkaline ash), which gives to the teeth and mouth a dirty green color and unpleasant smell.

In New Holland, striking out one of the lateral incisors is performed by the priest, when a youth has gone through various ceremonies, preparatory to his being introduced into the class of warriors.

In one of the tribes of New Zealand, the queen is distinguished by having a piece of gold substituted for the two front teeth.

Several of the tribes of Western Africa file their teeth down to points; while in Malacca, it is the custom with many to make horizontal grooves in their upper teeth.

But the most singular and to us the most unnatural custom is related of the natives of Prince William's Sound, who make an incision in the upper lip, parallel with the mouth, sufficiently large to admit the tongue through. When the sides of the incision are healed, they have much the appearance of lips. In this artificial mouth they wear a shell which is cut to resemble a row of teeth. Not content with the teeth which nature provides, they desire to appropriate another set.

It is stated that there was formerly a practice among the natives of some of the Sandwich Islands, to offer up to their god Eatooa, their front teeth, as being the greatest sacrifice and the most acceptable offering they could make.

Thus while different tribes and nations of the earth are trying, *according to their tastes*, to improve the ap-

pearance of their teeth, as being one of the most valuable gifts of their gods, how strange it is, that, among civilized and enlightened people, there should be so much apathy on the subject!

Indeed, we do not desire to see the teeth mutilated or colored by way of improvement; but we do desire to see persons interested in the anatomy and hygiene of the teeth, and willing to take the necessary care for their preservation.

CHAPTER III.

STRUCTURE OF THE MOUTH AND COMPOSITION OF THE TEETH.

CONTENTS.—The superior and inferior maxilla. Alveolar bones. Palatine roof. Muscles; the temporalis, masseter, pterygoideus internus, pterygoideus externus, diagastricus. The teeth; relative position. Composition of the teeth. Technical division of a tooth. Alveolar processes. Number of teeth; the incisores, cuspids, bicuspids, molares. The enamel observed through a magnifying glass. Constituent parts of enamel. Ivory or bone. Bell and Hayden on vascularity of the teeth. Experiments on teeth. Analysis of the osseous portion of the human teeth. The cementum; its composition, &c. The pulp. The gums. Salivary glands.

The bones which assist in the formation of the mouth are fourteen in number — the two superior maxilla, two nasal, two palatine, two jugal or malar, two inferior spongy, two lachrymal, and the vomer. These thirteen form the upper jaw. The inferior maxilla forms the lower jaw.

The *superior maxilla* is in fact two separate, though perfectly similar, pieces of bone, united in the middle. It is hollow, and lined with the connecting membrane of the nose. The cavity is usually called the *antrum*, but is known by the names of *antrum maxillare*, *antrum Highmori*, and *maxillaris pituitarius*. This is frequently the seat of disease. A thin plate of bone

forms the roof of the antrum, which has a groove terminating in a foramen, called the infra-orbiter. The infra-orbital nerve gives branches to the anterior teeth. The superior maxilla articulates with the nasal bones, forming the bridge of the nose, and the malar or cheek-bones.

Fig. 1.

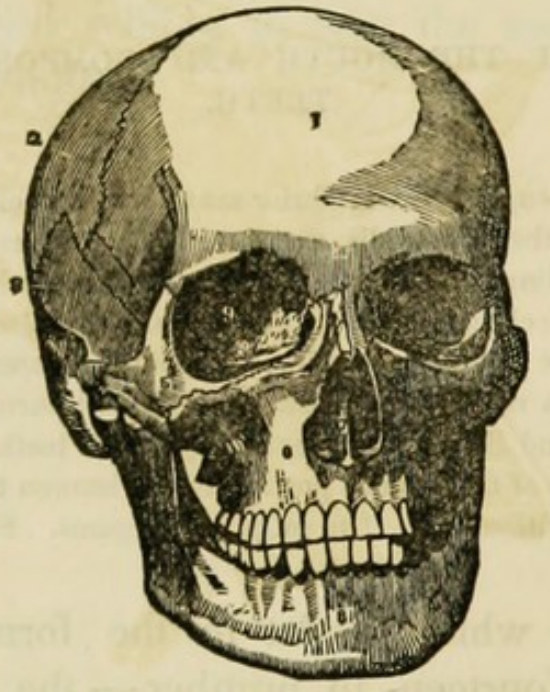


Fig. 1 shows the bones of the whole of the head and face.
1, Bone of the forehead, called the frontal. 2, The parietal bone. 3, The temporal bone. 4, The zygomatic process of the temporal bone. 5, The malar or cheek bone. 6, The upper jaw bone. 7, The vomer that separates the cavities of the nose. 8, The lower jaw. 9, The cavity for the eye.

The *inferior maxilla* is divided into a body and ramus. The body is that part which contains the teeth, the summit being formed by the alveolar process; the ramus rises at the back of the body, connecting at the posterior inferior corner, but varies somewhat in form according to the presence or absence of teeth. In young infants this angle is obtuse; in the adult it approaches a rectangle; in old age it is often rendered

obtuse again by the loss of teeth. The ramus terminates upwards in two processes; one upon which the jaw is hinged, and the other at which the *temporalis* muscle is attached. The lower jaw articulates with the temporal bones, and not with the upper jaw.

Fig. 2.

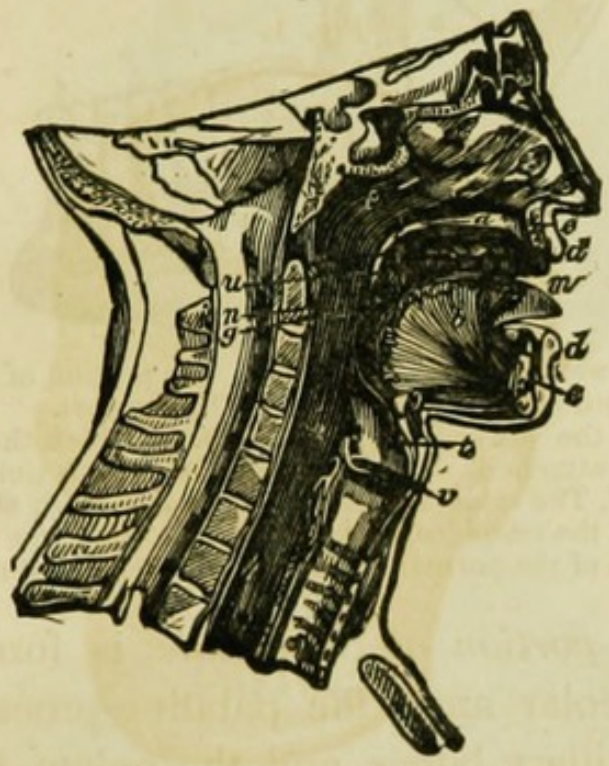


Fig. 2 represents the antero-posterior section of the mouth, tongue, pharynx, œsophagus, &c.

a, Palate bone or roof of the mouth. *b*, Genio glossus muscle. *m*, The tongue. *d*, *d*, Upper and lower lips. *e*, *e*, Upper and lower jaw. *u*, The soft palate. *n*, The opening of the pharynx into the mouth. *t*, Epiglottis. *v*, Vocal cords. 2, The commencement of the œsophagus. 1, Opening of the Eustachian tube. *y*, The œsophagus.

The *alveolar bones*, or processes, with which the upper and lower jaws are both supplied, are very thin on the edges, porous, and filled with foramina. They consist of little cells for the reception of the teeth, of the same size and number; when a tooth is extracted, that portion of the *alveolus* from which the tooth was taken, is absorbed, and the body of the jaw forms above

it a sharp ridge, which answers, though very imperfectly, for the mastication of food.

Fig. 3.

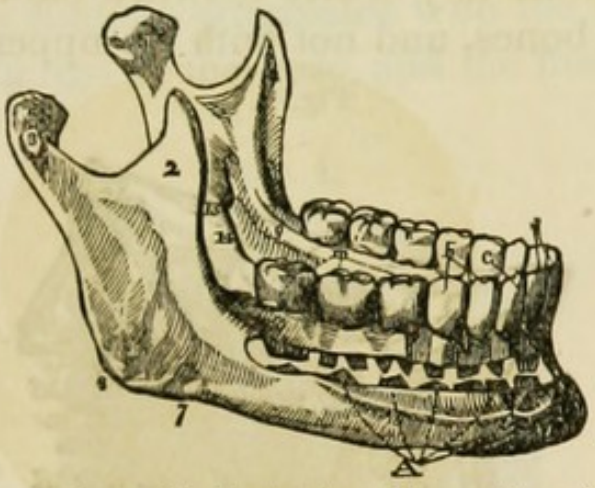


Fig. 3. The lower jaw with the teeth. The portion of bone in which it is observed the teeth are placed, is the alveolar process.

1, The body of the lower jaw. 2, Ramus, to which the muscles which move the jaw are attached. 3, 3, The condyles which unite the upper jaw with the head. *i*, The middle and lateral incisor tooth of one side; *b*, the bicuspid teeth; *c*, the cuspides, or eye teeth; *m*, the three molar teeth. A, shows the relation of the permanent to the deciduous or temporary teeth.

The *bony portion of the palate* is formed by the superior alveolar arch, the palatine processes of the superior maxillary bones, and the palate bones. *The palatine roof*, or upper portion of the mouth, is slightly concave. Through the middle there runs a longitudinal line, which is of a whitish color, and depressed. To the palatine roof are attached the superior teeth. Its lining membrane is thin, of a light color, though anteriorly it thickens; this tissue is specifically the same as that of the periosteum of the alveolar arches; this membrane is covered with excretory orifices between it and the bony wall of the palate.

The chief *muscles* employed in moving the jaws are the following:

The *temporalis*, which is covered by a fibrous expansion on the side of the head, called the *aponeurosis temporalis :* its use is to shut the jaw, draw it backwards, and press any article between the teeth.

Fig. 4.

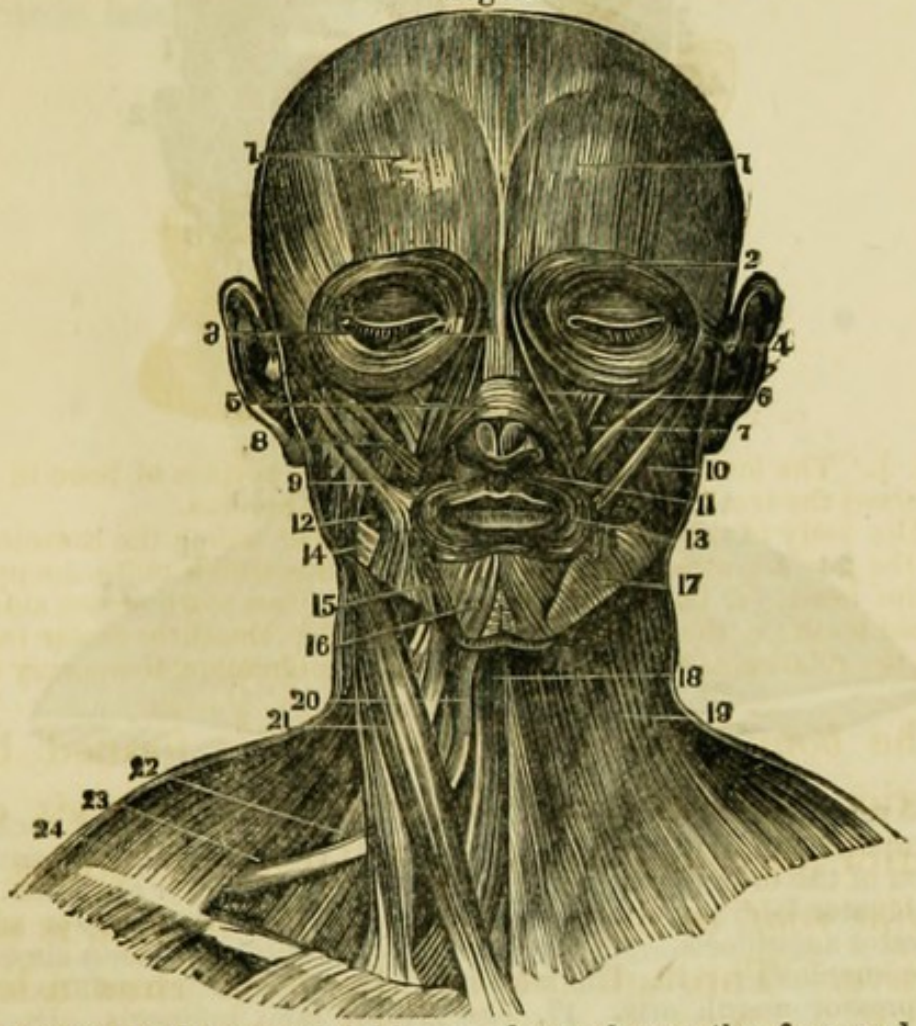


Fig. 4 represents the superficial layer of muscles on the face and neck. 1, 1, The occipito-frontalis muscle. 2, The orbicularis palpebrarum. 3, The nasal slip of the occipito-frontalis. 4, The anterior auriculæ. 5, The compressor naris. 6, The levator labii superioris alæque nisi. 7, The levator anguli oris. 8, The zygomaticus minor. 9, The zygomaticus major. 10, The masseter. 11, The depressor labii superioris. 12, The buccinator. 13, The orbicularis oris. 14, The denuded lower jaw. 15, The depressor anguli oris. 16, The depressor labii inferioris. 17, A portion of the platysma-myodes. 18, The sterno-hyoideus. 19, The platysma-myodes. 20, The superior belly of the omo-hyoideus. 21, The sterno-cleido mastoideus. 22, The scalenus medius. 23, The inferior belly of the omo-hyoideus. 24, The trapezius.

The muscle 2 closes the eye. The muscle 13 closes the mouth. The muscle 11 elevates the upper lip. The muscle 16 depresses the lower lip. The muscles 7, 8, 9, elevate the angle of the mouth. The muscle 15 depresses the angle of the mouth. The muscles 18, 19, 20, 23, depress the lower jaw and larynx, or elevate the sternum. The muscle 21, when both sides contract, draws the head forward, or elevates the sternum; when only one contracts, the face is turned one side towards the opposite shoulder.

Fig. 5.

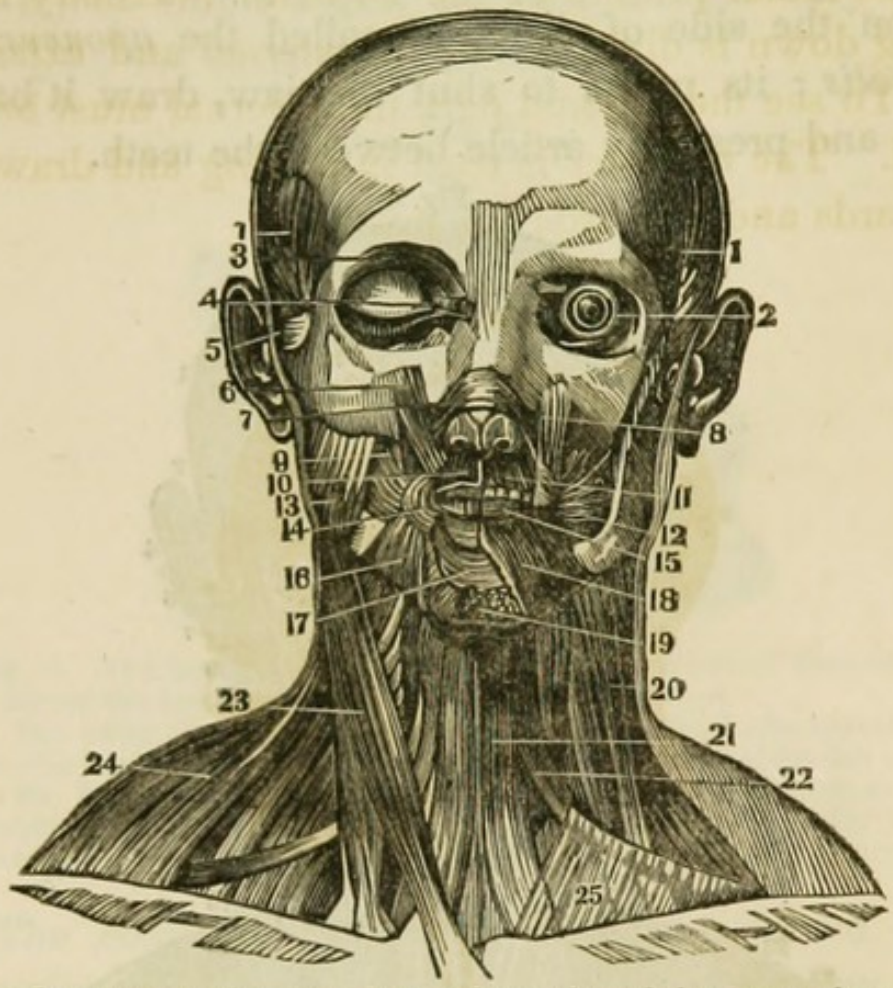


Fig. 5 represents the deep layer of muscles of the face and neck. 1, 1, The temporalis muscle. 2, The eye-ball. 3, The corrugator supercilii. 4, Insertion of the orbicularis palpebrarum. 5, The anterior auriculæ. 6 and 8, The levator labii superioris alæque nasi. 7, The compressor naris. 9, The levator anguli oris. 10, 11, The depressor labii superioris alæque nasi. 12, The buccinator. 13, The masseter. 14, 15, The orbicularis oris. 16, The depressor anguli oris. 17, The levator labii inferioris. 18, The depressor labii inferioris. 19, The adipose tissue on the chin. 20, The scalenus medius. 21, The sterno-hyoideus. 22, The omo-hyoideus. 23, The sterno cleido-mastoideus. 24, The trapezius. 25, Fascia attached to the clavicle.

The muscles 1 and 13 elevate the lower jaw, and bring the teeth together. The muscle 3 closes the eye. The muscles 14, 15, close the mouth. The muscles 6, 8, 9, elevate the angle of the mouth. The muscle 16 depresses the angle of the mouth. The muscles 10, 11, elevate the upper lip. The muscle 18 depresses the lower lip. The muscles 20, 21, 22, depress the larynx, or elevate the sternum. The muscle 23 draws the head forward, or elevates the sternum, when both act; but when only one acts, the face is turned toward one shoulder.

The *masseter* is so closely connected with the temporalis, that it is difficult to separate them. It arises

from the malar process of the superior maxillary, and passing down is divided into an *internal* and *external* part. To see the internal part, the external must be removed. The *masseter* is used in closing and drawing backwards and forwards the jaw.

Fig. 6.

Fig. 6. A view of the superficial muscles of the face and head. 1, The frontal portion of the occipito-frontalis. 2, Its occipital portion. 3, Its aponeurosis. 4, The orbicularis palpebrarum. 5, The pyramidalis nasi. 6, The compressor nasi. 7, The orbicularis oris. 8, The levator labii superioris alæque nasi. 9, The levator superioris proprius. 10, The zygomaticus major. 11, The zygomaticus minor. 12, The depressor labii inferioris. 13, The depressor anguli oris. 14, The levator labii inferioris. 15 and 16, The masseter. 17, The atrahens aurem. 18, The buccinator. 19, The attollens aurem. 20, The fascia of the temporal muscle. 21, The retrahens aurem. 22, The belly of the diagastric muscle. 23, The stylo-hyoideus muscle. 24, The mylo-hyoideus muscle. 25, The upper part of the sterno-cleido-mastoideus muscle. 26, The upper part of the trapezius.

The *pterygoideus internus* is on the inside of the ramus. It springs from the outer edge of the Eustachian tube, the internal process of the *sphenoid* bone and the *fossa pterygoidea.* It assists the *temporal* and *masseter* muscles.

The *externus pterygoideus* differs in its action, according as one or both act together. In the former case it moves the jaw from side to side. In the latter, the jaw is drawn forward with great power.

The *digastricus* is a very singular muscle, and acts antagonistically to the preceding ones. It has two bellies, with an intervening tendon which passes through the hyoid bone. Its posterior belly rises from the digastric fossa of the temporal bone, and its anterior from the lower maxillary. Both bellies are tendinous, and are fused into one. This muscle has several motions, among which is opening the jaw.

THE TEETH.

The relative position of the teeth, in a well-formed mouth, is as follows: — The central incisores of the upper jaw come over the central and half of the lateral incisores of the lower jaw; the lateral incisores of the upper jaw cover the half of the lateral incisores and more than half of the cuspidati of the under jaw; the cuspidatus of the upper jaw falls between and projects a little over the cuspidatus and first bicuspid of the under jaw; the first bicuspid of the upper jaw falls partly upon the two bicuspids in the lower jaw; the second bicuspid of the upper jaw shuts upon the second bicuspid and first molar of the lower; the first upper molar covers two thirds of the first and part of the second molar of the under jaw; the second upper molar shuts upon the remainder of the second and part of the third of the under jaw; and the third molar of

the upper jaw, being smaller than that in the under shuts even upon it.

Fig. 7.

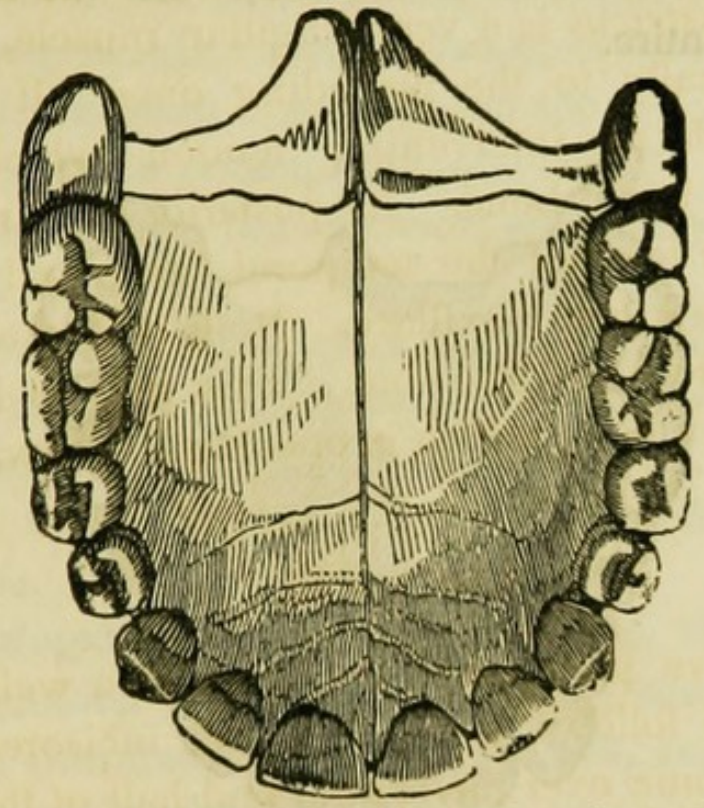


Fig. 7 is the upper jaw of an adult person where the teeth are regularly formed, and in their proper position. It is a cast taken from the mouth of a young man who has ever paid scrupulous attention to the order and cleanliness of his teeth.

The *teeth* are different in their composition, nutrition, and growth, from the other bones of the body. They vary in number at different periods of life, in color also, and are exposed to the action of the atmosphere. They do not possess the power of self-renovation, as the other bones do in some degree. If we break an arm, rib, or leg, for instance, it will generally knit together again, and become, for all practical purposes, as good as before the accident. This is not the case with the teeth: if one of them is broken, no power has yet been discovered by which it may be perma-

nently reunited. They are also much harder and enduring than any other of the bones; which is proved by the fact, that in bodies that have been long buried, every other bone has mouldered, while the teeth have remained entire.

Fig. 8.

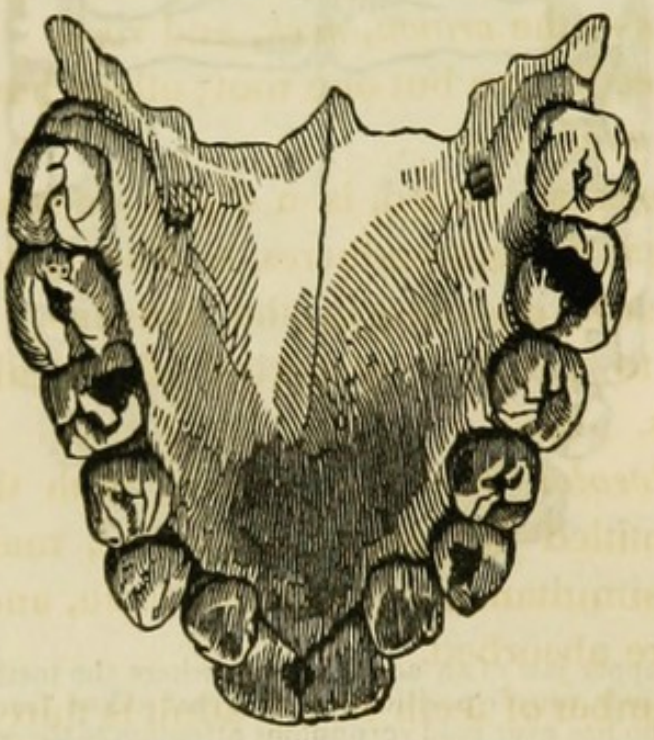


Fig. 8 is also a cast of the upper jaw of a person whose parents suffered irregularities of the teeth to remain uncorrected. The result is visible in the cut.

Not only do the teeth differ in these respects from the other bones, but they are formed of different substances. The body of the tooth is as different from the enamel as is the latter from the pulp, which once occupied the place of the former. It is not sufficient for the practical dentist to know the form, position, and relative connection of the teeth: he must know their particular structure — the various substances which enter into their composition, and the proportions of

each constituent part, that he may know what substances may be safely applied to them, and what articles would be likely to affect them injuriously.

In the tooth are combined four separate and different substances, viz.: *enamel*, *ivory*, or *bone*, *cementum*, and the *dental pulp*. Again, each tooth is divided into three parts — the *crown*, *neck*, and *root*.

Some teeth have but one root; others have two, three, four, and even five.

The neck, so called, is a slight depression, at that point where the gum adheres, and separates it from the root, which is enclosed in the alveolus. The root is attached to the jaw by a kind of articulation called *gomphosis*.

The *alveolar processes*, which, with the teeth, are usually entitled the dental apparatus, make their appearance simultaneously with the teeth, and, when *they* are lost, are absorbed.

The number of teeth in the adult is thirty-two, — sixteen in each jaw; they are divided into the *incisores*, *cuspidati*, *bicuspids*, and *molares*. The *incisores* are subdivided into *superior*, *inferior*, *central*, and *lateral;* their name is derived from *in*, into, and *scindo*, to cut, which is their office; there are four of them in each jaw. They are quadrilateral in shape, broader and thinner at the edge than at the neck, slightly convex in front; those of the superior jaw are largest. They possess but one root, or fang, which is flattened laterally; they are set close together, and their alveoli are quite thin. The action of the superior teeth pressing upon the inferior gives them an inclination inwards.

The *cuspidati* (from *cuspis*, a point), or canine teeth, so called from their resemblance to dogs' teeth (*canis*, a dog), are pointed much thicker, and quite convex anteriorly; they have but one root, which is, however, much longer than those of the incisores. Their roots are sometimes separated, which gives them the appearance of two single fangs united; and they sometimes penetrate the submaxillary bone. There are four cuspids.

The *bicuspids* are something like double cuspids; hence their name (*bis*, two; *cuspis*, point). They occur only in the permanent set, and occupy the side of the mouth immediately posterior to the cuspidati; their crowns have two points, but neither very sharp. The two superior posterior bicuspids have double roots. The dental cavity, which in the preceding sets we have named as single, is in these compound. The bicuspids are eight in number.

The *molares*, or grinders (from *molo*, to grind), are the largest of all the teeth; they are nearly flat on the summit, with the exception of four or five obtuse points; and these are so placed, that, when the jaws are closed, the points of the upper ones fit into the depressions of the lower, and *vice versa*. The first of the molar teeth, directly after the bicuspids, is the first of the permanent set which makes its appearance, though it is not always the most enduring. The roots of the molars are shorter, thicker, and more curved than the others; they have three or four fangs. It is the last of the molars which are called *wisdom teeth*, or *dentes sapientiæ*. Their crowns are smaller than

those of the other molars, and the fangs often twisted together or very irregular. They usually remain but a short time, and then decay. There are twelve molar teeth. The following is a correct drawing of the several teeth : —

Fig. 9.

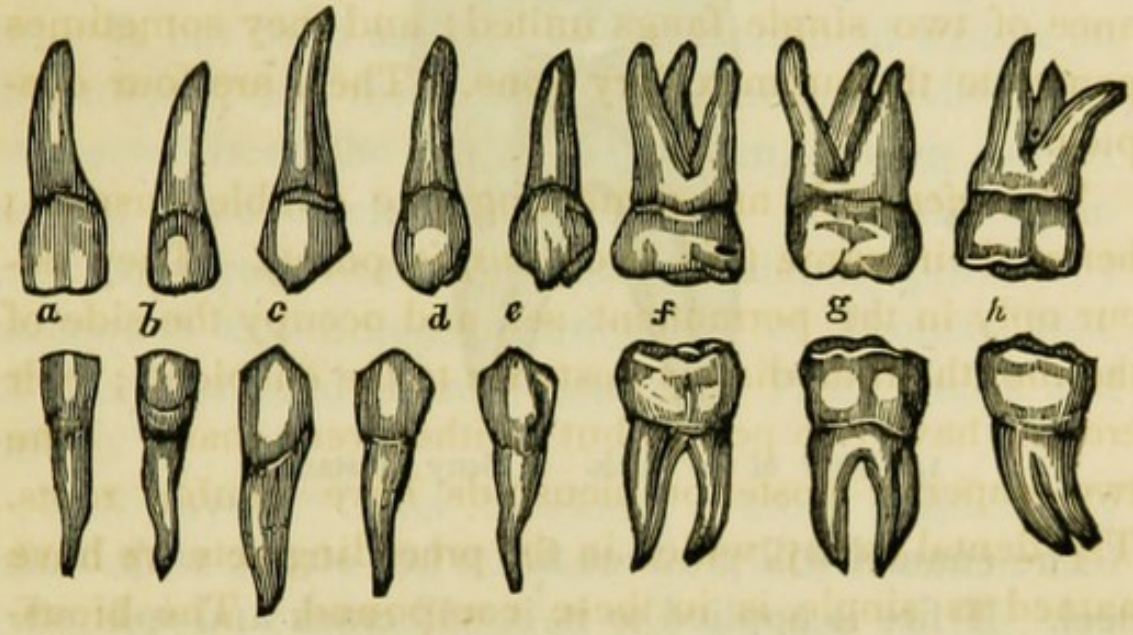


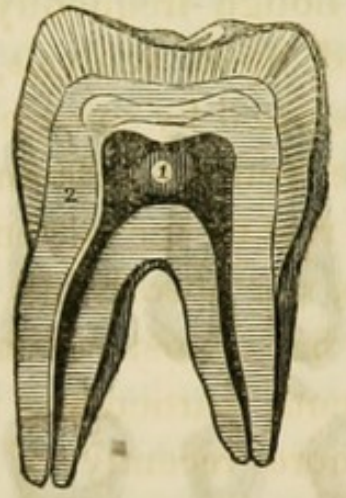
Fig. 9. The permanent teeth of the upper and lower jaw. *a*, Central incisores. *b*, Lateral incisores. *c*, Cuspids, or canine teeth. *d*, The first bicuspids. *e*, Second bicuspids. *f*, First molars. *g*, Second molars. *h*, Third molars, or *dens sapientiæ*.

The Enamel

Is a smooth, dense white substance, though varying somewhat in color, with the age, temperament, &c. of different subjects. It envelops the crown of the tooth, being thickest at the summit, where it is most needed to protect the ivory. Its texture is fibrous, composed of hexagonal prisms, one end of which rests on the investing membrane of the ivory, and the other forms the surface of the teeth. These fibres are not all of the same length, but somewhat resemble (on a very

diminished scale) the basaltic formation of the Giant's Causeway in Ireland, only that they are not straight, but have a slightly undulating shape.

Fig. 10.



1, Cavity of the tooth. 2, Bony substance.

The enamel will produce fire when struck with blue steel. If fire is applied to it, it will crack and split off. It becomes pliable if exposed to moderate heat for a long time. It is soluble in acid, showing a thin white flake. The enamel has been analyzed at various times, and with different results. The most eminent chemists give the following as the constituent parts and proportions: —

Of 100 parts:

Phosphate and fluate of lime, .	88·5
Carbonate of lime, ...	8
Phosphate of magnesia, . . .	1·5
Free alkali, ...	1
Animal matter and water, . .	1
	100·0

Ivory, or Bone,

Is the central part of the tooth, which is enclosed on the crown by the enamel, and by the cementum on the neck and fang. Though frequently called bone, its composition is found, upon analysis, to be very different. It has been asserted by some eminent writers on this subject, that the teeth are extraneous bodies, disconnected from the rest of the system, having neither nerves, bloodvessels, nor absorbents. That this opinion is incorrect, has been most satisfactorily proved by numerous experiments, particularly of Thomas Bell, of Hayden, and more recently of Prof. Harris and others.

Bell says, "Upon breaking a tooth immediately after extraction, when the pain and inflammation had been severe, I found distinct red patches in the very substance of the bone."

Hayden remarks, "that in certain varieties of *asphyxia*, the appearance of the teeth is singular, and in a physiological point of view instructive. They are almost uniformly tinged red. If examined immediately after death, they present a pinkish hue; if some time after, darker; varying with the age of the person and the violence of the death. These appearances are particularly observable in the teeth of such as have been hanged. They are met with in the teeth of refractory bullocks, which have been forcibly drawn into the slaughter-house by a rope round the neck." He also remarks that on examining teeth, for the purpose of ascertaining the nature of these appearances,

on splitting them open through the roots or fangs (which ought to be done from the edge of the crown, so as not to disturb the vessels of the tooth), the whole nervous pulp is turgid, almost black, and even surrounded with blood." On removing the nerve, he found *that the bony substance was literally* injected with the coloring matter of the blood.

That absorbents enter into the teeth is proved by a removal of their inner portion by ulceration. And in sawing open the tusks of elephants, iron balls and spear heads have been found, and always in a space or cavity large enough for them to be moved about. As these have sometimes remained in the tusks a long time, it shows plainly that some kind of action is going on by which bone can be removed; and this can only be effected by the medium of absorbent vessels.

These experiments fully prove that the teeth are vascular, connected with the general system, and sympathizing with it. The tooth contains a cavity, which diminishes in size to the end of the fang, in which is found the dental pulp, of which we shall speak hereafter. The bony substance has a yellow tinge, which may be owing to the large portion of phosphate of lime which it contains.

If we break a tooth and apply a microscope, we discover that the bone consists of little tubes, the diameter of which is computed at $\frac{1}{1620}$ of an inch,* and the

* It has been argued, that, because tubes are smaller in diameter than the globules of the blood, *therefore* the blood could not be injected. But it is to be observed, that blood has usually been found in the substance of the tooth, after some kind of violence had been suffered; and under these circumstances the globules might very easily be broken and separated.

space between these tubes is composed of a solid transparent white substance; but the material is not so hard as that of the tubes. When immersed in acid, the earthy part is dissolved, leaving the shape and bulk unimpaired. The following is the composition of the ivory, as given by Berzelius: —

Analysis of the osseous portion of the Human Teeth.

Phosphate and fluate of lime, .	64·3
Carbonate of lime, ...	5·3
Phosphate of magnesia, . . .	1
Soda and muriate of soda, . .	2·4
Animal matter and water, . .	28
	100·0

The Cementum

Is a substance bearing a resemblance to bone; but it lacks some of the constituent parts of the latter. It contains more animal matter. It serves as a protection to the fang and neck; it is probably secreted by the periosteal covering; it is also found in the dental canal of old teeth, and affords a protection to the pulp when the crown of the tooth is broken off or worn away. The composition of cementum is as follows:—

Animal matter, ...	42·18
Phosphate of lime, ...	53·84
Carbonate of lime, ...	3·98
	100·00

The Pulp

Is a soft, light-gray substance, which fills the cavity we find in the centre of a tooth, and which is extended through the root and separate fangs of the tooth. It is very sensitive, and is protected by the *epithelium*, a very delicate membrane. The pulp secretes a serous fluid, which keeps vitality in the tooth. If the pulp is destroyed, the tooth decays; and, if exposed, gives an exceedingly disagreeable and fœtid smell.

The Gums

Are of a pulpy, fibrous nature, and highly vascular. Of their arteries, veins, and nerves, we shall speak more particularly when we come to treat of their diseases.

The Salivary Glands

Consist of the *parotid*, *sub-maxillary*, and *sub-lingual*. The parotid is the largest, having the form of an irregular pyramid inverted. It is situated on the side of the face, and extends from the *zygoma* to the angle of the jaw. The *sub-maxillary* is smaller, resembling somewhat in shape an almond divested of its shell. It is placed on the internal side of the lower jaw, between the two bellies of the *diagastric* muscle. It is nourished by branches of the *lingual* and facial arteries. It much resembles the parotid in internal structure. It secretes large quantities of saliva, which is carried to the mouth by the Wharton duct.

The *sub-lingual* gland is of similar shape to the *sub-maxillary*, and is situated in the lower part of the

mouth. It differs in many respects from the other glands, being firm and red, and the lobes of which it is composed being smaller than those of the sub-maxillary. Its excretory ducts are numerous and differently situated. Three or more open into the Wharton duct.

Fig. 11 gives an excellent view of the situation of these glands.

Fig. 11.

1, The parotid gland. 2, The duct of Steno. 3, The sub-maxillary gland. 4, Its duct. 5, The sub-lingual gland, brought to view by the removal of a section of the lower jaw.

CHAPTER IV.

THE CONNECTION AND SYMPATHY OF THE TEETH WITH THE GENERAL SYSTEM.

CONTENTS.—Remarks on the nerves. Fifth pair of nerves. Par vagum. Necessity of medical education for the practical dentist. Pulmonary complaints. Case of a young lady. The stomach. Necessity of perfect mastication. Hemicrania, or headache. Case of Mrs. ——. Case 2d, of Mrs. ——. Disease of the antrum. Fatal case of exostosis. Singular case of cure of amaurosis neuralgia. Case of Mrs. W. ——. Case of Mr. J. ——. Case of Mrs. G. ——. Cure of ague of the face by extraction of carious teeth. Cure of dysopsy, or weakness of the eyes, by extraction of diseased teeth. Deafness. Case of a gentleman. Remarkable case of tumor.

In relation to this subject, we have an immense number of *facts*, a few of which we shall lay before the reader; but we will first trace the connection of some of the nerves, showing their origin to be remote from the teeth, by which it can be plainly inferred, that *diseased teeth sensibly affect remote organs of the body, and the general health;* and that the teeth themselves are in their turn affected by the state of these organs.

The nerves are the seat of sensation. If by any process all the nerves of the body could be paralysed, or separated from their connection with the brain, we should be perfectly insensible to pain. But so numerous are the nerves, that the whole body is enveloped in a complete net-work; and so intertwined and

interwoven is this system of living threads, and the whole is so delicately, singularly, and closely reticulated, that the spot cannot be found large enough for the admission of the point of the finest needle, without touching a nerve; for wherever the needle touches the surface of the body, a nerve instantly reports it to the brain.

The finest cloth wrought by the English looms contains but one hundred and sixty threads to the square inch. Ancient cloth has recently been discovered, having four hundred and eighty threads to the square inch; but an ordinary thimble, when placed on the skin, covers hundreds of nerves, and a square inch of the surface of the skin embraces over a thousand. So delicately organized and so extensive and minute is the ramification of these nerves, that not a particle of cuticle is exempt from susceptibility.

It is because the nerves are the seat of sensation, that a division of the *trigemini* is recommended in violent and protracted cases of tic-douloureux.

We cannot, of course, enter into a minute description of *all* the nerves, nor is it necessary. We shall content ourselves with a few remarks on those only which are most intimately connected with the teeth, though they are all connected together, as may be inferred form the fact that no one portion of the body can feel pain, and the rest be perfectly insensible to it.

"The *fifth pair of nerves*," says Charles Bell, "gives sensation to the head, face, and appendages; communicates with the third, sixth, seventh, and eleventh, and with the great sympathetic, forming of itself a kind of

sympathetic nerve, by which not only *all parts of the head* are connected with each other, but nearly all the other parts of the body."

In Fig. 12 may be seen the manner in which these nerves of the face and head unite with each other; and in 13, how these same nerves are, by junction with others, extended to remote portions and organs of the body.

Fig. 12.

Fig. 12 represents the distribution of the facial nerves, and some of the branches of the cervical plexus of nerves. 1, The facial nerve, escaping from the stylo-mastoid foramen. 2, The posterior auricular branch. 3, The temporal branch. 4, The frontal nerve. 5, Facial branches. 6, The infra-orbital nerve. 7, Facial branches. 8, The mental nerve. 9, Branches to the face and neck. 10, The superficialis colli nerve, forming a plexus (11) over the submaxillary gland. 12, 13, 14, 15, and 16, Nerves that have their origin in the cervical portion of the spinal cord. They are distributed to the muscles and skin of the neck and back of the head. The nerves 1, 2, 3, 5, 7, and 9, are branches of the seventh pair, and are distributed over the face in a radiated direction, which constitutes the pes anserinus. The nerves 4, 6, 8, are branches of the fifth pair. The branches of the fifth, seventh, and cervical nerves communicate with each other.

Fig. 13.

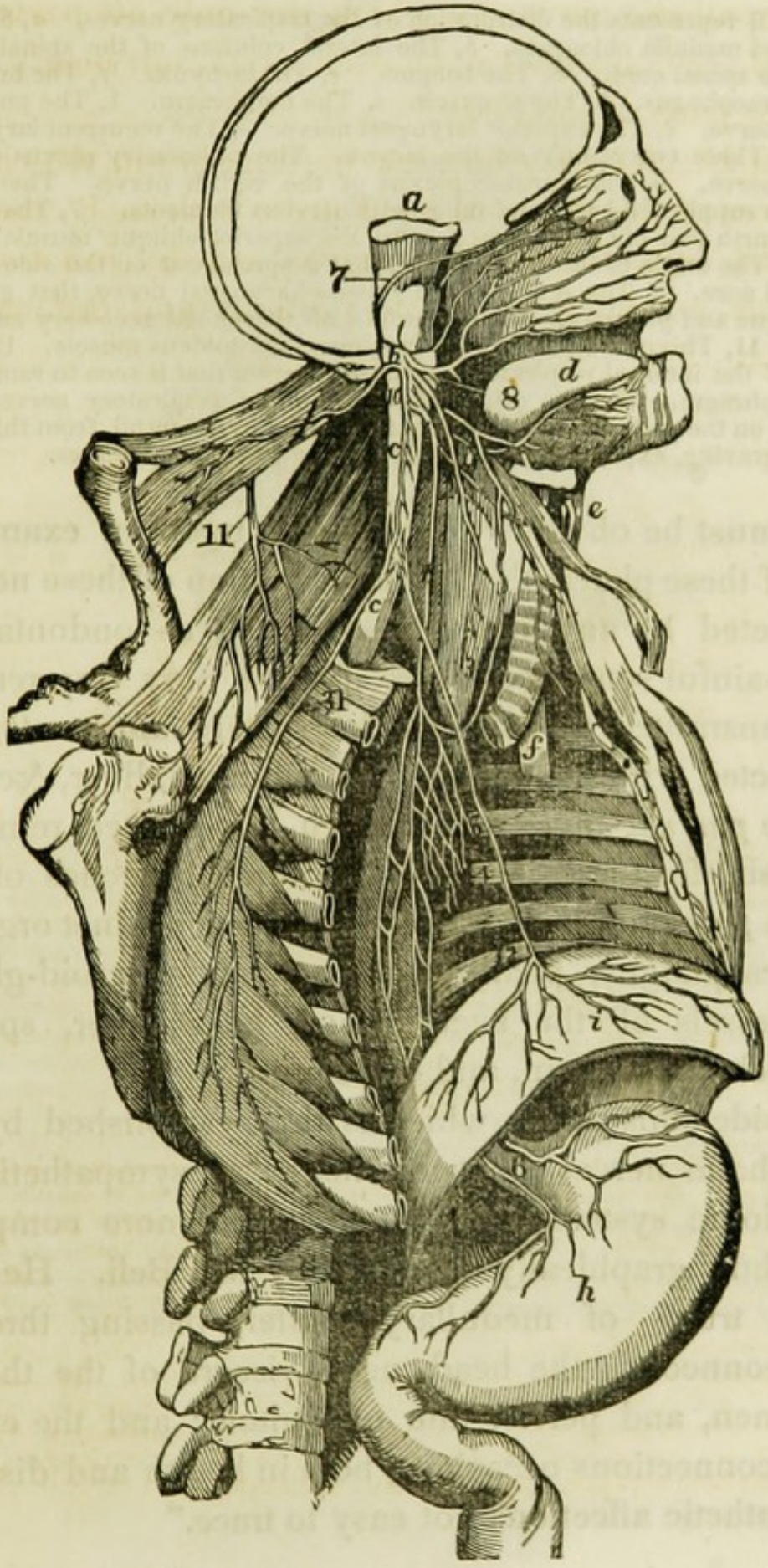


Fig. 13 represents the distribution of the respiratory nerves. *a*, Section brain and medulla oblongata. *b*, The lateral columns of the spinal cord. *c*, *c*. The spinal cord. *d*, The tongue. *e*, The larnynx. *f*, The bronchi. 6, The œsophagus. *h*, The stomach. *i*, The diaphragm. 1, The pneumo-gastric nerve. 2, The superior laryngeal nerve. 3, The recurrent laryngeal nerve. These two ramify on the larynx. The pulmonary plexus of the eighth nerve. 5, The cardiac plexus of the eighth nerve. These two plexuses supply the heart and lungs with nervous filaments. 7, The origin of the fourth pair of nerves, that goes to the superior oblique muscle of the eye. 8, The origin of the facial nerve, that is spread out on the side of the face and nose. 9, The origin of the glosso-pharyngeal nerve, that goes to the tongue and pharynx. 10, The origin of the spinal accessory nerve of Willis. 11, This nerve penetrating the sterno-mastoideus muscle. 12, The origin of the internal respiratory or phrenic nerve, that is seen to ramify on the diaphragm. 13, The origin of the external respiratory nerve, that ramifies on the pectoral and scaleni muscles. Let the pupil, from this graphic engraving, explain the distribution of the respiratory nerves.

It must be obvious to every one, upon an examination of these plates, that, when a portion of these nerves is effected by any local disease, such as ondontalgia, &c., painful sensations and disease may very readily be transmitted to parts of the system *apparently* unconnected with the teeth, as the stomach, liver, &c.

The *par vagum* (a nerve which, if separated, removes all desire for food) is one of the three branches of the *eighth pair*, and is distributed to twelve distinct organs; the œsophagus, pharynx, larynx, the thyroid-gland, the vessels of the neck, lungs, heart, liver, spleen, stomach, diaphragm, and duodenum.

Besides this union, which is thus established by the encephalic nerves, that of the great sympathetic or ganglionic system is, if possible, still more complete. It is thus graphically described by Mr. Bell. He calls it "a truck of medullary matter, passing through and connecting the head, neck, viscera of the thorax, abdomen, and pelvis, into one whole; and the extent of its connections occasions, both in health and disease, sympathetic affections not easy to trace."

Fig. 14.

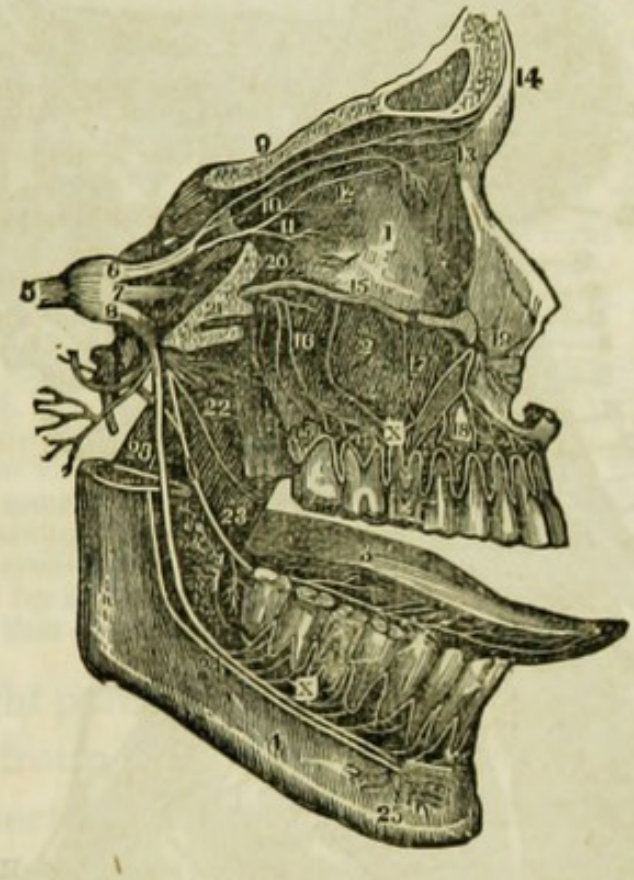


Fig. 14 represents the distribution of the fifth pair of nerves. 1, The orbit. 2, The antrum of the upper jaw. 3. The tongue. 4, The lower jaw. 5, The root of the fifth pair of nerves, forming the ganglion of Casser. 6, The first branch of the fifth pair, or ophthalmic. 7, The second branch of the fifth pair, or superior maxillary. 8, The third branch of the fifth pair or inferior maxillary. 9, The frontal branch, dividing into external and internal frontal nerves. 10, The lachrymal branch of the fifth pair. 11, The nasal branch. 12, The internal nasal nerve. 13, The external nasal nerve. 14, The external and internal frontal nerve. 15, The infra-orbital nerve. 16, The posterior dental branches. 17, The middle dental branch. 18, The anterior dental nerve. 19, The terminating branches of the infra-orbital nerve. 20, The malar branch. 21, The pterygoid, or recurrent nerve. 22, The five anterior branches of the third branch of the fifth pair. 23, The lingual branch of the fifth, joined by the chorda tympani. 24, The inferior dental nerve. 25, Its mental branches. 26, The superficial temporal nerve. 27, The auricular branches. 28, The mylo-hyoid branch. x, x, A tooth in the upper and lower jaw, divided so as to exhibit the roots traversed by nerves from the fifth pair, which ramify on the pulp situated in the crown.

Fig. 15.

Fig. 15 is a beautiful engraving of the sympathetic gangalia, and their connection with other nerves. It is from the grand engraving of Manec, reduced in size. A, A, A, The semi-lunar ganglion and solar plexus, situated below the diaphragm and behind the stomach. B, the small splanchnic nerve, formed by filaments from the tenth, eleventh, and twelfth great ganglia. It pierces the diaphragm, and descends to join the renal plexus. C, The great splanchnic nerve. It arises from the sixth dorsal ganglion, and receives filaments from the seventh, eighth, ninth, and tenth dorsal ganglia. It pierces the diaphragm, and terminates in the semi-lunar ganglion. D, D, D, The thoracic ganglia, ten or eleven in number. E, E, The external and internal branches of the thoracic ganglia. G, The right coronary plexus, situated upon the heart. H, The left coronary plexus. I, The inferior cervical ganglion. J, The inferior twigs from this ganglia. K, Its external threads, very slender. L, Its internal twigs, very minute. M, The anterior thread. N, The middle cervical ganglion. O, Its interior twigs. P, Its external twigs. Q, The superior cervical ganglion. R, Its superior branches. S, Its inferior branches. T, The external branch. U, The submaxillary ganglion. V, The vidian nerve. W, Its naso-palatine branch. X, The spheno-palatine ganglion. Z, The auditory nerve and membrane of the tympanum, containing within its cavity four small bones of the ear. 1, The renal plexus of nerves that surrounds the kidneys. 2, The lumbar ganglion. 3, Their internal branches. 4, Their external branches. 5, The aortic plexus of nerves that lies upon the aorta.

Of the eight pairs which have their origin in the brain, an offshoot from two of the branches of a single pair goes to the teeth. Thus we see, that it would not be sufficient for the dentist to confine his anatomical study to the head, but that he should be perfectly acquainted with every portion of the body.

Of the *fifth pair*, one branch is called the ophthalmic nerve, and is not connected with the teeth; one goes to the superior, and the other to the inferior maxillary. The second, or superior, maxillary gives *but one* of seven branches to the sockets of the teeth of the upper jaw, while the *inferior* maxillary gives but one of nine branches to the teeth and sockets of the lower jaw. Thus, if the anatomy of the parts immediately contiguous alone is studied by the dentist, he must remain entirely ignorant of the connection which the greater number of the teeth have with the body.

That the practical dentist should be possessed of a

thorough medical education, must be obvious to every one who reflects upon the subject. Not only so, he should be thoroughly skilled in anatomy, which is the foundation of all intelligent surgical operations. He who is not familiar with the structure of the human body cannot *with certainty* know how to repair its injuries. It must be all guess-work with him; and if he does not kill his patients, it will be through accident, or because nature has triumphed in spite of him. It would be as wise to submit to his operations, as to employ one to repair the steam engine, who knew neither its construction nor the object for which it was made.

Every physiologist is aware that one organ of the body cannot be disarranged or diseased without affecting the whole system; "that, when one member suffers, every other member sympathizes with it;" that nature has formed us with a complete set of organs, perfectly adapted to our wants, and to perform, in the best manner, the duty assigned them. Nature has given us every necessary, but no superfluous organ.

When, therefore, through ignorance or misfortune, we injure or lose a part or the whole of any organ, it must either be supplied by art, or we must suffer the loss of it through life. Indeed life itself may thereby be abbreviated.

Nature has not been so indulgent to man, in all respects, as she has to some of the lower orders of creation. The heads of the zoophytes, for instance, if cut off, will grow again; and if their bodies are divided longitudinally, the parts soon grow into two separate and perfect bodies. If our heads are taken off, we must do

without them; even if our *teeth* are lost, nature refuses to provide others.

There is a vital process going on continually in man, by which the various organs of the body are kept in action; which state of being we call *life*. Without this process, our bodies would be decomposed by the chemical action of the atmosphere. The suspension of this process we call *death*.

This vital power is the chief instrument in the cure of diseases, wounds, and broken bones; but when any member or organ of the body is separated from it, it is not competent to reproduce another. The way, therefore, to preserve and enjoy life is plain. We must seek to know the causes of disease, and avoid them; and, when we are already affected, to find and apply a remedy.

It is by no means our province to enter into the details of every kind and form of disease, nor would it be possible in a single volume; but only in brief to direct the attention of the reader to such as are most *intimately connected* with the dental organs.

We name first, because they are the most dangerous, *pulmonary complaints*. Among the many causes of this fatal disease, not the least frequent is diseased teeth. The lungs are exceedingly delicate organs, and, when once diseased, are difficult, on account of the state of activity in which they are kept, to cure. Every time we breathe, that is *inspire* and *expire* air, the lungs have a double office to perform; to receive the fresh and throw off the vitiated air. It is computed that the whole volume of air received into the lungs, and decomposed and thrown off, every twenty-four

hours, is 221,882 cubic inches, or about five hundred and forty times the whole capacity of the lungs.

Now it is highly important, for the health of the lungs, that the air received into them should be of the purest kind. If it is mixed with noxious vapors, or in any way vitiated, the whole of the *bronchi* and lungs, over and through which the air passes, must be injured.

It is perfectly evident, therefore, that the air, though ever so pure before entering the mouth, must be vitiated, if it has to pass over a mass of decayed teeth. Every one must be convinced of this, who has had the *pleasure* (and who has not?) of conversing with an individual whose teeth were thus affected.

Many consumptive patients spend their substance upon physicians and medicines, that at best but alleviate suffering, without restoring health; take long and expensive voyages to the "sunny south," or to fashionable springs; or seek relief by voyages to the Indian Isles, or to "ever bright and glorious Italy." *From what we have seen and known*, in many such cases, we cannot doubt, that, had these consumptive patients applied in season to a skilful, judicious, and honest dentist, they would have saved themselves much suffering and expense, and not unfrequently a premature death.

Not long since, a young lady, a friend of the author's, became gradually, but seriously ill. A physician was called in, who, apparently with great reluctance, informed the young lady's parents that he feared pulmonary consumption had become seated. She was feeble and emaciated; and over her pale concave cheek, blanched as by ghastly famine, there

periodically flashed a bright vermilion tinge, which spoke loudly and alarmingly of danger.

She was finally advised to take a voyage to France, her native country, in hopes that the sea-voyage, and the genial air of Marseilles, would restore her wonted strength and animation. Her parents could not accompany her, and were quite unwilling to let her go alone, or with strangers, on such a voyage; but, alarmed for her life, they at last consented, and arrangements in accordance with this plan were making when I saw her.

She had been troubled, occasionally, with toothache; but had merely applied soothing remedies. But, as she was going away, her father suggested that she had better have her teeth properly attended to before leaving home, "that toothache might not be added to the miseries of sea-sickness."

I accordingly examined her mouth, and was astonished to find how extensively her teeth were diseased; as, from the appearance of the anterior teeth, I had not been led to suspect it. On the right side of the superior jaw, the second bicuspid and each of the molars were so much diseased, that I feared they would all need to be extracted. In the inferior jaw, nearly every tooth, with the exception of the incisores and cuspidati, was more or less diseased, so much so that all hopes of successful reparation were excluded. The gums were considerably inflamed, and depositions of tartar were observed on the posterior sides of the inferior molars.

I first extracted such as it was found unadvisable to retain in the mouth, and thoroughly cleansed the re-

mainder from the tartar and mucous secretions of the mouth; a suitable lotion for the gums was directed to be used for three or four days, after which I proceeded to plug such as could be preserved, and lastly provided the young lady with a wash for the gums, to be used as long as was found necessary; with dentifrice and brushes for the teeth, and a final admonition to be constant and persevering in their application.

In about a week, she expected to sail. Calling to ascertain if any change was apparent, I found her so much better that she had concluded to defer her voyage for the present; and, soon after, I was informed that she had given it up altogether.

I met with her some three months afterwards, and she was so altered in appearance that I hardly knew her. Her attenuated form had become full; her step had recovered its elasticity and firmness, and her eye its brightness; while the bloom of health diffused its richness over that fair cheek, where, but a few months before,

"Revelled the febrile heat of hectic fire,"

or pale and death-like hues gave painful signs of premature dissolution.

There was no other apparent reason for this transformation, than the restoration of her mouth and teeth to a state of health. Her father has never ceased to congratulate himself on his happy thought of "having her teeth fixed before she went."

This is by no means an isolated case, though the restoration in this instance was unusually rapid and complete. We have met before and since with similar cases, as we presume is the fact with every member of

the profession, of extensive practice. These things show how great and deleterious an influence is exerted on the whole system by diseased teeth. And we cannot but think, that, when physicians are called in, they would greatly facilitate the recovery of their patients, by seeing that diseases of their teeth and mouth are examined and corrected, in conjunction with other local or general diseases of the system, while under their peculiar care.

Next in importance to the lungs, is the *stomach*, that poor and much-to-be-pitied organ, which is compelled to work harder, and take more abuse, than any other member of the body. For many persons, no matter what may be their ailment, immediately *ascribe* it to a "foul stomach;" which, after being overloaded with an enormous quantity of half-masticated food, is condemned as weak, if it does not evacuate its burden without trouble or complaint, and get ready for another task in time most unreasonably short. The stomach needs rest as well as any other organ of the body. Abernethy once said to a patient, who was continually complaining of a disordered, uneasy stomach, "*Sir, why don't you let it take a nap?*" The improper quality and quantity of food usually taken into the stomach is no doubt a sufficient reason for a great deal of the complaint we hear about dyspepsia and weak stomachs; but when we consider the fact, that a great deal of the food eaten is but half-masticated, and that too with disgustingly dirty and decayed teeth, we are no longer surprised at the result. The object of mastication is to finally divide the food, mixing it at the

same time with saliva, preparatory to its reception into the stomach, for the process of digestion.

When food is proper in quantity and quality, and well masticated, the process of digestion is perfectly natural and easy; but, when food is swallowed partially masticated, the gastric juice, a secretion of the stomach, which is the active agent in the digestion of food, has to perform its own office, and that of the teeth also. Added to this, the fact of the teeth themselves being unfit for use, decayed and dirty, it frequently happens that small portions of diseased bone, with particles of tartar, and often the putrid remains of previous meals, dislodged from hollow teeth, mix with the food, and are all carried down together!

Can we wonder that the stomach abhors such deposits, and that, in its efforts to dispose of this amalgamated trash, it should cause nausea, and all the disagreeable feelings of the dyspeptic, and the horror of the hypochondriac.

In regard to dirty teeth, we have been often astonished to see persons who are scrupulously neat in their houses, and who will have articles intended for culinary purposes and for the table examined with extraordinary care, after all, masticating their food with teeth so dirty that they are disgusting to behold. Why is it any better to eat with dirty teeth than with dirty knives? Is not the latter just as reasonable as the former?

If, then, one would enjoy healthy digestion, he must have sound, clean teeth, that the food may be properly prepared for the stomach, before being permitted to enter it.

It is asserted with truth, by a writer in the Journal of Health, that "the secondary irritation, arising from decayed teeth, is not always confined to the face or head: it not unfrequently displays itself in all the symptoms of indigestion, and at times of periodical or intermittent fever; with many anomalous nervous symptoms, resembling hysteria." Neuralgia faciei, or tic-douloureux; hemicrania, a peculiar species of headache, which bears some resemblance to neuralgia; epilepsy, mania, deafness, rheumatism, amaurosis, ophthalmia, and other diseases, are often caused or aggravated by diseased teeth.

Hufeland enumerates sound and firm teeth as among the signs of long life; for, as he says, "to ensure good digestion, *good teeth* are absolutely necessary; and one, therefore, may consider them among the *essential* properties requisite for long life, in two points of view. First, good, strong teeth are always an accompaniment of a good, sound constitution, and good juices. Those who lose their teeth early have in a measure taken possession of the other world with a part of their bodies. Secondly, the teeth are a great help to digestion and, consequently, to restoration."

But, in medical science, as on every other subject, *facts* are the best arguments; and they are so numerous that we hardly know which to select for publication. Some of these occurred under our own observation, and others we have upon the most respectable authority.

* "In September, 1830, I was consulted by Mr. ——,

* Harris's Dental Surgery.

at that time a resident of New York. Before I examined his teeth, he informed me that his general health had for four or five years been very bad; and that he had applied to some of the most eminent physicians of Albany, Troy, and New York, but could obtain no permanent relief from his sufferings.

"The character of his symptoms this time was very peculiar. His digestive organs were so much disarranged that he was obliged to observe the strictest regimen, and to confine himself to the simplest kinds of vegetable food. Besides the *dyspeptic* affection with which he was troubled, he had severe periodical paroxysms of headache, of from four to five weeks. These were always preceded by a numbness, that commenced first in his tongue, and thence extended throughout the whole system. This sensation generally continued about two hours, and was succeeded by a violent pain in the head, and partial vertigo, from which, in about ten hours afterwards, he was relieved by vomiting. The effect of these fits lasted about ten days, and the other symptoms had continued without much mitigation for three years.

"On examining his mouth, I gave it as my opinion that the diseased state in which I found his teeth, was the cause of his affliction.

"This idea, though perfectly new to him, he was disposed to believe correct, and, therefore, the more readily consented to the treatment I prescribed. Many of his teeth were much decayed, and nearly all of them covered with tartar. The roots of some were denuded of the gum; the alveolar processes more or less absorbed; the gums turgescent, fungoid, bleeding on the slightest

touch, and of a dark red color; the secretions of the mouth viscid, and their exhalations exceedingly offensive. Such of his teeth as could not be perfectly restored were extracted, and as much of the tartar as could be conveniently was at the same time removed from those that remained, and the rest taken away at subsequent sittings. His gums were freely scarified; and a tonic astringent, and detergent wash, directed to be used three or four times a day.

"Under this treatment the local affection of the mouth rapidly disappeared, and in about four or five weeks his teeth and gums became perfectly healthy. His general health also began to improve, and in about two months he was perfectly restored, and has continued so ever since.

"In May, 1834, Mrs. ——, a lady of this city, of high respectability, was advised by her family physician to consult me in relation to her teeth. Her health at this time was very delicate and precarious, and had been so for six years previously. She had taken much medicine, and had visited the Saratoga and White Sulphur Springs, but without obtaining permanent relief. Her stomach was so much disordered that the lightest kinds of food produced, for several hours after it had been taken, a heavy, burning, and very painful sensation. Her whole nervous system was so completely deranged, that the quick slamming of a door, or any other sudden noise, would almost throw her into convulsions. Her eyesight was much affected, and she was troubled with an almost constant swimming or dizziness of the head.

"On examining the mouth, I found that the crowns

of the superior incisores, cuspidati, and bicuspids, the inferior molars, a bicuspid on the right, and a *dens sapientiæ* on the left side of the lower jaw, were involved in general and complicated caries. Their alveolar processes were more or less absorbed, the gums tumefied, soft, spongy, and ulcerated along their edges. The inner surface of the inferior incisores and the outer surface of the superior molars were thickly coated with tartar, and the salivary and mucous secretions of the mouth in a viscid state.

"At the earnest request of her friends, she submitted to the necessary treatment, by which the health of her mouth was completely restored, and, with it, that of her general system also.

"When, in addition to the result of the treatment, it is stated that she enjoyed almost uninterrupted good health, until her teeth became diseased, I think it will not be doubted, that her illness was occasioned by a morbid condition of the organs of mastication."

DISEASE OF THE ANTRUM.

Disease of the antrum is often occasioned by diseased teeth, as may be seen from a view of its near connection with them, which we will briefly describe:

Within the superior maxillary bone is a cavity; and that portion of the cavity immediately over the molares, is called the antrum. There is a communication between this cavity and that of the nose, by means of a small opening. This, with the other cavities connected with it, helps to make the voice more sonorous; on the

same principle that the cavities of the violin or bass-viol increase the sound communicated to them, when their strings are vibrated.

The lining membrane of the antrum (Scheniderian membrane) comes into such near contact with the fangs of the molares, that inflammation is very readily communicated from one to the other. When inflammation is protracted, this cavity becomes the seat of an abscess; and as the disease closes the communication existing between it and the nose, the matter which forms is obliged to seek another outlet, and, consequently, we find it working through the jaw-bone, and making an external opening for itself through the cheek.

The symptoms by which this disease is known are rather uncertain. It is so closely connected with the teeth, that common affections of these organs are sometimes confounded with disease of the antrum; but where we have reason to believe it exists, remedial measures should not be delayed. It has been known to occasion the entire destruction of the superior jaw with the bones of the palate, the molar or cheek-bone, together with that portion of the lower jaw which articulates with the condyle; the bones which form the orbit of the eye and forehead were also considerably diseased.

Thus we see, that, by suffering one diseased and inflamed superior molar tooth to remain in the jaw, inflammation and abscess of the antrum ensued, which involved nearly every bone of the face in destruction.

The most marked symptoms of disease of the an-

trum, particularly during the existence of inflammation, is a feeling of tightness and weight, with a throbbing pain in the cheek, commencing at the affected part, but often extending over the side of the face to the forehead. The cheek then swells interiorly near the gum of the affected tooth, and afterwards the whole side of the face, which becomes red and hard.

Means should first be tried to subdue and remove the inflammation; but if we do not succeed in this, and matter forms, an opening through which it may escape must be made as soon as possible. This may best be done by extracting one of the molars; the second one would be preferable, as it is situated most nearly in the centre of the antrum; after its removal, a perforation should be made through the socket, through which the matter may discharge itself.

After the matter has come away, a decoction of bark, or the tincture of myrrh, should be prepared, and frequent injections should be made into the antrum by means of a suitable syringe. If the membrane is now mostly affected, and the bones but slightly, a cure may soon be anticipated; but if the bones are much diseased, it will be necessary to remove them before the face can possibly recover.

Some writers have recommended making an opening in the cheek above the gum; but as this would not admit of so complete a discharge of the matter, we could not advise it; especially as the teeth, being always more or less diseased, would still need to be removed.

In this disease, exostosis sometimes occurs. This is a deposition of bony matter, or rather the formation

of a bony tumor, which sometimes begins in the cheek, and increases in size till a horrible distortion of countenance is the consequence.

In Fox's Natural History of the Teeth, is found the following *case of exostosis* in the jaw, which terminated fatally: —

"Sarah Dulwich, aged 13, of scrofulous constitution, was admitted into Guy's Hospital, on April 8th, 1812, with a large tumor under the left cheek; which first made its appearance, twelve months previously, in the form of a small tumor of the gum upon the lower jaw, and at that time not painful.

"At the time of her admission, the tumor occupied the whole of the left cheek; it was globular, and fell irregular under the integuments; it projected below the jaw, and extended from the cuspidatus of the lower jaw on the right side, irregularly under the tongue, which it had thrust close to the right cheek, and, consequently, rendered speech difficult and indistinct. Internally its surface was irregular, hard, and unyielding; it was in a superficial state of ulceration, from the pressure of the teeth of the upper jaw of the left side.

"For six months previously to its rising above the teeth of the lower jaw, it prevented the approximation of the jaws, the lips remaining an inch and a half or two inches apart. The discharge from the ulcerated surface was sometimes bloody, and offensive to the smell.

"Upon viewing the tumor externally, it reached from under the edge of the orbit, extending by the side and pushing up the left nostril, and around to the ear,

forming an immense extended tumor, even down to the forepart of the chin. It was at least half the size of the head; the skin in some places had a slight blush on it, and here and there the veins were seen of considerable size running over its surface.

"Deglutition was extremely difficult and painful, in consequence of the pressure of the tumor against the teeth of the upper jaw.

"Half the upper jaw, together with the teeth, from the pressure of the tumor, were pushed towards the opposite side.

"*The only cause she can assign for the disease is, that she was subject to constant toothache in the two molar teeth of the lower jaw*, for two or three months previous to the appearance of the tumor on the gum. In other respects her health is good.

"The tumor continued increasing in size, and distorting the countenance. About two or three months after admission, it began to press forward, and to hang out of the mouth; and about this time she began to be troubled with a constant discharge of saliva over the tumor, together with a profuse discharge of fœtid, bloody matter.

"About five or six months after her admission, the tumor and lower jaw became extremely painful, and small pieces of the jaw began to exfoliate from under the tumor; and, from that time to her demise, about ten or twelve pieces of bone exfoliated. She died in about eleven months after her admission.

"This tumor was afterwards dissected by Sir Astley Cooper."

Although such cases as the foregoing are rare, yet the *mere possibility* of such an occurrence is incentive enough to make us guard with unceasing vigilance the first symptoms of disease in the teeth.

In more than one instance have we seen exfoliation of the jaw, with a loss of several teeth, proceed from the obstinate retention of one diseased tooth in the jaw.

A young lad, Horace——, had suffered many months with toothache; and being called upon to attend him, we found his face badly swollen, and the tooth very painful; but still he could not be prevailed on to have the tooth, which was a superior bicuspid, removed.

In a short time, mortification of the jaw took place; the teeth adjacent, three on the anterior and two on the posterior side, were separated by this ulceration from their connection with their sockets, and came away, together with a large portion of the jaw. The teeth on each side were so loosened as to render their removal necessary; and he thus lost seven teeth, with a large portion of the jaw, because he could not bear the pain of the extraction of one tooth.

Soon after, on the opposite side of the jaw, a similar enlargement of the cheek presented itself; purulent matter had collected, and the gum had become turgid. Leeches were applied; and, soon after extracting the affected tooth, and bathing the gums with a soothing lotion, I prescribed a dose of Rochelle salts, and in a few days he was well as usual.

We have translated from a foreign Medical Journal the following extraordinary case of complete recovery from *amaurosis* after the extraction of a carious tooth:

" S. P., aged 32, of strong constitution, but occasionally affected with rheumatism, in October, 1839, was all of a sudden affected with a sharp pain in the left side of the upper jaw and eye, which lasted a few days, and then subsided by degrees, but returned at regular interims afterwards.

" The patient disregarded it, until the pain became very severe; and he perceived that the sight was gone from his left eye. He then made application to a practitioner of medicine, but found no relief from his applications, and he gave up in despair.

" About eight months after the commencement of the pain, a tumor was discovered on the left cheek, which afterwards terminated in an abscess between the conjunctive and lower eyelid of the affected eye. Purulent matter, to the amount of several ounces, was discharged from the tumor; after which the pain was not so great; but the sight of the eye was in no degree restored. The discharge of matter still periodically continued, but increased in quantity for nearly six months; when the pain in the eye became so intolerable that the patient was again induced to apply for medical treatment.

" He went to Wilna, determined rather to have the eye removed than longer to endure such excruciating pain. Dr. Galenzowski, of Wilna, examined the eye, which was found in a perfectly torpid state, with the pupil dilated, and sight entirely gone. The most brilliant light and total darkness could not be distinguished by him. No *organic* disease of the eye existed, the mus-

cles acted regularly, but the discharge still continued. The pain in the eye moderated for a few days.

"On examining his mouth, one of the molar teeth was found to be extensively decayed; and in one of its roots a small piece of wood was discovered, which had helped to keep up the irritation. The antrum was perforated, so that a tube could be passed into it from the cavity of the tooth. *After the extraction of this*, no matter was discharged, and sight was restored with such rapidity, that after nine days' suitable treatment of the patient, with gargarisms, &c., he was enabled to return to his native place."

The Western Medical Gazette gives the following account of cure of a severe case of neuralgia, or tic-douloureux: —

"Mrs. W——, aged 35, labored for several years under the most excruciating tortures, occasioned by attacks of tic-douloureux on the left side of her face. All the ordinary remedies had been resorted to without any obvious advantage.

"She came at length to a resolution, spontaneously formed, to have all the remaining teeth of the upper jaw, on the affected side, removed, although they were perfectly sound.* They were three in number, and in no respect productive of uneasiness. Yet she became possessed of a notion that their extraction would be salutary.

* In regard to the teeth being perfectly sound, we suspect that though they might exhibit no *external* marks of disease, yet, if they had been longitudinally severed, they would have been found to contain a portion of *pus;* as was the case with some teeth we extracted under similar circumstances.

" Her physician, after many vain entreaties, was at length prevailed upon to extract the teeth, but without the least degree of expectation of a permanently good result. The consequence, however, turned out to be precisely what the patient had predicted. She was perfectly cured, as her attending physician, Dr. Mitchell, testified, and continued well several years after the operation had been performed."

An interesting case of *neuralgia faciei* is related by Koecker, author of Principles of Dental Surgery, &c.:

" Mr. J——, a gentleman of great respectability, a native of this country (Eng.), but for many years a resident of Smyrna, aged 39 years, had suffered upwards of ten years with this distressing malady, attended by *all* its torturing symptoms in a most unparalleled manner.

" His whole constitution, but particularly the glandular system, was so much affected as to produce swellings and indurations in the most distant parts, accompanied with great pain and inconvenience; but its effects on his head were frequently agonizing. Indeed, he assured me, so great were his sufferings, that he had been so far driven to despair, as to implore Heaven to relieve him by putting an end to his miserable existence.

" He repeatedly applied for the best medical and surgical advice that the country could afford; but the real cause of his suffering was not detected, and such was the character of this disorder, that it baffled every exertion, and all the remedies which were applied for many years.

" At length the effect of a sea-voyage, and a visit to

his native country were proposed, and at the same time a trial of such medical measures as he might be able to command in England.

" Immediately after his arrival in London, he consulted Mr. Lawrence. This sagacious and disinterested surgeon soon suspected his teeth to be the chief cause of his malady, and recommended him to have my advice without delay, and to submit to any treatment I should deem necessary and proper.

" On examining the gentleman's mouth, I found the gums and all the alveolar processes more or less diseased. His molar teeth, however, had especially suffered; and so considerable a part of their sockets were destroyed, that their preservation was rendered altogether improbable. I therefore proposed their immediate removal; and, although the gentleman was exceedingly nervous, he acceded to my proposed plan of cure without the least hesitation.

" Feb. 14, 1826. Thirteen teeth and roots were extracted, and the mouth was subsequently cleansed with a gentle stimulant lotion every hour or two in the course of the day.

" Feb. 21st. The remaining front teeth of the upper and lower jaw were carefully scaled, as far as the diseased state of the gums would allow, and the patient provided with the means of preventing a reäccumulation of tartar. He was requested to continue the lotion.

" Feb. 28th. The above operation was repeated, and cleanliness particularly recommended.

" March 17th. The same operation was completed,

and a perfect removal of the tartar accomplished. The patient was directed to proceed as before.

"Thus by the judicious disposal of the case by Mr. Lawrence, and the above treatment, the patient was in less than one month restored to perfect health. His mouth was rapidly recovering from a disease of nearly fifteen years' standing; and the most important of his teeth saved from total destruction, and permanently preserved."

The following case occurred some time since in my practice. Mrs. G——, a respectable married lady, had been sick for years, suffering intense pain in her head and face; gradually growing worse till she was incapacitated for taking care of her family, and confined to her room by sickness, supposed to be tic-douloureux. After uselessly trying many things to alleviate her sufferings, she was advised by an intelligent member of the medical faculty to apply to me for examination and advice.

I found her mouth in a very bad state; the gums much inflamed; which was reduced by local depletion. I then extracted several teeth, which were too much affected by caries to render the operation of plugging practicable, and cleaned and filled those which remained.

She recently informed me, that, after my operations on her teeth, all the pain in her head left her; she began immediately to recover, and has remained perfectly well ever since, though it is now nearly three years since the operations were performed, to which she attributes her entire recovery.

A case is related of a person who was cured of *ague* by the extraction of carious teeth.*

A gentleman, having had the nerve of the second left inferior molar exposed by *caries*, was attacked by what, in the popular jargon of the day, is termed "*ague*." He applied to a dentist for the extraction of the tooth at the time, and while the face was much inflamed and swollen. The dentist, in the effort to extract, broke off the crown of the tooth; and, after several ineffectual efforts to remove the root, he informed the patient that it was utterly impossible, "as the root was 'locked.'"

The gentleman returned home, feeling that there was no other alternative than to submit to the affliction; and, after five months of the most agonizing suffering, during which period he was often tempted by the severity of the pain to put an end to his life, he was in some degree relieved by an abscess opening a little anterior to and below the ear, near the angle of the inferior maxillary.

After a period of nine months from the attempt to extract the tooth, with the abscess as described, he became my patient. Much to the gentleman's astonishment, I extracted with ease the fangs of the tooth; and, after I had cut away a portion of the diseased bone, brought together the wound, or edges of the opening, and applied proper dressings to the parts, the sinus healed, and the patient was restored to perfect health.

Dr. Rush states the following cases, the one of *epi-*

* V. Vol. Jour. Dent. Sci.

lepsy and the other of *rheumatism*, which were produced by decayed teeth:—

"Some time in the year 1801, I was consulted by the father of a young gentleman in Baltimore, who had been affected with *epilepsy*. I inquired into the state of his teeth, and was informed that several of them in the upper jaw were much decayed. I directed them to be extracted, and advised him afterwards to lose a few ounces of blood, at any time when he felt the premonitory symptoms of a recurrence of his fits. He followed my advice, in consequence of which I had lately the pleasure of hearing that he was completely cured.

"The other case occurred in October, 1801. I attended a Miss O. C., with *rheumatism* in her hip joint, which yielded for a while to the several remedies for that disease. In the month of November it returned with great violence, accompanied with a severe toothache. Suspecting the rheumatic affection to be excited by the pain in her tooth, I directed it to be extracted. The rheumatism left her hip immediately, and she recovered in a few days. She has ever since been free from it."

A physician residing in London has a young son, who, on a number of occasions, caused him great uneasiness by becoming *blind* in one eye, without any obvious cause, and without any visible change in the organ; but the blindness on each occasion had gone off again, apparently in consequence of the extraction of some teeth which were growing irregular. Dr. Asburner states that such cases are common.

A case in which *dysopsy*, or *weakness of the eyes*, was completely cured, came under my observation in November, 1842. Mrs. L——, a lady about thirty-five, had been much troubled with dimness of sight, and general weakness of the eyes. She tried glasses, but they did not assist her. She used various ointments and washes with no better success, and finally applied to a physician.

He first took several ounces of blood from the arm; ordered a blister to be placed on the back of the neck; directed the use of purgatives; and gave her a lotion to be applied to the eyes, the composition of which she knew not. She continued this course for some time, with scarcely any perceptible benefit.

At this time, having given up every kind of treatment for her eyes, she came to me to have some operations performed on her teeth, without the most distant idea of benefit to her eyes. It so happened, however, that immediately after, or in the course of a few days, her eyes began to amend, returning by degrees to their original power. In the course of three weeks, she could read fine print, which she had not done for months previous; and, at the end of a month, her eyes were as well and strong as ever. She has since removed to a Western State; but I had the satisfaction of hearing recently, that she had never suffered since with affections of the eye.

From the connection of the auditory apparatus with the teeth, it is not uncommon to find *deafness* caused by disease in them, and cured by the extraction of such as are carious.

When we consider the intimate connection that exists between the ear and the mouth, by means of the Eustachian tube, and that of the *chorda tympani* with the fifth pair of nerves, we see that nothing is more probable than that deafness should result from carious teeth. That they have this effect, we have been more firmly convinced by a case that occurred in our practice in the autumn of 1842.

A gentleman called at our office to have a tooth extracted. He was so deaf that he heard with difficulty, without the use of an ear-trumpet, which he usually had with him. We ascertained that he had been gradually growing deaf for about five years. After we had extracted the tooth, with some decayed roots, and plugging two carious teeth, he left. About six months after, we met him on board a steamboat on the Hudson river. He immediately recognized us; and, with a bright smile and joyous countenance, observed, "Do you recollect the deaf man, whose teeth you fixed last fall?" By this time we had discovered who the gentleman was, and replied in the affirmative. "Well," said he, "I am the man; but you see I've got no ear-trumpet now." He further observed, that, after the removal and repairing of his teeth, he had gradually recovered his hearing, and for the last two months had been perfectly restored, and could hear as well as any person.

What makes the case clearer, he informed us that, when quite young, he had been once afflicted with deafness; which, however, had disappeared after the extraction of an aching tooth; but that he had not

thought of it in connection since. In the last case, he said he did not know when his teeth *commenced decaying*, but that he had been growing deaf some months before his teeth troubled him much.

The following remarkable case of tumor is related by Mr. Fox: —

"S. M., a servant in a gentleman's family, about thirty years of age, was affected with a superficial sore on the cheek, immediately beneath the left orbit, of a very remarkable character. It was about the size of a shilling, of a black color, having very much the appearance of a portion of the integuments destroyed by actual cautery. It was uniformly but slightly depressed, and distinctly circumscribed; and the edges of the surrounding skin were somewhat inflamed, though there was but little pain.

"Various applications had been employed, with but little success, for the removal of the slough; poultices had been persevered in alternately, with *ung. hydrargyri*, *nitrics oxydi*, and *arsenical* ointment. Once or twice the slough had been removed; but it immediately reäppeared. At length the surgeon who attended her sent her to me, to ascertain whether any thing in the state of the mouth could have occasioned this singular disease.

"I found the second molar of the upper jaw on the left side much diseased, and an enlargement immediately over the socket, passing upwards towards the orbit; and thus indicating that there had existed some irritation in that direction. The tooth was therefore removed, and with the best effect. The part was

again poulticed; but, finding the adhesion of the slough very strong, I removed it with the knife, and it never reäppeared. The part healed in the usual way, though somewhat tardily."

We might go on, adding case after case, *ad infinitum*, to prove the connection of the teeth with the different diseases of the body; but we have given enough to satisfy any reasonable mind. We shall now turn to another branch of our subject.

CHAPTER V.

FIRST DENTITION.

CONTENTS. — The manner in which the teeth pass through the gums. Description of the dental germ. Absorption of the gums. General directions for management of infants during the process of dentition. Pernicious practices in regard to diet, clothing, &c. Number of the deciduous teeth. Order of their appearance. Symptoms of teething. Flow of saliva, and its use. Convulsion fits — remedy. Proper articles to assist the process of dentition. Teething attended with diarrhœa — mode of treatment. Eruptions of the skin — applications. Use of the lancet.

"The first dentition asks our earliest care;
For oft obstructed Nature, laboring there,
Demands assistance of experienced Art,
And seeks from Science her appointed part.
Perhaps, ere yet the infant tongue can tell
The seat of anguish that it knows too well,
Some struggling tooth, just bursting into day,
Obtuse and vigorous, urges on its way;
While inflammation, pain, and bitter cries,
And flooding tears, in sad succession rise."

As the period of the first dentition, or *teething*, is one of peculiar care and anxiety to the parent, and often of acute and sometimes of fatal suffering to the infant, we shall be somewhat minute and particular in its consideration. If, in the preceding chapter, we have failed to convince any *mother* of the sympathy that

exists between the health of the teeth and that of the general system, we know she will acknowledge that in "cutting the teeth" (as it is commonly called), at least, there is a connection so intimate as often to excite her fears for the *life* of her child.

The manner in which the teeth pass through the gums is not generally known. It is usually supposed, that, as they increase in size and strength, they *force* their way through the gums by *mechanical* pressure. This is not the case, and we shall see it cannot be if we reflect on the state of the gums and teeth at that period of life.

Each pulp is enclosed in a membrane, firmly attached to the gum, and to the pulp at its base; so that at the upper edge it is but loosely enclosed by the membrane, which is merely bent over it. At the base, the pulp is slightly attached to the alveolar cavity in the jaw.

In Fig. 16 is seen the germ, or pulp, enclosed in its sac.

Fig. 16.

During the formation of the tooth, while it is yet but loosely enclosed in the socket, it could not exert sufficient force to penetrate so firm a substance as the gums, which likewise possess a degree of elasticity,

that would, by the gradual pressure of the teeth, become elongated, and still continue to cover them.

The passage for the teeth is prepared by the process of ulceration, unattended, however, by any formation of matter. By the pressure of any extraneous substance on a sound part, or by a diseased enlargement of any part within the body, an *absorption* of the parts subjected to this pressure will take place.

When the teeth are so far advanced as to be no longer contained within their sockets under the gum, they press upon the membranes which enclose them; which are then absorbed; and the pressure being applied to the gum, that also is absorbed, and the teeth make their appearance.

Though the teeth are not visible at birth, yet they exist in the fœtus of two months, and ossify as early as the fourth or fifth; but do not usually make their appearance through the gum till between the fourth and six months after birth. As to this, however, there is no absolute uniformity.

It is during this period of first dentition, that the greatest mortality exists among children. In London, in one year alone, seven thousand two hundred and sixty-one children died under two years of age; nearly all of them from diseases connected with the teeth. The statistical reports of deaths for New York, Philadelphia, and other large cities, ascribe to the effects of teething nearly two-thirds of all the deaths among children.

It is, therefore, of the utmost importance, that not only physicians, but parents, especially mothers, who,

at this early period of life, have, or should have, almost the exclusive charge of children, should be correctly informed as to the natural process of dentition, the accompanying symptomatic ailments of the little subject, and the best means of rendering the process as easy and as little inconvenient as nature will permit.

Children who are born of weak and nervous parents, usually suffer most from their teeth; while those who inherit a sound, hardy constitution, often pass through the whole process with but little suffering.

Our first aim, then, should be to strengthen the general system of the child by daily contact with fresh air, scrupulous cleanliness, and the daily application of cold water to the whole body, accompanied with the gentle friction of a sponge. The head particularly should often be washed with cold water. There is no danger of the child's taking cold, if accustomed to this treatment from the first, as it should be. In fact, it is one of the best preventives against taking cold.

In diet, every thing of a stimulating nature should be avoided. If the child is obliged to have other food than that furnished by the mother, it should be such as most resembles it.

We cannot avoid here speaking of that most pernicious habit of many persons, who put into the mouths of tender infants, as soon as they can swallow, any and every unwholesome, indigestible stuff, which they are accustomed to impose on their own stomachs. How often have we seen mothers, as they held their infants in their arms at the table, ply them not only with tea and coffee, but, as they most foolishly expressed it, "with

whatever they loved themselves," whether strong tea, pickles, or greasy soup!

Such ignorance in parents is inexcusable; and if mothers will not make themselves acquainted with the physical and moral natures of the little beings entrusted to their guardianship, they fairly deserve all the trouble and anxiety arising from their children's fretfulness and sickness, which are so often induced by such mismanagement. Instead of merely consoling them under the "afflictive dispensation of Providence," which removes their children from their care, we feel inclined to say to them, according to the spirit and letter of the Bible, "You have reaped as you have sown."

The practice of keeping a child for weeks and months confined in a warm, close room, buried beneath a mass of bed-clothes, strata after strata of quilts and blankets, coverlets and spreads, till the poor thing is almost suffocated; and, if it has to be carried from one room to another, so enveloping it in its superabundant swaddling-clothes, that it is really quite a complicated and protracted process to find "the dear little thing," thus inhumanly smothered to prevent "its getting cold," is the very way to render children susceptible to cold. It is the way to make them delicate and feeble, and doubly liable to all the diseases incident to childhood, and to none more than to those which accompany *teething*, which, though not in itself a disease, frequently affects the whole system, and, by the irritation kept up, calls out all the morbid influences that might otherwise have lain dormant. The same precaution and care are therefore necessary, as if it were in itself, and necessarily, a disease.

The deciduous teeth, or those of the first dentition, are twenty in number. They are not developed, as are the bones of the body, from a cartilaginous mould, but grow from germs, or a pulpy substance, contained in a membranous sac (as we have described, see plate 16), and buried in the gums near the edges of the maxilla; in form something like the crowns of the teeth.

The two inferior incisores usually appear first; and their sharp edges coming in contact with the upper gum, help forward the superior teeth, which appear next. Then come the two lateral incisores of the lower jaw, and the corresponding ones of the upper soon follow. Next to these, two anterior molars on each side of the jaw, and lastly, two of the canine, or cuspidati. The teeth do not invariably appear in exactly the same order; but this is the usual course.

Among the symptoms observed in the dentition of the milk teeth, is, first, an increased flow of saliva, often observed for weeks, and sometimes months, before any teeth make their appearance. This is rather favorable to their development than otherwise, as it softens and dilates the gums, in consequence of which they are more easily penetrated by the teeth; it also serves to allay inflammation. When there is an absence, or a very limited quantity, of saliva, the gums become dry and hard, and the whole process is thus more difficult and painful.

The child at this time is often affected with restlessness, and irritability, of temper; during sleep it will start, and sometimes cry out; and it exhibits uneasiness and pain by shaking the head, &c.

Sometimes the face, and again the whole body, is convulsed, and the child "falls into a fit," as it is commonly described. These convulsive fits are extremely dangerous, and often fatal, if the subject is not promptly relieved. When convulsive fits are accompanied by fever, the application of leeches behind the ear is sometimes necessary; but usually, if the child is placed in a warm bath, and a mild clyster administered, it will suffice for restoration.

The application of a small stream of ice-cold water to the head, in case of convulsions, is recommended by Ritcher, as being a very successful restorative. It is also recommended by Dr. Heim of Berlin, and Dr. Graves of Dublin. The stream should be repeated as long as the fits of insensibility continue; the neck and shoulders should be covered with oiled silk, and the body kept warm.

The back may likewise be rubbed with oil of ambery, or aqua ammonia.

These fits usually excite considerable alarm; and, if the child is subject to them, it may be advisable to use occasionally anti-spasmodic medicines.

Some children are peculiarly subject to attacks of this kind, from hereditary predisposition. In some families it has descended through several generations. The children of such as have married prematurely, or in very advanced age, are observed to be more liable than others. It is therefore especially necessary, that, where there is any hereditary predisposition, great care should be taken to strengthen the general system, and to avoid, as much as possible, all exciting causes.

During teething, there is an unusual tendency of blood to the head; which, if not counteracted by the use of cold water, or if encouraged by allowing the child to wear flannel or other warm close caps, may terminate in inflammation of the brain.

The child, during the whole period of dentition, manifests a desire to put into its mouth every thing it lays its hands upon. Nature here evidently points out the necessity of giving the child something to bite, in order to allay the irritability of the gums, and to relax and soften them, which will be effected if suitable substances are used.

The common custom of putting an ivory ring, or pieces of coral, in the child's hand, is very injurious. The gums are thereby rendered callous, and the appearance of the teeth delayed.

Some recommend the use of sticks of liquorice, wrapped in linen and dipped in sweetened or aromatic waters of different kinds; but, as these injuriously affect the digestive apparatus, and a better substitute can be found, we decidedly object to their use.

Before the incisores appear, an India-rubber ring is very suitable; but when the child has any teeth, he soon penetrates this substance, when it is no longer fit for use, as he might swallow portions of it. There is nothing better than a crust of bread for this purpose. It is ordinarily of about the right consistency, being hard enough, but not too hard, unless very stale; and it nourishes the child at the same time. We need not be afraid lest a child will overload his stomach with bread.

Perhaps the most common, and not the least fatal, complaint incident to teething is diarrhœa; which, however, must be checked very cautiously, as, during dentition, all children are more or less liable to congestion of the brain or lungs, which diarrhœa may prevent. If it is excessive, however, and accompanied with spasmodic twitches, short respiration, and great thirst, mild external and other remedies should be resorted to without delay. It is always necessary, before attempting to check it, to administer some cleansing aperient, or the disease may be sent to the head. After this, if the disease does not abate, we may administer opiates and soothing injections, or applications of laudanum to the abdomen. But great caution is necessary to be observed. Clysters of starch, with twenty drops *tr. opii*, and forty drops *catechu*, or *kino*, may be administered.

Eruptions of the skin often appear during dentition; but, as they disappear with the exciting cause, it is safest to leave them unmolested. But where great irritation is experienced, the skin may be washed with warm milk and water, or with *hydrargyrus muriatus*, in *aqua calcis*, in proportion of 1gr. to 1oz.

Constipation sometimes ensues, but may generally be relieved by emollient clysters, or gentle purgatives, as magnesia, rhubarb, &c., accompanied by the warm or tepid bath. Cold-water injections are likewise useful, and oftentimes better than any drug which the apothecary has compounded, the physician prescribed, or the nurse administered.

In cases where the gums are very much swelled,

tense, and red, it is often necessary to apply the lancet. This is by no means a painful operation. Indeed, I have seen children, who but a few moments before were screaming with pain, smile in the face of the operator, as soon as the lancet had completed its work, so sudden and entire was the change from intense suffering to perfect ease.

This practice has been objected to by some, on the ground that the cicatrix, when closed, presented a greater resistance to the tooth, than the gum itself would, if it had been left untouched. That such is not the fact is proved by daily experience; and though mischief may have occasionally resulted from the bungling performance of some ignorant operator, yet the immense number of cases in which it has proved of essential and obvious benefit very far exceeds those of its failure.

Having thus noticed the most common and dangerous complaints to which children are subjected during the process of first dentition, we shall now proceed to show the necessity of retaining the temporary teeth in the jaw, till nature brings forward the permanent ones, and to point out the manner in which this change is effected.

CHAPTER VI.

SECOND DENTITION.

CONTENTS. — Process of substituting the permanent for the temporary teeth. Effects of diseased temporary teeth on the second dentition. Immoderate use of sweets — their indirect but certain effects on the teeth. Use of "sugar teats." Kind of brush to be used for the teeth of young children. Diseases of children's teeth, with their remedies.

When the rudiments of the deciduous teeth are somewhat advanced, a new sac is given off at the superior posterior portion of their membranes. These little sacs are at first enveloped in the same socket, and are so connected with the membranes of the deciduous teeth, that their separation would result in the destruction of both. As the sacs of the second dentition advance, the sockets of the first are enlarged, and small niches are formed in the internal plate of the alveolar processes. These are enlarged as the sacs of the permanent teeth increase in size, and are gradually formed into distinct sockets around them — the temporary teeth being still attached by a membrane, after they penetrate the gum, which becomes much elongated.

The temporary set of teeth are generally completed by the twenty-fourth or thirtieth month. Thus in a little more than two years, the soft pulp which we dis-

covered in the fœtus has gradually elongated and become ossified; the absorbents have deposited layer after layer of bony matter; and the beautiful crystals of the enamel are arranged in shining radii from the osseous part of the tooth, presenting a beautiful, polished, hard surface.

It is a mistaken though very common idea, that it is totally unnecessary to take any care of the temporary teeth; that, as they are to remain but a few years in the jaw, it is of no consequence whether they are kept clean or not, or whether they are destroyed by caries.

Now if the effects of diseased, temporary teeth were confined to themselves alone, it would not be very material; though we do think it of *some* consequence, that children should not be rendered disgusting in their appearance by foul, discolored teeth; or suffer from those which are diseased, when a little care and trouble would have prevented it.

But the effects of diseased temporary teeth are not so limited: they affect the general health as do the permanent ones, and moreover exert an especial influence on the character and regularity of the second set.

And here we are again compelled to urge upon mothers a strict attention to the diet of their children. Though it may cause some extra trouble always to provide the most suitable food, instead of giving them just what is most convenient, we are sure that when the results of each course are faithfully depicted to the mother, she would not hesitate, if *humanity* or *duty* could influence her.

Having before alluded to this subject, we will specify but one habit, which we consider peculiarly injurious. We refer to the use of those little bundles of saccharine, denominated, in nursery parlance, "*sugar-teats.*" We know they have been very highly extolled for quieting crying children; and if they were only used occasionally, or in case of emergency, they would perhaps do no great injury. But it so happens that these emergencies are continually recurring, till it becomes a daily, sometimes an hourly habit. The consequence is, that the sugar ferments, turns sour upon the stomach, and disarranges the digestive apparatus, thus disordering the whole system. The teeth become discolored by the acidulated saliva, which penetrates and consumes the enamel; and, if the practice is long continued, caries is the certain result.

Besides attention to the general health (which should mark every stage of a child's existence), the teeth of the temporary set should be regularly cleaned, several times a day, to remove all impurities, and prevent the accumulation of tartar, which we have often seen disfiguring the teeth of very young children. Children's teeth should be cleaned with a soft brush, having short hairs, which will penetrate the interstices and inequalities of the teeth. Pure water is all that is necessary, if the practice is commenced before tartar has begun to form.

From the fact that the temporary teeth, when they are shed, present no roots, it has been supposed by some that they have none. This is not the fact. The roots are absorbed by the permanent teeth, which make

their appearance in pairs, in the same order as the temporary set.

The second molars, however, are cut before the first incisores drop out; and as each pair is supplied by the permanent as soon as the temporary are shed, the child, after the deciduous set is completed, is never, in the regular order of nature, possessed of less than twenty teeth.

The first incisores are generally shed at about five years of age; and the whole process of exchanging the temporary for the permanent set is not usually completed (exclusive of the *dentes sapientiæ*, or wisdom teeth) before the twelfth or fourteenth year. The wisdom teeth usually appear between the eighteenth and twentieth year.

As, by the natural process, the fangs of the deciduous teeth are absorbed by the second dentition, it is obvious that they ought to be allowed to remain in the jaw until they are quite loose, or drop out of themselves, unless some such emergency as the following arise.

First, If the teeth have become carious and ache, it may be advisable to remove them, provided always that soothing opiates have been applied, and have failed to allay the pain; as it is hardly ever desirable to plug temporary teeth, unless the caries is small, and the filling in nowise interferes with its permanent successor.

Secondly, If, by disease of the teeth, alveolar or contiguous abscess of any kind has formed, it is best to extract them immediately; as the abscess would certainly produce more evil than the loss of the tooth.

Thirdly, Where the permanent teeth protrude before the others are loose, and are consequently obliged to take an irregular position; especially in the case of the inferior incisores, where the pressure of the upper teeth would cause them to assume a position outside of the superior arch, thus reversing the established order of nature.

Cutting the permanent teeth is generally affected without pain or inconvenience to the subject. Though the jaw has elongated (the jaw of an infant being nearly in the form of half a circle, while the jaw of an adult is an ellipsis), to make room for the increased number and size of the teeth, for the increased depth of the maxilla, and the development of the alveoli, the teeth are still very compactly placed, and thus irregularity often ensues from the crowded state of the jaw.

It is always desirable to avoid extraction, if the fault can be remedied in any other way. If there is room, and the teeth merely take a wrong direction, they may be returned by the frequent pressure of the finger against them, or by passing a piece of silk around them attached to those on either side: this will usually bring them to their proper place.*

* Except in cases where the contiguous teeth would be equally affected by the ligature.

Mr. Fox has invented an apparatus which is probably the best for this purpose. It consists of a gold bar, about the sixteenth part of an inch in width, and of proportionate thickness, which is bent to suit the curvature of the mouth, and fastened with ligatures to the temporary molars of each side. It is pierced opposite to each irregular tooth by two holes. The teeth of the upper and lower jaw are prevented from coming entirely together, by

But if there is evidently want of room, it would be far better to sacrifice one tooth than to risk the regularity and health of the whole set. The removal of the posterior bicuspids is usually to be preferred.

Some eminent authors, and among others, Mr. Bell, have recommended filing to remove slight irregularities of the teeth; but to this we must certainly object. Although the file is invaluable in some instances of caries, &c. yet we think its use highly improper for the regulation of teeth, where the same object might be obtained by the removal of one; for where the file has passed, there must be interstices left for the reception and retention of particles of food. While, therefore, we would not say that the file should never be used, we certainly think every other means should first be tried.

It is highly important that the regulation of the permanent teeth be effected in time; for the longer they are permitted to retain an improper position, the more difficult will be the operation of regulating them.

The most frequent causes of irregularity are a want

means of thin blocks of ivory attached to each end of the jaw by small pieces of gold, and resting upon the grinding surfaces of the temporary molars.

After the instrument has been thus fastened to the teeth, silk ligatures are passed around the teeth that have deviated to the interior, and through the holes opposite to them, and then tied in a firm knot on the outside of the bar.

The ligatures must be removed every three or four days, until the teeth shall have come forward far enough to fall plumb on those that formerly shut before them, and acquired a sufficient degree of firmness to prevent them from returning to their former position. But, as soon as the teeth shut perpendicularly upon each other, the blocks may be removed, and the bar alone remain.

of simultaneous action between the decrease of the deciduous teeth by the absorption of their roots, and the increase of the permanent ones; and also the resistance made by the temporary teeth, which are not shed, and in close proximity to the permanent teeth that have arisen.

CHAPTER VII.

ECCENTRICITIES AND ANOMALIES OF THE TEETH.

CONTENTS. — Variation in the size of teeth. Irregularity of their appearance through the gum. Twin teeth. Entangled roots. Case of Phenecrates, who "never had any teeth." Cases of the new appearance of teeth in persons of middle and old age. Supernumerary teeth. Singular position of teeth. Deficiency of teeth. Osseous union of teeth. Case of cutting teeth at ninety years of age. Extraordinary case of teeth found in tumors of the abdomen. Case of triple dentition. Cases of osseous union. Supernumerary teeth. Children born with teeth. Richard III. &c.

Although nature, if not interfered with, generally proceeds with great regularity, yet we occasionally find her deviating from the usual course, and producing as great monstrosities in the number, position, size, and shape of the teeth, as she sometimes does in the bodies and limbs of persons. For some of these irregularities we can account; for others we cannot.

The size of the teeth is not at all proportioned to that of the body; for we frequently see quite small persons, of very feeble constitutions, possessed of unusually large teeth; while sometimes persons of large frames have very small teeth.

Delabarre states, in relation to the irregularity of the order in which the teeth sometimes appear, that at the

Orphan Hospital, where a great number of children came under his observation, he had seen the bicuspids come up at seven years, and the incisores not appear until twelve.

He narrates a case in which the last molar teeth did not appear till the woman was sixty years of age.

Again: "I have seen several aged persons in whom the teeth sprung up at a very late period; and one lady at seventy years of age, each of whose jaws was endowed with four excellent teeth, after the loss of all the others. These were the cuspids, which had not come up in her youth, and the *dens sapientiæ*, which for a great number of years had remained enclosed in the jaw."

"I saw at the hospital an infant, whose first dentition presented six incisores of the inferior jaw: after moulting, these were replaced by four only. In many dissections I have observed examples of such irregularity.

"Thus I have met with persons who have had five adult *incisores*, three *canine*, and five *bicuspids*, instead of the usual number.

"On the 22d of July, 1818, M. Debay, a young surgeon-dentist, brought me a child of nine years, showing a medial incisor between the two superior centrals.

"Sometimes there are twin teeth, or teeth with double crowns. I once dissected a very young subject, in which I found a milk incisor presenting this peculiarity."

The roots of teeth are sometimes so closely entangled, that we have seen two, and in one case three, which were extracted, when the extraction of one only was intended.

Beaumes, in his excellent treatise on dentition, relates that a beadle of his acquaintance, named Vaizar, never was possessed of a single tooth!

Villa likewise reports, that, in his own time, Phenecrates "*never had any teeth.*"

Mr. Fox mentions several cases in which the teeth were wholly deficient.

Borelli speaks of a woman who, up to the age of sixty, had no tooth.

Dr. Slade, in the Philosophical Transactions for 1713, relates the following singular case of his father, who, when he was seventy-five years old, shed an incisor tooth, which he cut when he was fifty; and at seventy-seven, another was replaced in the same way. Thus at eighty years of age he had a complete row of teeth; when he was eighty-two, they all dropped out in succession, and at eighty-four appeared again; so that at eighty-five he had still a complete set.

Dr. Hervey Burdell, of New York, relates the following case as occurring in his practice:—"I had inserted several teeth upon a plate for a lady, aged thirty-five or forty. After she had worn them a few weeks, the gums became much inflamed, and she was unable to retain them in her mouth. At the expiration of six months from that time, three teeth appeared through the gums in different parts of the upper jaw."

The dentist to the king of Holland has a numerous collection of singular teeth: among them was a superior jaw in which the right central incisor pointed towards the wings of the nose.

Teeth have been met with, situated transversely in

their sockets; others piercing the alveolar border, or the palatine arch. They are sometimes developed in the substance of the superior maxillary bones, with their crowns pointing upward, and their roots downward.

Prof. Marjolin has presented to the faculty of medicine in Paris, a case containing many curious specimens. One displays two supernumerary incisores, situated in the substance of the base of the maxillary bone. The bodies of these teeth were inverted, and the root of the right central incisor presented the form of a bayonet.*

Mechel relates a case in which only four permanent teeth appeared in each jaw.

Duges saw a case in which the teeth did not appear until eleven years after birth.

There is a case related by Hunter, in which a complete set of adult teeth and sockets was reproduced.

One of the most remarkable cases is recorded by Albinus. He says: "Two teeth between the nose and the orbits of the eye, one on the right side and the other on the left, were enclosed in the roots of those processes that extend from the maxillary bones to the eminences of the nose. They were large, remarkably thick, and so very like the canini, that they might have seemed to be these teeth themselves, which had not before appeared, but that the canines themselves were present, more than usually small and short, and placed in their proper sockets. The former, therefore, appear to have been the new canine, which had not penetrated their

* Journal of Dental Science.

sockets, because they were situated where these same teeth are usually observed to be in children. But what is still more remarkable, their points were directed towards the eyes, as if they were the new eye teeth inverted. And they were also so formed, that they were, contrary to what usually happens, convex on the posterior, and concave on the anterior side."

Lemaire has narrated a case in which three accessary teeth were engrafted on the root of one eye tooth.

It is related of Pyrrhus, king of Epirus, that all the crowns or bodies of his teeth were united.

Fox describes a tooth that he saw, as resembling in shape the letter S. This was occasioned by a temporary tooth obstructing its growth.

* "A lady cut several teeth at the age of seventy-four; and, at the same time, she recovered her sight, of which she had been deprived for some time." And in another case that came under his observation, a lady cut two double teeth, and at the same time recovered her hearing completely, though she had been perfectly deaf for some years.

Dr. Besset, of Knayton, relates a case in which the patient, a female in her ninety-eighth year, cut twelve molar teeth, mostly in the lower jaw; four of which were thrown out soon afterwards, while the rest, at the time of examination, were found more or less loose.

The following is one of the most painful and singular cases on record; and, if it were not fully authenticated,† we should not introduce it. It is related by

* Dr. Good's "Study of Medicine."

† Boston Med. and Surg. Journal, 15th No. 8th vol.

J. C. Farly, M.D.; and, on account of its remarkable nature, we shall give it in full, or nearly so.

"In April, 1832, I was requested to visit Harrison ——, about nineteen years of age, who had been laboring, since his third year, with a troublesome ulcer upon the abdomen. Upon examination, I found an ulcer about two inches below the original situation of the umbilicus. The external opening was small; but, upon examination with the probe, it was found to extend downwards about two inches under the symphysis pubis, and to occupy about the same extent from side to side.

"The sinus appeared to be filled by a compressible, but very elastic tumor. * * * * * * The bottom of the sinus, when examined with the probe, was found to be endued with great sensibility. * * * * There was constantly discharged a thin and very offensive fluid, that rendered the situation of the patient very uncomfortable.

"His general health was good, and his appetite and digestion regular, although his complexion was sallow, and his constitution delicate.

"The attempt was made to dilate the orifice of the sinus with wax bougies, which were retained in their position by a bandage passing round the body, and increased in size as the orifice dilated; but the enlargement went on very slowly, on account of the extreme sensibility of the orifice of the sinus, and the cartilaginous hardness which its walls assumed.

"While pursuing this course, a wash of the chloride of lime was daily used, by which the offensive smell of the discharge was removed. * * *

"At an early period of his childhood, a small sore had formed at the umbilicus, supposed by his parents to be produced by the bite of a wood-tick, which, instead of healing, had rapidly burrowed into the cellular texture, and probably occupied the sheath of the rectus muscle.

"About two years before I saw it, a physician in Indiana had attempted an operation, the object of which was to lay the sinus open, remove the unnatural growth with which it was filled (long black hair), and permit it to heal from the bottom. The object was but partially accomplished, in consequence of unanticipated difficulties. The blood flowed very profusely, and the cartilaginous structure which occupied the walls of the sinus next the abdomen was of so dense an organization as to resist the action of the knife; and, being more extensive than had been originally supposed, it was not entirely removed.

"The patient being unwilling to submit to a repetition of the operation, an unsuccessful attempt was made to destroy it with caustic; and consequently the sinus, although diminished in extent one half, remained with all its inconveniences.

"Our first project of a cure was to dilate the orifice of the sinus until the whole of its internal surface was exposed to the action of the air, hoping that the looseness of the cellular texture which covers the abdomen would admit of this extension, and expecting that the secretory surface with which it was lined would then assume the character of the common integuments. * * * * Disappointed in this expectation, it

was our design to remove the growth, which was probably the original cause of this sinus, and which seemed to form the principal obstacle to a cure: this was a task of no little difficulty. The tumor commenced at the orifice, with a base extending downwards an inch, and from side to side about two inches, and from this extending so as to fill the whole cavity.

"The cavity thus filled was irregular in its shape, and possessed of great sensibility; and in addition, the tumor, when wounded, bled so profusely, that, if the wound were at all extensive, it could only be checked by filling the whole cavity with lint. * *

"But one other prospect of cure now remained, viz. to cut through the cellular texture which formed the external wall of the sinus, and remove so much as would secure the exposure of the whole to the air. This, however, was so much thickened, and was so sensitive, that the patient was unwilling to submit to such an operation, and the prospect of a perfect cure was abandoned. His condition, however, is very much improved. The sinus is dilated very nearly to the bottom; and although it is still necessary to keep up the distension, yet, in consequence of its exposure, the discharge is very much diminished, and its offensive nature so far removed, that, with daily washing it with chloride of lime, he is enabled to get along very comfortably.

* * * * *

"The examination of the bony structure which was removed, presented some very curious phenomena:— TWO PERFECTLY FORMED HUMAN TEETH PROJECTED FROM THE SURFACE OF THE TUMOR. The first, a *dens*

caninus, rather smaller than natural for a tooth of the second growth, but with a root of the natural size. The second, a *bicuspid*, *perfect in size* and formation, and scarcely to be distinguished, by the closest scrutiny, from one extracted from the jaw of an adult!

"*These teeth were inserted in a socket*, formed upon a piece of very firm bone, about three-fourths of an inch in length. At a subsequent period, two additional pieces of bone were removed; the one about the size and texture of the former, the other nearly round, three-fourths of an inch in diameter, and of a light cellulated texture. These pieces of bone appeared to constitute the basis upon which the tumor was formed, and were so firmly connected with the body as to admit of little motion.

"With regard to the origin of this unnatural growth," the writer adds, "it is useless to speculate. Whether it was congenital or not, it is impossible to decide. Perhaps the difficulties respecting its formation may be diminished by supposing its rudiments to have been formed coeval with the first existence of the fœtus."

To us the whole account, though undoubtedly true, appears involved in mystery, and totally inexplicable.

A remarkable case of *triple dentition* is contained in the *Annali Univers. Di Medicina di Milano.*

The subject was a well-formed woman, who had enjoyed good health, and had never suffered any inconveniences, except from a few attacks of toothache, which occurred about the middle of March, 1821. She was induced, from the severity of the pain, to have the two left molar teeth pulled out. Toward the end

of October, in the same year, she felt some very acute pain in the part from which the teeth had been removed, and soon after two new teeth made their appearance.

In January, 1826, the new teeth became loose; and, causing considerable pain, she had them also drawn out. These teeth were very white and well-shaped, without the least appearance of caries. On the 16th of July, in the same year, the patient consulted Signor Aimonino, complaining of intolerable pain in the same part of the jaws as before. General and local antiphlogistic measures were tried without avail, and on the 18th the patient perceived that two teeth of the same figure and size as the former had again made their appearance. These teeth were seen by Aimonino, so that there can be no doubt of the accuracy of the report of the case.

Although this has been called a case of triple dentition, it might with greater propriety have been called a *quadruple* dentition, since the temporary teeth are not included in the history of the case.

"Catharine, Countess of Desmond, Ireland, died in the reign of James the First, at the age of one hundred and forty years: during her life she thrice renewed her teeth."—*Beach's D. M.*

"John Taylor, a Scotch miner, lived to be one hundred and thirty-two, and never lost a tooth; all continuing sound to the hour of his death." — *Ibid.*

Several cases of *osseous union* of the teeth have come under our own observation, not only where the roots were united, but where the crowns of several of the

front teeth were enclosed in one continuous envelope of enamel.

One young lady, whose teeth we examined, had the whole of the incisores of the superior jaw united in this way.

Mr. J. D. M'Cabe, S. D., relates a case of the osseous union of a second bicuspid and first molars of the inferior jaw.

There are also preserved in Guy's Hospital, London, four cases of osseous union.

The extraction of these teeth is always a difficult, and sometimes a dangerous operation; especially where the fangs alone are united — the crowns giving the operator no intimation of such a union.

In cases of this kind, it is probable that the union was effected while the teeth were yet in a pulpy state; when, becoming enclosed in one membrane, they would necessarily be united during the process of ossification.

"The *molar* teeth are the least subject to irregularity, except the *dens sapientiæ*, which, from the crowded state of the jaw, often leaves too little room for the roots between the ramus and the second molar. It is not unfrequently found in nearly a horizontal position, with the summit of the crown placed against the side of the second molar, which often causes great pain to the subject, and renders the extraction of the second molar necessary."

Supernumerary teeth are often found in the jaw: they are generally among the incisores and bicuspids. It is the opinion of Prof. Harris, that supernumerary

cuspidati never occur; but this can hardly be considered an established fact, though their occurrence is certainly more rare. It has been observed that these teeth are less subject to caries than others; probably because they possess less vitality, and are harder, being a sort of extraneous body.

Supernumerary teeth are generally small and round, resembling somewhat the point of a quill. When there are two in the anterior part of the jaw, it is so crowded as to occasion a double row, consisting of the incisores and the cuspidati. We have seen two such cases.

Many cases are on record of children being born with teeth: they are generally but loosely attached to the gum, and, from the pressure upon them in nursing, they soon drop out, if they are not removed. Mr. Fox advises that this should always be done, as he says "they can never come to perfection."

We have known one case, however, in which they remained several weeks; but are not informed whether they finally came out.

Being born with teeth was formerly considered a very evil omen, and by some superstitious people is so considered to this day. Shakspeare, in his Henry VI., makes the king in his prophesy against Richard say,

> "The owl shrieked at thy birth; an evil sign;
> *Teeth hadst thou in thy head, when thou wast born,*
> To signify thou cam'st to bite the world."

And again, Gloucester, after he has stabbed the king, says to himself,

" Indeed, 't is true that Henry told me of.
* * *
The women cried,
' O Jesus ! *he is born with teeth*,'
And so I was — which plainly signified,
That I should snarl and bite and play the dog."

CHAPTER VIII.

COMPARATIVE DENTALOGY.

CONTENTS. — All animated beings provided with digestive organs. Varieties, description, and comparison of these. Ruminating species. Rodentia, or gnawing animals. Carnivorous. Uniformity of man's teeth. Proper food for man discovered by examination of his teeth. Man's capability of digesting great varieties of food. Proper aliment for man. Supposed experiments by individuals on themselves. Experiments of Dr. Beaumont on the stomach of Alexander Martin. Experiments of Stark, of Vienna. Experiments on dogs, rabbits, &c. Training of professional boxers. Conclusion of "argument by comparison." Chemical analysis of food. Evidence adduced by Prof. Liebig. Nutritious and non-nutritious articles of diet. Use and formation of the blood. Presence of nitrogen necessary for nutrition. Necessity of assimilation of food to the constituent parts of the blood. Nutrition of the young carnivori. Use of food to the adult animal. Mode of nutrition of graminivorous animals. Elements of nutrition and respiration. Conclusion of argument by analysis of food. Rule of dietetics. Apparent exceptions to rule.

In examining the structure of the different orders of existences, from the zoöphytes and polypi to man, and the animals most nearly resembling him, we find, that whatever other organs are wanting, — whether it be nerves, or muscles of voluntary motion, eyes, ears, or limbs, — there is no creature, however minute, which is not provided with a mouth and stomach.

Some have several mouths, as the hydra; and some have several stomachs, as the star-fish, which has ten

distinct digestive organs; and ruminating animals with horns, which have four.

There is also the greatest variety in nature as to the kinds of organs used for mastication and digestion. Indeed, this is so well known to naturalists, that one can determine unhesitatingly on the habits of an animal, whether it is carnivorous, herbivorous, or of a mixed character, merely by an examination of the teeth, without seeing the rest of the body, or being in any other way acquainted with its habits.

We do not mean to assert, that the rest of the body is made in conformity to the structure and form of the teeth; for this would imply, that the teeth were made first, and that the jaw, head, and remainder of the body were made in conformity to them. But we mean that there is a peculiar and distinctive adaptedness of the teeth to the manner of eating the food which is intended to be used, and to that kind of food which will most promote the growth and vigor of the animal.

There are some orders of animals that have no teeth, as birds, lobsters, &c. These, however, are furnished with an equivalent in the form of a grinding apparatus, as the gizzard in birds; which consists of two hemispherical substances, attached to strong muscles, having a lateral and grinding motion, which answers the purpose of our masticatory organs in preparing the food for the stomach, before it is permitted to enter it.

But whatever apparatus is furnished for mastication or digestion, we always find that it is in accordance with, and adapted to, the known habits of the animal.

Thus the feline race, or such as seize their prey

alive, as the lion, tiger, and cat, in their wild state, are provided with canine or cuspidati, of enormous size and strength, with the points turned inward to admit of their retaining their prey, and tearing the raw flesh with their teeth; thus plainly indicating that their food was to be the flesh of other animals, eaten in a raw state.

The cow, sheep, deer, and other herbivorous animals, have *no* canine teeth, but, instead, are provided with long incisores for the purpose of cropping grasses, leaves, &c.; while their molar teeth, instead of presenting sharp-pointed summits, as do those of the feline race, are round and nearly flat, capable of reducing only soft and tender articles to a pulp.

Again, the *rodentia*, or creatures that gnaw their food, as the squirrel, beaver, and rat, have teeth perfectly distinct from either of the others which we have mentioned. Their teeth are capable of gnawing the hardest vegetable substances, as the shells of nuts, &c. Their front or cutting teeth project forward, are pointed and extremely sharp; the roots of them are very large, and so firmly imbedded in the jaw, that it is extremely difficult to remove them; while their grinding teeth have sharp raised lines on their summits, by which they can reduce hard substances to powder.

Man has masticatory organs perfectly distinct from each of these, and from every other class of animals.*

* It is worthy of note, that, while we find only those animals in particular divisions of the globe, which are expressly adapted to find their subsistence in those divisions, man is found in every habitable spot, where every variety of food must be used; but we never find any variation in the form, number, or size of his teeth.

Even in the *simiæ*, or ape tribe, whose teeth most resemble man's, the cuspidati are considerably longer than the others; and there are intervals in the series of each jaw, to receive the cuspidati of the other.

Man's teeth are marked by greater regularity and uniformity of shape: he has neither the long canine teeth of the tiger, nor the long incisores of the antelope. His molars are neither so flat as those of the cow and sheep, nor so sharp and angular as those of the lion or squirrel. Human teeth seem to be capable of masticating almost any substance of moderate hardness: the *incisores* can cut, *cuspids* tear, and *molars* grind, all substances of not *extremely* hard or tough texture; and can equally well divide and masticate soft, pulpy substances.

Thus we see that man is differently constituted from every other class of animals; for though he can both masticate and digest meat, and some tribes of men do this in the raw state, it would be as impossible for the herbivorous race to do this as it would for the carnivori to subsist upon plants and leaves. Man may justly, therefore, be considered as an omnivorous, or all-eating animal.

Although he has the capability of eating and digesting almost every substance that is used for food by any class of animals (if duly prepared), it does not hence follow, that every thing which his teeth can masticate or his stomach digest is useful, beneficial, or desirable for him; but that, being liable to be placed in various and widely different circumstances, his Creator has kindly and wisely provided him with such a

masticatory and digestive apparatus as enables him to adapt himself to almost any situation in which it is possible for him to be placed.

We know this to be the fact; for, while the inhabitant of the tropics subsists often upon the spontaneous fruits and vegetable productions of the earth, the Laplander and the Esquimaux Indian consume vast quantities of frozen flesh and fish; and the epicure of the city contrives to convert almost every article, either flesh, fish, fruit, or vegetable, into an article of diet.

It has long been a mooted question, whether certain articles of food in common use were not destructive to the teeth and the digestive apparatus generally. There are several ways by which we are enabled to arrive at pretty satisfactory conclusions on this subject:

First, by an examination of the teeth and stomach themselves, we can decide what kinds of aliment they are *fitted* to dissolve and digest.

Secondly, by experiment on man and other animals, we can perceive what most tends to his growth and nourishment.

Thirdly, we can proceed by chemical analysis of the blood, muscles, nerves, bones, and various parts that compose the body, and by a similar analysis of the food intended for his use, and comparison of the component parts of each.

In regard to the first proposition, we think we have been sufficiently explicit in our preceding remarks and comparisons between the different orders of animals; and that we have clearly shown, that, according to the established order of nature, if man had been designed

to subsist entirely on vegetable food, he would have been provided with teeth and stomach corresponding with other herbivorous animals; and, on the contrary, had flesh been intended as his sole aliment, he would have had teeth corresponding with the carnivori. For in all the works of creation, we see a perfect fitness, concord, and harmony of principles. It is, therefore, no far-fetched conclusion, that, if man was intended to eat only one kind of food, the Creator must have departed from his usual course in regard to man, and must have furnished him alone, of all the orders of animated beings, with organs not adapted to his wants and habits.

It is true that man, in regard to diet as in other things, "has sought out many inventions," and those not always of the most useful or healthy kind; but still we insist, and shall endeavor further to prove, that he needs variety of diet. A perfectly just inference from this proposition would be, that, if the body is best nourished by a certain kind of food, the teeth certainly cannot suffer by its use. Otherwise they would not be adapted to the body to which they belong — which would be contrary to the universal law of nature, that every animal should be provided with the best possible apparatus for digesting the food which instinct truly teaches.

Our second proposition, that, by experiment on man and other animals, we can decide on what most tends to their health and development, has been in part successfully applied by Stark, Magendie, Beaumont, Sir Astley Cooper, and others.

We must here remark, that, in experiments of this kind *on ourselves*, we are very likely to err, because of the intimate connection between the brain and the stomach; the action of the former often interfering with the healthy action of the latter. To illustrate, let us take a case.

Suppose two individuals, the one an earnest contender for an exclusively vegetable diet, and the other a practical believer in the necessity of using a mixed and partly meat diet, should resolve to convince each the other of the falsity of his system, and should exchange diet for a day or so.

The vegetable-eater would take what to him appeared rather a large portion of meat and other articles for dinner, and the flesh-eater would devour a large quantity of fruit and vegetables. Then, turning their thoughts in upon their stomachs, they would look for symptoms of indigestion. The first would probably find that his dinner of meat lay like a dead weight on *his* stomach; and the latter would imagine that *he* was filled with wind, and should never digest *his* meal. Thus they would both, no doubt, soon reach that state in reality, which they at first only imagined, and really suffer from indigestion — *not* because the food that either had taken was in itself indigestible, but because their whole attention and thought had been turned to the subject, and thereby the process of digestion had been suspended, on the well-known principle, that fear and anxiety operate through the brain and nervous system, producing universal debility and prostration. Thus each would be confirmed in his opinion, and would be less open to conviction than

before. Whereas, if the food could have been introduced into the stomach of each, without his knowledge or suspicion, both would no doubt have digested their food without pain or inconvenience.

The experiments of Dr. Beaumont on Alexander Martin are well known. He was a young man who had for years an opening in his side (a gun-shot wound), by which the whole process of digestion could be seen, and experiments on the power of the gastric juice to digest certain articles of food fully tested.

As the case has been so often recorded and commented on, we shall not go into the details. But the case indisputably proves, as any one may see by obtaining a report of the experiments, that the human stomach is capable of digesting the usual articles of diet, with the variation of time from one hour to four hours and thirty minutes. The last-mentioned time is required for the digestion of *cold slaw*, or raw cabbage and vinegar; while fish, meat, and farinaceous substances, as wheat, rice, &c. are of more easy digestion than vegetables. He will also see, that ardent spirits invariably produce disease; and that water and other fluids were not acted upon at all, but passed rapidly out of the stomach; and, finally, that rapid and easy digestion depends more than any thing else on the fine division and perfect mastication of the food.

The experiments of Stark, of Vienna, and Magendie, of Paris, are worthy of attention in regard to the possibility of sustaining life on one article of diet. Dr. Stark, by a continuance of these experiments on himself, so debilitated his constitution and prostrated his

strength, that premature death was the result. He subsisted, in turn, upon meat, bread, milk, and other articles, using exclusively but one at a time; and though he became conscious of the fact that this course was injuring his health, yet a return to the usual style of living failed to restore it. Indeed it has always been observed, that, when animals have been kept for some time on a particular article of food, if other food is offered them they willingly and greedily devour it; but that it does not suffice to restore their drooping energies, and they perish as soon as if the exclusive diet had been continued.

Dogs, which by domestication have become omnivorous animals, and have learned to eat white bread, or sugar, with water, if fed on either of these articles exclusively, soon lose their flesh, and die for want of nourishment.

Rabbits, too, if left free, will eat cabbage, carrot, corn, &c. When confined exclusively to one article, they will live but a short time.

Experiments on the domestic hog have been tried with the same results.

The fact is well known, that, in the process of training which professional boxers undergo, *beef*, rare cooked, with bread, is almost their sole diet. This is found to give great muscular strength, with no superfluous fat.

Thus we have indubitable proof, that though man, with other omnivorous animals, is capable of sustaining life for a limited period on one article of food, yet his health, strength, and most perfect development, re-

quire variety; and that variety should be a mixed, animal, farinaceous, and vegetable diet; though simplicity in cooking is absolutely necessary to its easy digestion.

Nor would we conclude, because man is capable of digesting and thriving upon a great variety of articles, that therefore we should put into our stomachs every thing we can masticate or swallow whole, merely because *we do not know what else to do with it;* which we have sometimes thought to be the reason when we have seen young ladies chewing slate pencils and chalk, and men, too, chewing a mass of tobacco in their mouths, closely approximating to "perpetual motion."

Having briefly shown what diet is natural to man, and most conducive to his health and nourishment, as we remarked in a preceding paragraph, we have every right to conclude, that the teeth (under proper attendant circumstances, which we shall hereafter consider) will not suffer by its use.

Our third proposition is, that, by chemical analysis, we can discover what the various organs, nerves, muscles, bones, &c. are composed of; and, by a similar process in regard to articles of food, can determine what is most suitable to accomplish the end in view, viz., the growth, reparation, and strength of our bodies.

Prof. Liebig has demonstrated the fact, that *an animal must be, and is, nourished only by those substances which have in themselves the same properties as the body of the animal which it goes to support.*

"Articles of diet have been divided into *nutritious* and *non-nutritious;* but these theories, being founded

on observations destitute of the conditions most essential to the drawing of just conclusions, could not be received as expressions of the truth.

"The animal organism requires for its support and development highly organized atoms. The food of all animals, in all circumstances, consists of parts of organisms. The activity of animals is manifested by means of influences produced within their organism. Digestion, secretion, and circulation, are no doubt under the influence of the nervous system; but the force in the secreting membranes and glands of animals is that which enables them to perform each its own proper functions.

"All the parts of the human body are produced from a peculiar fluid, circulating in its organism by virtue of an influence residing in every cell, in every organ, or part of an organ. Physiology teaches that all parts of the body were originally blood, or that, at least, they were brought to the growing organs by means of this fluid. And the most ordinary experience shows, that at each moment of life, in the animal organism, a continued change of matter, more or less accelerated, is going on; that every conception, every mental affection, is followed by changes in the chemical nature of the secretory fluids; that every thought, every sensation, is accompanied by a change in the composition of the substance of the brain.

"In order to keep up the phenomenon of life in animals, certain matters are required, parts of organisms, which we call nourishment. In consequence of a series of alterations, they serve either for the increase

of the mass (nutrition), or for the supply of the matter consumed (reproduction), or for the production of force.

"If we hold that the increase of mass in the animal body, the development of its organs, and the supply of waste; that all this is dependent on the blood, that is, on the ingredients of the blood; then *only those substances can properly be called nutritious which are capable of conversion into blood.*

"To determine, therefore, what substances are capable of affording nourishment, it is only necessary to ascertain the composition of the food, and to compare it with that of the ingredients of the blood.

"Two substances require especial consideration as the chief ingredients of the blood, when withdrawn from the circulation. It is well known, that in this case blood coagulates and separates into a yellowish liquid, the *serum* of the blood, and a gelatinous mass, which is the part that adheres to a stick, in soft elastic fibres, when coagulating blood is quickly stirred. This is the *fibrin* of the blood, which is identical in all its properties with muscular fibre, when the latter is purified from all foreign matters.

"The second principal ingredient of the blood is contained in the *serum*, and gives to this liquid all the properties of the whites of eggs, with which it is identical. When heated, it coagulates into a white elastic mass, and the coagulating substance is called *albumen.*

"*Fibre* and *albumen*, the chief ingredients of blood, contain in all seven chemical elements, among which nitrogen, phosphorus, and sulphur are found. They contain also the earth of bones. The serum retains in

solution sea-salt, and other salts of potash and soda; in which the acids are carbonic, phosphoric, and sulphuric.

"The globules of the blood contain fibrin and albumen, along with a red coloring matter, in which iron is a constant element. Besides these, the blood contains certain fatty bodies in small quantity, which differ from ordinary fats in several of their properties.

"Both the albumen and fibrin, in the process of nutrition, are capable of being changed into muscular fibre, and muscular fibre is capable of being reconverted into blood. If we now compare the composition of all organized parts with that of fibrin and albumen, the following relations present themselves.

"All parts of the animal body which have a decided shape, which form parts of organs, contain nitrogen. No part of an organ which possesses motion and life is destitute of nitrogen. All of them contain, likewise, carbon and the elements of water; the latter, however, in no case in the proportion to form water. The chief ingredients of the blood contain nearly seventeen per cent. of nitrogen, and no part of an *organ* contains less than this.

"The most convincing experiments and observations have proved, that the animal body is absolutely incapable of producing an elementary body, such as carbon or nitrogen, out of substances which do not contain it; and it obviously follows, that all kinds of food, fit for the production either of blood or of cellular tissue, membranes, skin, hair, muscular fibre, &c., must contain a certain amount of nitrogen, because that ele-

ment is essential to the composition of the above-named organs; because the organs cannot create it from the other elements presented to them; and, finally, because no nitrogen is absorbed from the atmosphere in the vital process.

"The nutritive process is seen in the *carnivora* in its simplest form. This class of animals live on the flesh and blood of the *graminivora;* but their flesh and blood is, in all its properties, identical with their own. Neither chemical nor physiological difference can be discovered.

"The nutriment of carnivorous animals is derived originally from blood: in their stomach it becomes dissolved, and capable of reaching all other parts of the body. In its passage it is again converted into blood, and from this blood are reproduced all those parts of their organization which have undergone change or metamorphosis.

"With the exception of hoofs, hair, feathers, and the earth of bones, every part of the food of carnivorous animals is capable of assimilation. That which serves for its nutritition is identical with those parts of its organization which are to be renewed.

"The process of nutrition in graminivorous animals appears at first sight altogether different. Their digestive organs are less simple, and their food consists of vegetables, the greater part of which contains but little nitrogen. From what substances, it may be asked, is the blood formed, by means of which their organs are developed?

"Chemical researches have shown, that all such

parts of vegetables as can afford nutriment to animals contain certain constituents, which are rich in nitrogen; and the most ordinary experience proves, that animals require for their support and nutrition less of these parts of plants in proportion as they abound in the nitrogenized constituents.

"When the newly expressed juices of vegetables are allowed to stand, a separation takes place in a few minutes. A gelatinous precipitate, commonly of a green tinge, is deposited; and this, when acted on by liquids, which remove the coloring matter, leaves a greyish white substance. This is one of the nitrogenized compounds, which serves for the nutrition of animals, and has been named *vegetable fibrin.*

"When the *clarified* juice of nutritious vegetables, such as cauliflower, asparagus, or turnips, is made to boil, a coagulum is formed which it is absolutely impossible to distinguish from the substance which separates as a coagulum, when the serum of blood, or the white of an egg, diluted with water, is heated to the boiling point. This is *vegetable albumen.*

"The third nitrogenized constituent of the vegetable food of animals is *vegetable caseine.*

"These three nitrogenized compounds — *vegetable fibrin*, *albumen*, and *caseine* — are the true nitrogenized constituents of the food of *graminivorous* animals. All other nitrogenized compounds occurring in plants are either rejected by animals, as in the case of the characteristic principles of poisonous and medicinal plants, or else they occur in the food in so very small

proportion, that they cannot possibly contribute to an increase of mass in the animal body.

"By chemical analysis, these three substances are found to contain the same organic elements, and to be identical in composition with the chief constituents of blood, animal fibrin and albumen. There is the same relative amount of sulphur, phosphorus, and phosphate of lime.

"How beautifully and admirably simple, with the aid of these discoveries, appears the process of nutrition in animals!

"From what has been said, it follows, that the development of the animal organism and its growth are dependent on the reception of certain principles, identical with the chief constituents of blood. *The substance of cellular tissue, of the membranes, of the brain and nerves, these the vegetable cannot produce.*

"The nutrition of the young of carnivora is obviously accomplished by means similar to those by which the graminivora are nourished. Their development is dependent on the supply of a fluid which the body of the mother secretes in the shape of milk.

"Milk contains only one nitrogenized constituent, known under the name of caseine. To convert caseine into blood, no foreign substance is required; and, in the conversion of the mother's blood into caseine, no elements of the constituents of blood have been separated.

"In the adult animal, the food serves to restore the waste of matter.

"The food of the carnivora is converted into blood,

which is destined for the reproduction of organized tissues: it is identical with the chief constituents of their bodies. Hence the metamorphoses which their organs undergo must be the same as those which, under the influence of the vital force, take place in the matters which constitute their food.

"In the class of graminivorous animals, we observe that, during their whole life, their existence depends on the supply of substances having a composition identical with that of sugar and milk, or closely resembling it.

"The substances of which the food of man is composed may be divided into two classes, *nitrogenized* and *non-nitrogenized*. The former are capable of conversion into blood; the latter are incapable of this conversion.

"Out of those substances which are adapted to the formation of blood, are formed all the organized tissues. The other class of substances, in the normal state of health, serve to support the process of respiration: the former may be called the *plastic elements of nutrition;* the latter, *elements of respiration.*

"Among the former we may reckon

Vegetable fibrin,
do. albumen,
do. caseine,
Animal flesh,
do. blood.

Among the elements of respiration in our food, are

Fat, Pectine,
Starch, Bassorine,

Gum,	Wine,
Cane sugar,	Beer,
Grape sugar,	Spirits.
Sugar of milk,	

"The animal organism unquestionably possesses the power of forming, from the constituents of its blood, the substance of its membranes and cellular tissue, of the nerves and brain, of the organic part of cartilages and bone.

"But the blood must be supplied to it, ready in every thing but its form — that is, in its chemical composition. If this be not done, a period is rapidly put to the formation of blood, and consequently life."

If our limits permitted, it would be desirable to go more fully and minutely into the philosophy of this subject; but enough has been given to show distinctly that the nearer articles of diet approach in their constituents parts the composition of the human body, the more easily food is assimilated and identified with the body, and consequently is more nutritious; — that meat, the flesh of animals, being of such a nature, is not only not injurious, but, taken in proper quantities and properly prepared, is eminently calculated to sustain and nourish man; — and that vegetables, containing, though in smaller proportion, these principles, answer the purposes of nutrition, so far as they contain them; but that, in eating vegetables, we consume a much larger quantity of substance that *does not tend* to the nourishment of the body, and consequently is rejected by the system.

From the whole argument, including the examination of the structure of the teeth, experiments on living subjects, and chemical analysis of the blood of man, by which every portion of his system is developed and nourished, and the corresponding elements in the composition of his food, we conclude that a mixed diet of animal, farinaceous, and vegetable food, is best adapted for the nourishment and well-being of man's system, physically considered. Had we time, and were this the place, we could show conclusively that, to possess a *sound mind*, we must have a healthy, vigorous body; though among the friends of the vegetable system are found many possessing good minds and comparatively healthy bodies. One of the most distinguished of the editorial corps in the country is an excellent illustration of this remark; but how *much more* robust and capable of endurance his frame would become, and how much keener would be his satires on the daily wrongs he exposes, and how much brighter would be his already glowing descriptions of the good things existing and anticipated in this life, if he adopted a more rational system of dietetics, remains yet, like the *social system*, enveloped in darkness!

It is a very general thing to find writers in this day decrying the use of meat as destructive, not only to the system generally, but to the teeth especially.

That meat, as generally cooked, is productive of mischief, we do not deny; but we might say the same, with equal truth, of many other articles of food. The use of pepper, spices, and all stimulating condiments, is to many systems peculiarly detrimental, and to the teeth universally so.

Simplicity in preparing food, with a uniform rejection of such articles as are found to disagree with the *individual system* (for undoubtedly one article of food will disagree with one person, from some accidental circumstance, which is readily digested by another), will be found, we apprehend, the best rule for dietetics.

In regard to the teeth, however, one or two remarks are necessary. First, the use of *hot* food, and particularly of hot drinks, cracks the enamel; and all sudden transitions from hot to cold are injurious.

Finally, whatever food is used, though of the most simple and nourishing kind, will prove destructive to the teeth, if suffered to remain lodged in their interstices, from one meal to another. The effect would be just the same (only greater in degree) if we made a practice of eating decayed and putrid articles; for food very soon becomes decomposed, when allowed to remain about the teeth.

CHAPTER IX.

PATHOLOGY, THERAPEUTICS, AND HYGIENE.

CONTENTS. — Constitutional differences in teeth. Remote causes which act on the teeth. Influence of mercury on teeth. Changes which take place in teeth from fever. Influence of scrofula in the system. Reason why upper teeth decay more readily than lower. Progress of caries indicated by color. Classification of caries; calcarious, peeling, perforating, carbonated, or black decay; disruptive caries; stationary, simulating wearing caries. Prevention of caries.

"Let azure eyes with coral lips unite,
And health's vermilion blend with snowy white;
Let auburn tresses float upon the gale,
And flowery garlands all their sweets exhale;
If once the lips in parting should display
The teeth discolored or in disarray,
The spell dissolves, and beauty in despair
Beholds her fond pretensions melt in air."

CAUSES AND PREVENTION OF CARIES.

By *caries* is understood the mouldering away, or gradual destruction of a portion or the whole of a tooth. There is no disease so frequently met with in teeth as this, or more destructive in its effects; and particularly so, because caries may sometimes proceed to a considerable extent, without the subject being aware of the fact, as pain does not always or necessarily accompany caries or decay of the teeth.

Teeth which are firm, strong, and regularly arranged, are much less liable to decay than those which are less perfect in their structure, or placed so as to interfere with one another. And that this more or less perfect structure and arrangement of the teeth are often hereditary,* is placed beyond question or doubt; though teeth naturally weak or defective may often be remedied by attention and care; and, on the other hand, naturally strong and well-arranged teeth may, by abuse or carelessness, become diseased, or by accident be displaced.

That the teeth also acquire a disposition to decay, from unfavorable influences exerted upon them, together with the system, generally during their formation, may be inferred from the fact, that they generally decay in pairs, in the same order in which they make their appearance.

There are also more remote causes acting upon them, dispossessing them of the power to resist decaying

* O. S. Fowler, in his work on "Hereditary Descent," cites an instance of this sort in "a family by the name of Howe; the one mentioned in the American Preceptor, as having been taken in the old French war by the Indians, at Fort Hinsdale. The Squire Howe, there mentioned as the little boy who was knocked off the sacks with the tomahawks, while sitting on them to rest, had *very large, wide, long, projecting upper teeth.* Most of his children had the same characteristic, and many of his grandchildren."

In the case of consumptive persons, it is particularly observable, that their children almost always are peculiarly subject to diseased teeth; though, until decay actually appears, they are usually remarkably white. In one family of my acquaintance, whose mother died of consumption, all the adult children wear artificial teeth, having lost their natural ones; and for several of the younger children I have extracted carious teeth.

In another family, a singular cuspid, commonly called a "dog's tooth," has descended for several generations.

influences. A very common case is that where the teeth, together with the bones of the body, have been subjected to the influence of mercury; in consequence of the secretions of the mouth being generally affected, and thereby influencing the teeth.

Mr. Fox says "he has had occasion to observe, that great changes take place in the economy of the teeth in consequence of continued fevers, and that the decay of teeth is often the consequence of certain states of the constitution."

It is further to be remarked, that caries of the teeth is not limited to any particular age. Both temporary and permanent teeth are liable to caries. The *density* of teeth is a great assurance against decay; as those of a looser texture are less able to resist the influence of disordered secretions of the mouth, and other unfavorable influences. But as our remarks under the head of "Connection and sympathy of the teeth with the rest of the system" have been so full, we shall not further continue the subject here.

The molar teeth, and those that are irregular, are more disposed to caries than the front or lateral, or those that are regularly placed. And it is asserted by many writers, that the teeth of women are more subject to disease of this kind than those of men.

Persons of a scrofulous habit of body are particularly liable to it. It has been observed to prevail most in cold countries. This may perhaps be accounted for by the sudden changes from heat to cold, to which the teeth are, with the rest of the body, subjected.

Caries sometimes makes its appearance near the den-

tal cavity, but oftener upon the surface of the teeth. The disease almost always ceases before it reaches the root. It generally commences on the crown of the tooth, often under the enamel, and not unfrequently, in the molar teeth, in the superficial cavities on their surface.

In chronic diseases, where the fluids of the mouth are vitiated, caries often attacks different portions of the tooth simultaneously. In these cases, an acid is generally developed, not large in quantity, nor retained long in the lower part of the mouth, and least in the vicinity of the incisores and cuspids; because, where the saliva enters the mouth, it is more alkaline, and does not assimilate with the acid (the destroying substance) until after it has been in the mouth some time. Thus the teeth of the upper jaw are much more exposed to its influence.

Hence the question so often asked, "*why the upper teeth decay so much sooner than the lower*," is solved by the above explanation. The lower teeth, being continually under the influence of fresh saliva, are not so readily acted upon by these destructive acids.

Caries indicates rapidity by its color. When very gradual, it is dark, nearly black; when more rapid, it is yellowish, and the faster it progresses, the lighter it becomes. Hence white is the most destructive.

Caries has been divided into internal and external, superficial and deep-seated, simple and complicated. But these divisions, instead of exhibiting the different kinds of caries, or suggesting the causes that have produced them, show merely the different degrees of progress which the disease has made.

It has also been divided into moist or putrescent; but this is also very imperfect. A more perfect classification is that of *calcarious*, *peeling*, *perforating*, *carbonated*, or *black decay*, *disruptive*, and *stationary*.

The first or *calcarious caries* is very common in youth, and often the result of inflammatory diseases. As age increases, it becomes very sensitive, and of a yellowish tinge. It is usually slow in its progress. It presents a slight circular depression near the gum, where the enamel is whiter than in the natural state. It is sensitive, rough, and friable.

The *peeling* caries is generally connected with tetterous affections. It is very brittle, crumbling away in small portions, and is of a yellowish tint: it finally becomes brown and smooth, and can be cut off in plates. Where the enamel is attached, it is extremely sensitive.

The *perforating* caries occurs most frequently, and is seen indistinctly upon all parts of the crown of the tooth. The diseased parts are sensitive to the contact of either cold or solid bodies; and, when inflammation reaches the pulp, the pain becomes intolerable. The bony part of the tooth is either yellow or brown, very fœtid, humid, and soft. The excavation increases in size with more or less rapidity, and is exposed by a funnel-like opening. Gradually the bone, or ivory, is destroyed; and the enamel, being left alone, breaks away piece after piece, until the fangs alone are left, when the pain ceases.

The *carbonated* caries, or *black decay*, does not usually appear until between the ages of fifteen and thirty; and more particularly in persons predisposed to pthisis

pulmonalis. It first appears as a dark spot, the circumference of which may be discovered on the side of the tooth, through the enamel, which here presents a dark-bluish or black appearance, and is very easily destroyed. A cavity succeeds, whose walls are formed by the bony substance, which is dry and friable, possessing neither odor nor sensibility. This disease is very rapid in its progress, and usually stops at the root.

Fig. 17.

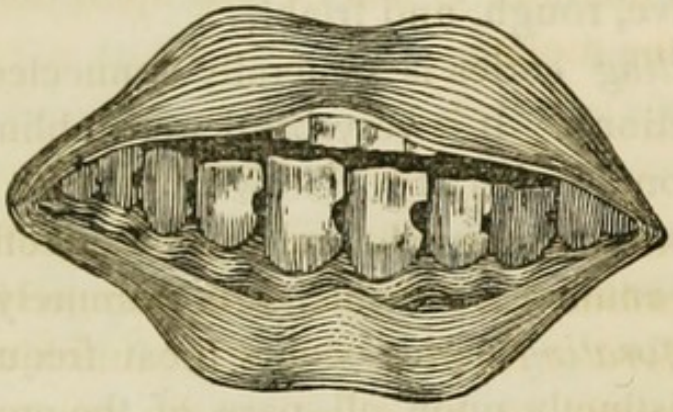


Fig. 17 exhibits the appearance of teeth affected by *carbonated caries*.

The *disruptive* caries shows a yellowish spot near the neck of the tooth. A loss of substance is observed, and the caries extends itself obliquely, deepening by the side of the root; presenting a semicircular groove of a brownish color: the ivory of the tooth softens, is sensitive to heat, cold, acids, and solid bodies.

Stationary caries may rather be considered as a condition of either of the others, when their progress has been arrested; although that which has been called *stationary* is confined to the enamel, leaving the other parts uninjured. It often appears suddenly in conva-

lescent persons, when the recovery has been rapid from serious diseases.

Simulating wearing caries exhibits a cavity more or less deep; the bottom sometimes reaching to the neck of the tooth. The opening or depression is level and smooth, yellow or brown; and from the polish on the enamel, it is sometimes mistaken for wearing of the teeth, until an examination of those opposite enlightens us about the nature of the disease. This last description is difficult to be distinguished at the commencement of the disease: it has its seat upon the grinding surface of the molars.

To Prevent Caries.

It is only necesssary to follow those suggestions alluded to on cleanliness of the teeth, with the rejection of such articles of food or drink as either act mischievously on the teeth directly, or, by affecting the general system, vitiate the secretions of the mouth, and engender disease.

CHAPTER X.

ODONTALGIA.

CONTENTS. — Different kinds of toothache. Quackery in regard to extraction of aching teeth. State of the tooth in acute toothache. Peridental membrane, seat of pain. Inflammation of dental pulp. Minute perforations of the enamel. Causes of toothache. Sympathetic, or nervous toothache. Great care and discrimination necessary. Case of a lady. Rheumatic toothache, its cause and remedy. Hot and stimulating articles to be avoided. General remedies for different varieties of toothache; eau de Cologne, arsenic, mercury and mineral acids, *conium maculatum* (cicuta leaves), anodyne poultices, carbonate of soda. Recipe for composition. Emetics, cataplasms. Hydropathic, botanic, or Thompsonian, and homœopathic remedies. Three methods of remedying toothache; sedatives, lessening or altering the secretions of the mouth, diversion of the disease. Quack medicines, &c.

"Thou hell o' a' diseases." — *Burns.*

"They say, who most have felt and best should know
The power of this most execrable woe,
That when Pandora's box of mortal pains
Was first unlocked among the wondering swains,
To every vice its kindred vice was sent,
And every crime received its punishment,
Except intemperance; — no *single* ill
Could Heaven's irrevocable law fulfil;
The fixed resolve, the omnipotent decree,
That each offence should meet its penalty;
Then all these mortal woes in one were joined,
And TOOTHACHE came, the terror of mankind!"

A *description* of toothache is hardly necessary, as few persons of adult age have escaped experimental

knowledge of its torment. If acquainted practically, all are not well informed of its exact locality, and why it is acute, temporary, or chronic.

Under the common name of *toothache*, are generally included all kinds of pain supposed to arise from or to be connected with the teeth, or the membranes that invest or line them; whether that pain is concentrated upon one tooth, a portion of it, or is diffused through several or the entire set.

Probably the exact condition of teeth that are painful, is not so perfectly understood as it should be, even by practitioners of the dental art. That it does not all arise from the same source, is evident from the variable nature of its attacks, from the different circumstances under which it is exhibited, and the variety of forms it assumes. Hence in applying a remedy, if we always depend upon the patient's statement, we shall be misled.

It would seem almost impossible, that substances so hard as the teeth are should suffer thus so frequently; but we shall see that their very density is the cause of intense and protracted pain.

No pain is more intolerable, none meets with less sympathy; yet none has fallen more under the care of charlatans and quacks. This has partly been caused by the ignorance and thoughtlessness of patients themselves. Being unacquainted with the various peculiarities of pain in the teeth, and knowing only that they suffer, they run to the first "*tooth-puller*," who will, without examination or question, jerk out or break off teeth which might have been serviceable for years.

Ignorance in the patient never justifies imposition in the operator; but that the latter is frequently the consequence of the former, the unhappy experience of many victims furnishes ample and palpable testimony. To avoid this wholesale sacrifice of teeth, it is essential that the dentist should clearly understand the local and sympathetic causes of pain in the teeth. In some cases, where there is violent pain, as in teethache produced by cold, or rheumatic affections, the extraction of a tooth is often as wise as the extraction of an eye would be under similar circumstances.

In most cases of acute pain, the immediate cause is to be found in an *inflamed state of the pulp*, which fills the cavity of the tooth and the membrane which encloses and surrounds these small fine blood-vessels and nerves with which it is supplied. We can readily see why, when this pulp is swollen and inflamed, intense pain is experienced.

Compressed on every side by an *ivory prison*, from whose walls it cannot escape, and against which the poor nerve, already inflamed and distended, is forced, it throbs for extrication, as the blood rushes through the arteries into the tooth, and produces the "*jumping*" toothache, which is very violent at each arterial pulsation.

Each fang is surrounded by a membrane, which has been called the *peridental* or *investing* membrane. These membranes are often the seat of disease; they are liable to inflammation often caused by continued inflammation of the pulp. It may be purely idiopathic, arising from external injury or cold; or again it may be sympathetic.

From our preceding remarks, it may be seen that pain in the teeth may arise either from an affection of the pulp, of the investing, or of the alveolar membrane. But in ordinary cases it can be traced immediately to some cavity, or small hole in the tooth, through which the cold air has reached the pulp, or some particle of food has effected an entrance.

An unsound but painless tooth sometimes suddenly breaks away while eating; particles of bone and food enter the cavity of the tooth, causing intense pain, and resulting in inflammation more or less violent and continued. In this case the tooth is useless and painful, until carefully cleaned out and filled, or the nerve destroyed.

With this view of the pathology of toothache, we can readily understand, from the extremely delicate, sensitive, and vascular structure of the dental pulp, the cause of the excruciating pain when inflamed or in any way diseased. Were it possible to remove the pressure, or reduce the swollen state of the blood-vessels, we should have more hope of mitigating the pain. In lieu of this, we are obliged to resort to other methods, some of which we shall enumerate hereafter.

Except through sympathy, there can be no pain in the teeth, unless there is actual disease or decay; though teeth, that are to all outward appearance perfectly sound, are frequently the seat of pain. In most cases we think it will be found, that the interior of the tooth, or that defended from the view by the enamel, is the seat of caries. But this by no means proves that the cause of decay in this case was internal. We

believe this is rarely the case at all; for, if it were, how can we account for the crowns only being destroyed by these means, and the roots left? Might we not naturally expect, if this were the case, that the roots would be first attacked?

In many cases in an apparently sound tooth, on a close examination, we have found *some minute perforation of the enamel*, which, though large enough to admit air, and even fluids, *might easily escape the observation of the naked eye.*

SYMPATHETIC OR NERVOUS TOOTHACHE.

Besides the acute form of toothache we have been considering, there is that which is purely sympathetic. This may be perceived in the case where a sound tooth on one side of the jaw is troublesome, and the pain originates in its defective fellow opposite. The diseased tooth alone should be extracted, which will immediately relieve the other.

A lady called upon me a short time since, presenting a case of this kind, and desiring the extraction of the sound tooth. I declined; explaining to her the nature of the sympathy between the teeth, and proposing to relieve her only of the diseased root. But remaining unconvinced in regard to sympathetic action, and quite positive that the cause of pain was the sound tooth, which I refused to extract, she applied to another individual, who, without examination, did as he was requested. The consequence was an immediate aggravation of the complaint; for the pain remained

in the alveolar membrane of the socket from which the sound tooth had been removed. She soon returned in great pain, and was obliged to have the diseased tooth extracted, which I at first pointed out as the seat of the disease. She has had no trouble since.

Cases of a similar kind often occur, and it is highly important that the true aggressors be discovered; for we have seen many beautiful sets of teeth wholly spoiled by this indiscriminate pulling, on the part of ignorant or mercenary practitioners.

RHEUMATIC TOOTHACHE.

There is another species of toothache, which may be called rheumatic; in which a spasmodic tension, increased action, and fulness of the vessels, are accompanied with heat and extreme pain, and which is frequently occasioned by a sudden check of perspiration; or in common parlance, "a cold." It locates in the gums and the neighboring glands; and the pain ensuing so resembles the toothache, that the patient is often anxious and impatient for extraction to afford relief. It would be improper and rash to gratify this anxiety, as it might augment, instead of relieve, the complaint.*

The object in this case should be to keep the body guarded from damp or cold air, with the application

* Sympathetic toothache is very common with married ladies, under *peculiar* circumstances, and extraction should never be resorted to in these cases, unless there is actual disease; and then great caution is necessary, especially with those of a nervous, irritable habit.

of soothing poultices to the cheek; and what is often of great benefit, a drawing plaster on the back of the neck, or behind the ears. *But the application of hot stimulating articles, such as spirits, spices, mustard, and similar substances, should be avoided,* as they are not only useless, but tend to increase the inflammation, and consequently aggravate the disease.

In one species of this rheumatic toothache, the investing membrane of the tooth becomes inflamed. In this case, the pain, though more protracted, is less violent. The gums are red and tumefied around the affected tooth; but the pain is ascribed to the origin of the nerves which supply the tooth. In making a direct pressure, some tenderness is discovered. The paroxysms of pain are usually brought on by entering a very warm room, or by long absence from food. If it has been of long continuance, the tooth feels too long; and a numb or tender feeling is experienced upon shutting the mouth. Depletions and warm fomentations are the best remedies in this case. Sound teeth, as well as those that have been well filled, are liable to be affected in this way.

The main distinction to be observed in regard to toothache is to decide whether it results from what may be called external injury; such as caries, exposure of the dental pulp, &c.; or from inflammation of the investing and alveolar membranes, or from mere sympathy. These kinds of toothache require entirely different treatment.

REMEDIES FOR TOOTHACHE.

As it is always desirable to avoid extraction, if possible, we shall now consider some of the remedies which have been successfully employed in alleviating and curing toothache. And, as what has been signally successful in many cases has failed in others, some constitutions being more susceptible to certain articles than others; and as, under some circumstances, only certain articles can be obtained; we shall considerably extend this chapter, in order, if possible, to meet the cases of all.

In cases of *acute* toothache, but where, from attendant circumstances, such as protracted sickness or great feebleness or nervousness in the patient, more active and energetic remedies might be unsafe, the *spirit of camphor* or *eau de Cologne* has often been tried with success: a change from one to the other is often beneficial. Small pledgits, or portions of lint, should be saturated with the spirit, and placed in the cavity; but care should be taken not to put in too much, or to press it down too heavily; as this would irritate the morbidly sensitive structure beneath, and cause an increase of pain to the subject, by causing inflammation of the periosteum in the diseased, as also the adjoining tooth; and the liquid would be pressed out, instead of being introduced into the cavity.*

This is rather a tedious operation, as the application must be frequently renewed, as will be seen by consid-

* Dental Journal.

ering the object to be accomplished, viz. the exhaustion of the sensibility, or the absorption of the pulp. The period necessary to effect a cure of course will depend partly on the extent of surface that is exposed. It may require weeks, or even months; renewing the application two or three times in the course of every twenty-four hours.

When a cavity is thus protected against the air, there is generally very little pain; and if the application is persevered in, it will ultimately so deaden the sensibility of the nerve, as to render the operation of filling practicable. As we have before remarked, this application is peculiarly adapted to such as have neither the necessary strength nor courage to bear more energetic treatment.

But in cases where the patient is less irritable, and the operator is at liberty to pursue such a course as he thinks best, a better and more speedy remedy should be selected. The cavity should be carefully wiped out with a lock of fine soft cotton, to remove every particle of foreign matter; and then should be inserted some acute preparation which will speedily allay the irritation and pain, without injuring the surrounding parts.

By many dentists, a preparation of *arsenic* has been highly recommended and extensively used.* That in cases of slight inflammation it is beneficial, and, when judiciously applied by intelligent dentists, has been oftentimes successful, we do not deny; but, as it is a deadly poison, and as a trivial mistake or awkward-

* Goddard, p. 90.

ness of application might be followed with serious or fatal consequences, we would not advise *its general use. The inexperienced* will find it safer to shun its use entirely. An English writer* recommends the *solution* of arsenic for destroying the nerve.

In this application the pain will be less, if the surface of the pulp is first excised, and allowed to bleed a short time. The cavity should afterwards be entirely closed up with wax, or mastic dissolved in ether.

Mercury, and mineral acids, which are now in common use, have destroyed many beautiful sets of teeth; and, though the pain be ever so intense, it is short-sighted policy to apply remedies without considering their ultimate effect on the teeth.

In cases of acute pain, originating in morbid irritation of the teeth and jaws, where the pain is felt in one or more teeth, extending to the gums, the muscles of the face, jaws, throat, and ear, the following is one of the most efficacious applications: — Take about six ounces of the dried leaves of *conium maculatum* (called by the Shakers *cicuta* leaves), put them in a bowl, and pour upon them boiling water, lean the head over the bowl, applying the face, with the mouth open, as near to the steam as it can be borne, and let the vapor circulate freely about the neck, putting over the patient's head a thick cloth, to prevent the too rapid escape of the steam. Relief, in many cases, is instantaneous.†

In this species of toothache, anodyne poultices, local depletion, and cooling purgatives, often prove in some

* Darwin's Zoonomia, v. 2, p. 199.

† Jour. Dent. Science.

measure efficacious. Kreosote, in ordinary cases of toothache, is often a successful palliative; but it is necessary to apply it on the first exposure of the nerve; as, after different applications have been made, the pulp becomes insensible to it, and unaffected by it. Persons have applied to us for a remedy, who stated that they had used vials of kreosote, and still had the toothache.

A very effective remedy is that of filling the cavity with carbonate of soda; which, by taking up the acid which is usually generated in a diseased state of the mouth, forms a protection to the exposed nerve.

The following recipe has, in nearly all cases, proved permanently beneficial:—

℞	Ol. Peppermint, ...	ʒ.3
	Ol. Cloves, ...	ʒ.ss
	Ol. Cinnamon, ...	ʒ.3
	Nitras argenti (pure) . . .	ʒ.1
	Tinct. opii prepared with pure alcohol,	℥.4

Combined with sulphate of morphine and arsenic one-twentieth of a grain. Put a small quantity of the mixture on a lock of cotton, and place it in the cavity. This we think much better than kreosote; though, mixed with the following ingredients, we have used it with benefit:—

℞	Sul. Ether, .	ʒi.*
	Kreosote, .	ʒss.
	Ext. Nut Galls,	ʒi.
	G. Camphor, .	ʒss.

Misce.

* Harris's Dent. Sur. 2d ed. p. 270.

"If the toothache is unusually violent, on going to bed at night, a fomentation of the head, or part affected, with warm flannels steeped in a decoction of chamomile flowers, in which two or three poppy heads have been boiled, is an excellent application. It may be continued for about twenty minutes." *

Emetics often have a good effect; bathing of the feet in warm water; mild purgatives and gargles. An infusion of sage or mulberry leaves makes a good gargle. As an increase of saliva is beneficial, it is well to chew such things as promote this secretion. Genitan calamus and yellow water flower-de-luce may be used for this purpose.

Cataplasms of the seeds of hyoscyamus or mustard plant have been recommended as proper applications to the face; but these should be avoided as much as possible, as in case of suppuration they have a tendency to draw the abscess to the exterior of the face.

The author of a popular botanic work gives the following directions for the cure of toothache: —

Botanic Cure.

"Place the feet in warm water, and take freely of composition or pepper tea. In violent cases an emetic should be given, followed by broken doses of lobelia, stimulating teas, and warm applications to the feet. A very intelligent and experienced Thompsonian once told me that he generally prescribed a dose of the *third*

* Maury, p. 105.

preparation of lobelia for toothache, and said it seldom failed of removing the pain." — *Med. Bot.* p. 180.

Reformed Practice.

"Tincture of capsicum is excellent for pain in and about the teeth. Apply it in the tooth, between the lip and gums, and outside of the cheek. This is very effectual for ague in the face."

"I have heard washing of the mouth and teeth twice a day with salt and water, strongly recommended by a gentleman who had both experienced and observed much benefit from it. Also brushing the teeth with cold water and soot from wood ashes."

"If habitually painful, clean out the teeth, and drop in some oil of cloves, or powdered opium. If that fail, dip a splinter of any kind into nitric acid, insert it at the bottom of the tooth, to destroy the nerve: it may have to be repeated. *Great care* must be observed, that the acid do not get upon the other teeth or gums." — *Beach's Dom. Prac.* p. 771.

For the benefit of those who prefer the *Homœopathic Cure*, we have selected from one of their best established authors, the following remedies for toothache:—

"Where the pain is severe, shooting and increasing in intensity in the evening, accompanied with swelling of the gums and cheeks, with aggravation of the pain while eating, &c., use *belladonna*. *Chamomilla* is recommended in cases of toathache where great agitation, excessive weakness, irascibility, and disposition to

shed tears during the paroxysm, is felt. *Mercurius* is advised where the pain extends to the whole side of the head and face extending to the ears, loosening of the teeth, and a feeling as if they were too long. It is particularly useful to persons who are subject to glandular swellings. *Nux vomica* is useful for persons who are habituated to *wine*, *coffee*, or other stimulants, and whose sufferings are increased by intellectual labor. Sulphur is valuable where with toothache there is a tendency to constipation; *coffæ*, where there is violent pain, with great excitability, and almost distraction in adults, when the patient is conscious that the excitement is disproportionate to the pain suffered. *Aconite*, *belladonna*, *chamomilla*, *coffæ*, and *ignatia*, are useful in affections of this nature with children."*

Hydropathic Remedy.

A very simple, and, as is said by those who have tried it, efficacious remedy, exclusively employed by the followers of Priesnitz, is the following:—

"Take two basins filled with water, one cold and the other tepid; fill the mouth with the tepid, and retain it till it becames warm, then change it: in the mean time the hands should be dipped constantly in cold water, and the face, and the parts behind the ears, rubbed violently till the pain ceases. The gums should also be rubbed briskly; and if they bleed, so much the better." †

* Laurie's Dom. Med. p. 28.

† Shews' Water Cure, p. 121.

There are three very evident means by which toothache may be alleviated. The first is by sedatives; the second, by lessening the secretions of the mouth, or altering their quality; the third, by a diversion of the disease to some other place.

In the first case, we should use, internally or externally, opium or laudanum in some of its preparations. Indeed, this is the base of all the quack nostrums of the day, which are sold under various high-sounding names, as "toothache drops." That which costs fifty cents or a dollar in this shape might as well be used in three cents' worth of tinc. laudanum. Then people would know what they were using; and the various evil consequences which follow the use of these catch-penny drops, from ignorance of their strength, or component parts, might be prevented. In the hands of quacks, opium is liable to much abuse; but, used judiciously, is often of great benefit.

The second purpose is accomplished by the use of purgatives, and by the smoking or chewing of such articles as occasion a flow of saliva; as yellow flower-de-luce, chamomile flowers, &c., or by warm fomentations and poultices.

Thirdly, when we seek to divert the disease, it must be done by applying irritating substances to other parts of the body, such as drawing blisters, plasters, setons, &c.

So far as these objects can be obtained by the common nostrums which are sold for the purpose, they may be useful; but it would be quite absurd to use them for any but the first-named purpose; and as their com-

position is unknown to most people, it would be better to avoid them.

These quack medicines have often received credit for that which nature has accomplished without their aid. They are often applied after the inflammation has begun to subside. Violent toothache seldom continues more than three or four days at a time. The victim generally manages to bear the pain pretty heroically the first day; but loss of sleep, during the night, leads him, on the succeeding day, to try many of the thousand and one cures that he has heard of; and at last in despair he seeks relief in some of the many "toothache drops," which are vended by persons who know no more about the human teeth than they do about the psychological history of "the man in the moon."

Sometimes there is a discharge of matter, or subsidence of inflammation, which gives relief; and the patient ignorantly extols the nostrum, and unwittingly leads others into the deception.

Thus we have gone over the most successful remedies for alleviating pain in the teeth; but among them all, *which is the cure?* We have in our practice applied a preparation which always stops the pain, unless the tooth is ulcerated.*

It not unfrequently occurs, that many who have sought and applied every known remedy for the toothache are finally compelled either to submit to the ope-

* Alum and camphor, equal quantities, reduced to impalpable powder, and dissolved in sul. ether, to which is added a few drops of ammonia.

ration of filling or extraction — of which we shall speak more fully hereafter.

Fig. 18.

Where teeth are ulcerated at the roots, there is no remedy but extraction. Fig. 18 gives a view of a tooth having an ulcer on the fang.

CHAPTER XI.

VARIOUS DISEASES OF THE TEETH.

CONTENTS. — Atrophy, or consumption of the roots. Necrosis. Exostosis. Osteo-sarcoma. Spina ventosa. Loss and decomposition of the enamel. Periodontitis. Inflammation of dental pulp. Fungosity of dental pulp. Ossification of dental pulp. Destruction of the dental bulb. Loosening of the teeth. Accidental luxation. Spontaneous abrasion of the teeth. Mechanical abrasion of the teeth.

Atrophy, or *consumption of the roots*, is generally the effect of decomposition of the surrounding parts; the periosteum of the fang is inflamed, and the integuments that surround it suppurate. It thus becomes similar to an extraneous body in the socket, the nerve dries away, and the substance of the root is gradually consumed. This disease is rarely confined to a single tooth, but more frequently extends its ravages to surrounding teeth and the edges of the alveoli of both jaws, and sometimes affects the whole of the dental arches. It is generally necessary to extract several of the teeth. If not arrested in season, it proves very destructive and dangerous. Tonics are beneficial, and the cautery is sometimes necessary.

Necrosis. — This disease is common to all bones; and in the teeth it results, if not arrested, in the death of one or more of them. It much resembles consump-

tion of the roots. It may be occasioned by external violence, gangrene, or chronic inflammation of the surrounding parts. The front teeth, from being more exposed to external injuries than the others, are most liable to it. Teeth affected by *necrosis* assume a dark-blue hue, varying with the density of their structure. Where it has been produced by violence, they are particularly dark; as it then happens that the blood in the arteries is prevented from returning. If they do not drop out, they always exude a fœtid, purulent discharge near the gums. Local bleeding and astringent washes are beneficial.

Exostosis of the Teeth. — The diagnosis of this disease may generally be traced to engorgement and ossification of the dental periosteum. It often attacks perfectly sound teeth, and is frequently attributable to hereditary predisposition. Its symptoms are deep, heavy pain, and swelling of the alveolus; and generally a marked depression in comparison with the other teeth. It may sometimes be subdued by narcotic and emollient applications and bleeding. If this does not succeed, recourse must be had to extraction.

If the teeth are not timely removed, the most disastrous results may follow. "A case is recorded where the whole of the teeth were obliged to be removed; another, where four sound teeth and nine roots were extracted."*

Osteo-sarcoma is a disease which sometimes attacks the bones of the jaw, and changes them into a semi-fleshy substance. It is accompanied by a dull,

* Harris's Dent. Sur. 2d ed. p. 304.

continuous, deep-seated pain, while a ponderous tumor, occasionally smooth, but generally tuberculated and irregular, is discovered upon the bone. Ulcerations, which break through the skin and discharge a sanious or fœtid matter, are often the result of *osteosarcoma.* If suffered to progress, the knife alone will suffice for its extirpation; but, in the first stage of the disease, general and local applications, with alterative medicines, will generally arrest its progress.

Spina ventosa is an ulcerated tumor, which enlarges a bone externally, while it destroys the internal portion; which is occasioned by the corrosive nature of the confined matter. It presents a great analogy to exostosis of the teeth, and requires similar treatment.

Loss and Decomposition of the Enamel. — The enamel is subject to peculiar diseases, which eat away its substance by a kind of denuding process, and sometimes by a general decomposition. In the former case, the disease is marked by continuous horizontal grooves, which sometimes reach and affect the bony part of the tooth. Occasionally the work of destruction is commenced at different points, which unite in their progress, entirely stripping the teeth of their envelop. The enamel is not much changed in color during the process; but, as the bone is exposed, it assumes a brownish color, and the surface is quite polished. The cause of this strange disease has never been satisfactorily explained. It may sometimes be arrested by filling the groove with gold in the commencement of the disease.

What is called decomposition of the enamel is of two kinds: that which is most frequently met with,

shows brown or black spots, supposed to be occasioned by disease of the dental pulp, or the proximity of a decayed tooth. These spots appear first on the sides of the crown, and may usually be removed by the file.

The other species of decomposition differs from the first by the whiteness it acquires during its first stages, which afterwards changes to yellow, and by the ready adhesion of tartar to them. They are extremely sensitive to changes of temperature. The disease usually commences near the gums, and the teeth generally become carious.

Periodontitis, or inflammation of the alveolar dental membrane.—This inflammation is distinguished by a dull pain, which appears in a tooth apparently sound. The gums afterwards swell and redden, and the pain becomes acute and pulsating. This disease often terminates in abscess; but sometimes becomes chronic, especially if there is constitutional predisposition to it.

The chief remedies to be relied on are leeches, or bleeding with the lancet, the application of cataplasms, narcotic and emollient gargles and drinks.

Inflammation of the Dental Pulp. — This, as might be expected, most frequently occurs when the tooth is carious; and as is the case in wearing of the teeth, it is least painful as the opening approaches the cavity. The pain is much increased by striking the sides of the teeth; and though at the commencement the pain is confined to the tooth, in the course of a few days it extends to the nerves of the face; the pain pulsating, and almost intolerable. The cause of this inflammation of the pulp may be ascribed to cold, decomposition of food

in the teeth, chronic affections, or any disease that affects the general system. For treatment, see remarks on odontalgia.

Fungosity of the Dental Pulp. — This fungus is a tumor; an excrescence thrown out by diseased dental pulp, which, having become much swollen, thus disposes of its redundancy. It assumes a red appearance, and may be perceived at the opening in the tooth. On being lanced, it bleeds freely; and though excised, generally grows again, and extraction is finally the fate of the tooth.

Ossification of the Dental Pulp occurs in teeth affected by denudation. As the bone is wasted away in its near approach to the cavity, the pulp hardens and finally ossifies; and, becoming attached to the portion of bone left by the erosion on the outer surface, they become one substance.

Destruction of the Dental Bulb. — Sometimes, without any reason that we have been able to discover, teeth change their color, lose their density, and easily break upon the slightest pressure. These changes occur without acute pain to the subject. On dividing these teeth longitudinally after extraction, we perceive the cavity to be nearly empty; the debris of the nervous and vascular substance alone remaining. No certain prevention or remedy has been discovered.

Loosening of the teeth may be occasioned by any external shock, an inflamed state of the periosteum or gums, and the use of mercury. Very often sound teeth are loosened by the continued action of bands and ligatures, used for regulating the natural, or sup-

porting artificial teeth. In women, at the decline of life, they frequently become loose and fall out. If it be rheumatic, or produced solely by external agencies, we must avoid all irritation of the tooth, either by handling it, or in mastication. Where ligatures have caused it, the remedy is plain; remove them, and seek some other tooth for the ligature, which is better able to sustain the pressure.

If teeth become loose from an accumulation of tartar, this must be speedily, but with great care, removed; and if the gums are yet in a healthy state, they will contract upon the teeth, thus securing them more firmly in their sockets.

It occasionally happens that teeth are loosened, when longer than the rest, by their continued contact with the opposing teeth. In this case, they should either be filed or extracted. If teeth become loose, as is often the case, after recovery from fever, they will generally, in persons of good constitutions, resume their natural state, and grow firm in their sockets again, unless the individual is much advanced in life.

Accidental luxation is the more or less violent removal of a tooth from its natural position. The front teeth are consequently most exposed to this kind of accident — for disease it can hardly be called. When a tooth becomes either partially displaced or entirely removed from its socket, it should be replaced in its proper position, and supported by ligatures or bands, until firmly rooted again. But in case of the entire removal of the tooth, either by extraction or accident, the success of this plan is somewhat uncertain, depend-

ing considerably on the health and temperament of the patient; and where violence has been used, as in the case of a fall or blow, the sockets and adjacent parts should be carefully examined to see if there are any small particles of bone or other foreign substances remaining that might irritate the tooth.

In cases where several of the teeth have been displaced by accidents of this kind, it would be safer to select only such of the teeth as appear in the best condition to reset, than to risk the final success of the operation by attempting to reädjust the whole.*

Spontaneous and Mechanical Abrasion of the Teeth. Abrasion consists in a gradual wearing away of the edges of the teeth; usually the incisores and cuspids, sometimes extending to the bicuspids. In consequence of this, when the mouth is closed, the front teeth, such as are thus affected, do not meet — leaving a vacuum of sometimes a twelfth or an eighth of an inch. The exciting cause of spontaneous abrasion has never been satisfactorily explained, though various theories have been proposed on the subject. The teeth thus affected are not usually painful, but are somewhat sensitive, when touched by an acid, or by any thing extremely hot or cold.

Mechanical abrasion may occur when there is a recession or reversion of the dental arches, causing the

* In several cases I have extracted a painful tooth, and replaced it. In one case the subject was a gentleman about forty-five years of age, a shipmaster, who has used it in several voyages to India. In another, a young man, a Mr. D. S. of Newburyport; also a Mr. H. of Newburyport, aged about twenty-one, now a student in Harvard College.

teeth to strike each other upon their edges; or by the overlapping of some of the teeth, by which the continual contact, in an unnatural position, wears upon the enamel, and sometimes through a great portion of the osseous part of the tooth. This is the case when the cutting edges of the teeth exactly meet.

We have seen it produced in the case of a gentleman who had been many years a book-keeper, by the constant habit of holding the pen between his teeth, while turning over his books; and, in several instances, in old men, by the use of a pipe.

* When this wearing has proceeded to a great extent, so as to approach the dental cavity, the lining membrane is removed, and its place supplied by ossified matter. This is particularly the case in old persons. As their teeth wear away, the dental cavity near the top becomes filled with ossified substance, so that, when the crowns are entirely worn away, this wonderful contrivance of nature provides them with the means of mastication, which, though not so efficient as the original, yet, as very old people require less solid nutriment, answers the purpose sufficiently well.

* The late Capt. Coffin, of Newburyport, informed the author that he had several teeth worn away by "knotting" with his mouth, while "sounding" for his friend Perkins (the distinguished mechanician), who was a passenger with him to London, and to gratify whom he was continually fathoming the Atlantic.

CHAPTER XII.

TARTAR, OR SALIVARY CALCULUS.

CONTENTS. — Deposition and composition of tartar. Pepys', Vanquelin's, and Langier's analysis. Experiments of the author. Microscopic discoveries of M. Mandl. Appearance of infusoria in the tartar. Objections to the removal of tartar. Destructive nature of tartar. Recipes for dentifrice, powders, elixirs, &c. Proper means of removing tartar. Pernicious effects of chemical solvents. Case of a gentleman.

Calculus, or tartar, upon the teeth, is not confined to any particular state of the body. There are few teeth on or around which, if not kept scrupulously clean, this deposition will not form. Tartar is believed to be a deposition from the salivary glands, because it is always found in greater quantities in the vicinity of the *Stenonian*, *Rivinian*, and Whartonian ducts, and has been found in the mouths of these ducts themselves. Hence it is that usually the *inferior anterior* and the *superior molar* teeth are the first to suffer.

The character of tartar varies; its component parts being arranged in different proportions, partaking of the same nature as the saliva. According to Mr. Pepys, it is thus usually found: —

Of 50 parts,

Phosphate of lime, .	39
Fibrin, or cartilage, .	9
Animal fat, or oil, .	2
	50

Messrs. Vanquelin and Langier have recently given the following as the result of their analysis:—

Of 100 parts,

Phosphate of lime, ...	66
Carbonate of lime, ...	9
Animal matter, ...	14
Oxide of iron and phos. of magnesia, .	3
Loss, ...	8
	100

Our own experiments have varied from both of these, giving

In 100 parts,

Of animal matter and mucus,	17
Phosphate of lime, . .	59
Carbonate of lime, . .	15
Water and loss, . .	9
	100

These different results arise from different kinds of tartar experimented upon, and the different constitutions of the persons from whom it has been taken.

The yellow colored and the black dry tartar, which usually accumulate near the gums of those enjoying good health, may be dissolved in *hydrochloric* acid. But

that which is white, it is almost impossible to dissolve in acids, though it may easily be done by alkalies.

In some cases, we find almost every shade of tartar on the same tooth, disposed in layers like geological strata. The *salivary calculus* differs in many respects from the calculi held in solution in other parts of the body. It is affected by diet, and especially water, if there is much lime or other medical properties in it.

Says M. Mandl (of the French Academy of Science): "If we take mucous matter which accumulates upon and between the teeth, and dilute it with warm distilled water, upon examining it with a microscope, we perceive a *host of infusoria, which move about with great rapidity.* Their size varies from one five-hundredth to several hundredths of a millimetre, and their shape is the same as that of the infusoria described by authors under the name of *vibrones.* They cannot exist at a temperature below 55° or above 120° F."

The presence of infusoria in mucus was pointed out by Leeuwenhœk; but M. Mandl describes in minute detail their shape and other qualities.

These animals exist in great quantities in patients who live several days on low diet. They also constitute the greatest portion of the mucous coating of the tongue, when digestion is disordered. According to M. Denys, the chemical character of this coating agrees with that of tartar.

After having ascertained the presence of infusoria in the mucus of the mouth, M. Mandl was anxious to ascertain if these animals existed in tartar. He softened a particle in a drop of water for twenty or thirty min-

utes; and, compressing it between two pieces of glass, he found it composed of dead *vibrones* of different sizes, but generally measuring several hundredths of a millimetre, united by an organic substance (dried mucus), variable in quantity. The tartar is often almost entirely composed of these vibrones.* A fœtid, slimy substance, taken from very dirty teeth, revealed beneath the microscope eel-like animals frolicking about, quite *at home*.

Thus persons who allow an accumulation of mucus and tartar upon their teeth have the pleasure of reflecting that their teeth are made the residence of myriads of animalcula; and that, in eating with dirty teeth either vegetables or flesh, they are continually swallowing immense numbers of these little animals — the offspring of matter suffered to decompose and lie between the teeth. They may be the production of meat or of vegetable substances.† Even bread, if allowed

* We may remark in this connection, that fossil skeletons are found in limestone formations. Tartar contains a large proportion of lime: would it, therefore, seem improbable that the skeletons of infusoria help to make up this calcareous deposit about the teeth?

† Some years since, when the author was pursuing his studies at a Western College, where there was much lime in the water used, he, with many of the students, rigidly abstained from animal food, but found tartar collected more rapidly upon his own teeth than at any former period. This fact, coupled with the idea, so often heard, that animal food produces it, elicited an examination. The result was,

1*st*, That neither animal nor vegetable diet will prevent the deposit.

2*d*, Water containing lime in solution, originates or increases the accumulation of tartar.

3*d*, The persevering use of a brush is in almost every case necessary for its prevention.

4*th*, Neither tea nor coffee in any way affects the deposit.

to remain a long time in damp situations, becomes mouldy; though in contact with no living creature, vast numbers of animalcules spontaneously spring into being.

Tartar sometimes accumulates in such quantities as to cover the whole of the teeth in one continuous envelop. Many persons nurse this disgusting concretion to preserve the teeth. Just as well might a dirty face preserve the complexion. By insinuating itself beneath the gum, which becomes inflamed, it loosens the teeth, and sometimes causes them to ulcerate, and send forth a fœtid breath; producing disease of the antrum, pain in the ears, face, and jaws; and causing necrosis in the adjacent bones. It renders the enamel on the teeth rough, thus exposing the teeth to quick decay.

When tartar becomes very hard, and increases in thickness about the necks of the teeth, the gums are irritated, crowded off, and fœtid; the sockets destroyed; and the teeth, being thus left without support, are often pushed out by the ordinary pressure of the tongue and lips.

Tartar has been known to collect in such quantities upon the teeth of children, as to produce separation of the jaw; destroying utterly the temporary teeth, and injuring their permanent successors. This substance is found to be deposited most quickly on such teeth as are least used; as where persons chew on only one side of the mouth.

Tartar may always be prevented from accumulating on the teeth, by keeping them perfectly clean. Some

persons are afraid of using a brush, lest they wear out the teeth, or injure the enamel. They might with more propriety fear that they should injure their complexion, or wear out their fingers by cleaning them with a nail brush.

Where plain water and a good brush are not found sufficient, dentifrices, free from injurious acids, or other objectionable substances, prepared by a responsible person, should be used. If these cannot be procured of a person on whom we can rely, it will be better to prepare them ourselves. Acids act as solvents on the teeth, render them very white at first, but make them soon rough, and at length completely destroy them.

As many persons prefer making their own dentifrices, we shall offer a number of recipes. Prepared charcoal alone is by many supposed to supersede any complicated preparation; but if this is not extremely well pulverized, it is apt to scratch the enamel; for *charcoal is the hardest known substance in the universe.* Being porous, however, it *appears* soft. It often gives a dark color to the gums, by insinuating itself around and beneath them.

Peruvian bark, though a very common ingredient, and useful where the gums are of a spongy consistence, is not always to be recommended; as, where the teeth are of a very loose texture, it gives them a yellowish tinge.

The following are some of the most popular dentifrices; and, *when properly prepared*, contain nothing positively objectionable.

Vegetable Powder.

Chocleria, or Scurvy Grass,
Guiacum,
Calamus,
Rhatany Root,
Mint,
Peruvian Bark.

Mix in about equal proportions.

Another prepararion is —

Magnesia, . . .	192	grammes.
Red-shell, . . .	32	"
Florence Iris, . . .	160	"

Another: —

Charcoal of white Wood,	256	"
Peruvian Bark, . .	128	"
White Sugar, . .	236	"

Another: —

Florence Iris, cleansed with Spirits of Wine, . .	500	"
Magnesia, . . .	128	"
Pumice-stone, . .	256	"
Bones of Cuttle Fish, .	256	"
Sal. Quinine, . . .	128	"
Caserilla, . . .	32	"
Sugar of Milk, . .	300	"

These must all be reduced to impalpable powder, and passed through a fine hair-sifter.

The three following recipes have been highly recommended by many who have used them: —

* "*To Preserve the Teeth.* — Take tinct. of bayberry, myrrh, and golden seal; dilute, and use with soft brush."

"Equal parts of tinct. of myrrh, cinchona, and chloride of soda; dilute with eight or ten parts of water when used."

"Equal parts of pul. charcoal and cinchona bark; use with brush and cold water."

Sometimes, when the teeth are carious, or in such a condition that all parts cannot be conveniently reached with a brush, it may be permitted to use elixirs. We shall give but two recipes: —

Elixir, with Base of Essential Oil.

Take of	Spirit of Rose, .	64	grammes.
	Spirit of Mint, .	32	"
	Tinct. of Pellitory, .	128	"
	Tinct. of Vanilla, .	15	"

Battot's Elixir.

Spirit of Wine at 33, .	2	litres.
Essence of Peppermint,	16	grammes.
Cochineal powdered, .	16	"
Pounded Cloves, . .	32	"
Green Annis, . .	32	"

Where the elixir, with base of essential oil, is used, only a drop or two should be put into the water. It can be more or less diluted according to the susceptibility of the mouth.

* Botanic Theory and Practice, by A. N. Worthy, M.D.

In our own practice, we have various preparations suited to the different conditions of the mouth; always carefully avoiding any thing that can injure the texture of the teeth.

There are two means of removing tartar. After it has just begun to form, it may frequently be removed, by persevering application, with a brush, and some suitable dentifrice possessing slight mechanical properties.

Scaling with instruments is another way, of which we shall speak more fully under the head of Mechanical Dentistry.

As to the use of acids, or solvents of any kind, for the removal of tartar, we consider them wholly inadmissible, and therefore shall not allude to them further than to state the results of our observations on the use of these articles.

We are frequently consulted by persons who have used some of the numerous quack preparations for whitening the teeth; and who indeed exhibit deplorable ravages of the enamel, reaching sometimes even to the ivory.

About a year ago, two peregrinating dentists passed through the town where the author resides, visiting almost every house, soliciting the community to buy an article for "cleaning the teeth," which they applied themselves. As the article certainly did whiten the teeth in a most expeditious manner, and as their charge was less than that of the regular dentist, many persons were induced to have their "teeth cleaned." The result was that many whole sets of firm, sound

teeth were ruined. But a few days elapsed after the application, before they grew black, were denuded of the enamel, and became so extremely sensitive, that they had to be extracted. Others endured for a time the pain; but caries soon followed, and they were irreparably lost.

A gentleman applied to me with his teeth in a most wretched state. He showed me the bottle of wash he had been using, one of the most pernicious substances which could come in contact with the teeth. Upon analyzing, I found it to be diluted sulphuric acid, tinged with sanders. Thus, for the sake of saving a few shillings, he nearly ruined a good set of teeth.

Acids of any kind soften the teeth, and thus expose them most freely to every deleterious influence, making them especially susceptible to cold. Actual toothache, and loss both of strength and beauty, follow their use. In almost every case where these articles are applied, it costs the individual more than to have his teeth properly attended to.

"If we put a tooth in any of the mineral acids, an immediate alteration may be perceived; in a few hours the enamel is entirely destroyed. By diluting these acids with water, their solvent power is not proportionally weakened." It is this property which makes vinegar injurious as an article of common use. *"Place in a wine-glass full of vinegar a sound and well-enameled tooth; on taking it out, eighteen or twenty hours after, hollows may be noticed in the enamel, and ero-

* Treatise on the Teeth, by B. James, M.M.S.S.

sions on its surface similar to iron pitted with rust." Sugar, *as such*, does not injure the teeth; but when eaten in small quantities, and at improper times, it ferments in the stomach, generates an acid, and by acidulating the saliva, &c., the teeth gradually deteriorate.

It is a settled maxim in scientific dental practice, that *no chemical* means should be used for the removal of tartar, or cleaning the teeth.

To ascertain if a dentifrice contain acid, it may be mixed with water containing a small portion of pearl-ash; if acid is present, an effervescence will be produced.

If you suspect an alkali, mix with vinegar, and the same effect will be produced.

CHAPTER XIII.

DISEASES OF THE GUMS AND ALVEOLAR PROCESSES.

CONTENTS. — Apthæ. Stomatitis. Inflammation of gums caused by dentition. Sponginess of the gums. Phlegmon or abscess. Ulcers. Alveolar abscess, or gumboil. Case of a lady. Fungous tumor. Scurvy of the gums. Scrofulous affections of the gums. Gangrene. Preternatural growth. Mercurial affections. Means of preserving the gums, &c. in a healthy condition. Washing, brushing, &c. Kinds of brushes to be used. Toothpicks. Breaking hard substances with the teeth. Acid and mineral drinks. Use of snuff as a dentifrice. Sudden changes of temperature. Use of tobacco, &c.

The gums and alveolar processes, being so nearly connected, often suffer from the same cause. We shall therefore speak of them in the same connection. The gums, in a healthy state, present a firm, rose-colored appearance. In the adult, they exhibit slight elevations and depressions; while in old age and infancy they are more uniform in their appearance, but hard and resisting in the former case, and in the latter, smooth and pliable. They are subject to many diseases; — abscess, inflammation, absorption, preternatural growth, &c.

Apthæ is a disease of the gums which frequently occurs in infancy. It is characterized by white papalæ which appear on the lining membrane of the mouth.

It occurs more frequently in cold, damp climates. In the progress of the disease, these white spots become dark-colored, and run together, when the disease becomes more serious. The remedies for *apthæ* are either local or general, according as it is confined to the mouth, or affects the general system. When there is much inflammation, bleeding is useful.

Stomatitis is another form of inflammation, common especially to children. It is sometimes epidemic and contagious. We first perceive its approach by a fiery redness of the mucous membrane of the mouth, which becomes hot and dry in the progress of the disease. Afterwards appear white points, which, uniting, thicken and increase, making a complete lining to the mouth, from which plates come off, and may be removed. This inflammation often extends internally; its progress is rapid, and often fatal. At the commencement, soothing and emollient gargles are beneficial; but, if these do not arrest its progress, astringents must be used. If it result in gangrene, the cautery must be applied.

Inflammation of the Gums caused by Dentition. — As we have had occasion to speak on this subject in a previous chapter, we shall not enlarge upon it here. Sometimes this inflammation becomes very intense, and extends to the face and *sub-maxillary* glands, and affects even the bones themselves. General symptoms of inflammation should be treated with bathing, especially of the feet, with an infusion of mustard.

Sponginess of the Gums. — When gums are spongy, they are usually charged with pus, present a dark-col-

ored appearance, and are thickened upon their edges. They are not very painful, except when touched; they bleed upon the slightest wound. They are always attended with a very offensive breath.

The disease appears in the vicinity of dead, carious, and loose teeth, or those that have been separated from their nerves and integuments, and have become as foreign substances in the mouth; but it is not confined to the position whence it takes its rise. A distinguished practitioner,* whose opportunities for observation were extensive, declares "that he never saw a case of sponginess of the gums where tartar was not present." It is more or less rapid in its progress, according to the age and constitution of the subject. When there is any predisposition in the patient, it often spreads, and reaches the periosteum and alveolar processes, which are often so far absorbed, that the teeth become loose and drop out. The whole system is affected, and is relieved only by a removal of the offending cause.

Want of cleanliness induces this, as well as almost every other disease of the mouth. And, what is singular, persons of robust habits are more liable to it than those of feeble and delicate health.

A constant use of salt food has a tendency to induce this disease. Indeed, every thing that is likely to cause inflammation of the gums may be considered as an exciting cause. Acids of all kinds are of this character. Though not so dangerous as many other diseases to which the gums are subject, it is usually diffi-

* Kœcker on the Teeth, p. 282.

cult to be eradicated, and the patient is always liable to a repeated attack.

In seeking to remedy this complaint, it is always necessary first to remove any local irritating cause, such as dead, loose, or decayed teeth, tartar, &c. Bleeding is beneficial, either by lancet or leeches. When the gums begin to recover, astringent or tonic washes should be used for the mouth. An intelligent practitioner* recommends the use of the following lotion:—

Take of Clarified honey, . 3oz.
Vinegar, . . 1oz.

Dilute in the proportion of three table spoonfuls to a pint of warm sage tea or water; to be used several times in the course of the day.

I have used for this disease a wash composed of the following ingredients:—*pul. nut-galls, cort. cinchonæ, honey, decoction of sage.*

One author† recommends a weak solution of the *nitrate of silver;* but this should be used with caution, and on no account swallowed. It is indispensable that the teeth should be kept perfectly clean by the use of the brush; for, if foreign matter is allowed to gather, there is no possibility of a cure. A brisk brushing of the gums helps to stimulate them, and keep up a healthy action. A decoction of the inner bark of green white-oak has been proved beneficial.‡

Phlegmon, or *abscess of the gums*, is usually caused by the root of a tooth which is ulcerated or dead;

* Kœcker. † Fox.
‡ Vide Fitch on the Teeth.

though it may be produced by other irritating causes, as inflammation of the tissue proper, rheumatic affections, hereditary predisposition, or the violent removal of a tooth by accident, or otherwise.

A throbbing pain is first felt in the alveolar arch, and, at the commencement, is confined to the diseased gum; but, as the complaint progresses, the cheek is also affected, and an abscess is formed. This should be opened, but, if unmolested, will break of itself. Neither sedatives nor anodynes will prove sufficient: there is no remedy but *extraction* of the original aggressor.

Ulcers, long neglected, may become fistulous; and the same thing may happen if there is any part of the tooth or alveolar process permitted to remain in it. The border of the ulcer becomes hard and red, and somewhat swollen. Occasionally there are two or three openings to the tumor, filled with an exceedingly fœtid pus, which sometimes escapes, and runs into the mouth. When the diseased tooth, or portion of alveolus, is removed, the flow of matter ceases. Where the diseased state of the gums and cheek has not been radically cured, or an abscess has been but partially removed, or improperly treated, there sometimes occurs an adhesion of the gums to the cheek; to prevent which, mucilaginous gargles and applications of barley water and roseated honey should be used. Sometimes the place of adhesion is small; and again, the whole side of the face may be attacked, and under some circumstances both sides are thus affected. If attended to soon after the formation of the connection, it may be separated by passing the finger between the

gum and the cheek; but, if of longer growth, the lancet must do the work.

Alveolar Abscess, or Gum-boil. — This disease has its seat in the alveolar cavities, and not in the gum. After matter is here formed, the inflammation extends to the gum, ulceration takes place and forces an opening, sometimes through the gum, and occasionally it will appear on the cheek. When the pus remains in the jaw, the alveolar process may be absorbed, and the disease spread, until the jaw, or large portions of it, exfoliate. In the commencement of this disease, an intense throbbing pain is felt; but, after the matter is formed, it becomes less. The immediate cause of abscess is a diseased periosteum; and it is almost impossible to cure without the extraction of the tooth.

After these gum-boils, or abscesses, have been cured, they often appear again on the least irritating cause. Though they sometimes remain months, or even years, without causing the patient serious inconvenience, yet their consequences in other cases are very disastrous. These abscesses should be lanced; and, when a permanent cure is not to be expected, the diseased tooth better be removed without delay. There is often found, at the root of a tooth thus affected, a little sac of pus, which is the cause of the disease, the removal of which will stay its progress.

Before extraction, it will generally be proper to try other remedies; such as fomentations, and the use of astringent and detergent washes. Cataplasms have been recommended; but, where there is danger of an external opening, they should be avoided. Where

disease of this kind attacks a child, the jaw is not unfrequently diseased to a great extent, and the loss of several teeth is often the consequence. Where the disease is located in the alveolus of a *dens sapientiæ*, the consequences are frequently very serious, from the difficulty of reaching it.

A case occurs of a lady whom we were called to visit professionally, who had suffered intense pain from this cause. There seemed to be hardly room in the alveolus for the development of the tooth. After a time an abscess formed; and, the face being much swollen, it was impossible to introduce an instrument into the mouth, as was intended, for the removal of the molar tooth which was in the way; as the wisdom tooth was inaccessible while that retained its position. Emetics were, however, given, and, soon after, the abscess broke, discharging a large quantity of purulent matter. A day or two after, the tooth was removed, and she recovered.

Fungous Tumors. — These excrescences vary greatly in their appearance; they may be simple, fungoid, cartilaginous, long, or schirrus. They are smooth, rough, or ulcerated; are sometimes attached to the gum in nearly their whole extent, or are attached to it by a very small connecting pedicle. The exciting cause of these tumors is generally local, though they sometimes appear without our discovering any. They may sometimes be traced to necrosis of the alveoli or of the maxilla. The tumor sometimes is so large, and so insinuates itself between the teeth, that it both loosens them, and is very difficult to be removed; but,

where their attachment to the gum is not so extensive, they may be easily *excised.* They are generally of slow growth; some are accompanied by pain, and others are so extremely sensitive, that they have been called *noli me tangere.*

A case is recorded by a French writer,* of a cartilaginous tumor being removed from the mouth of a woman, by means of a brass wire drawn tightly round the base. The source of its nourishment being thus cut off, it soon sloughed away.

Paré† recommends cauterizing cartilaginous tumors "until they are cured," and says "he had excised them when other physicians had been deterred by their livid appearance."

When they are in such a situation as to render it practicable, they ought to be excised; but where their base is large, and the tumor extensive, the better way is to perforate them with the needle, as otherwise the bleeding might be too profuse and prolonged. It is a very good plan to rub the gums with a stiff brush to induce bleeding.

Scurvy of the Gums. — Scurvy discovers itself not only in the gums, but also in the alveoli and maxillary bones. This often results from a general scorbutic attack, and is to be treated with general remedies. The gums in this disease swell, become red, and bleed upon the slightest occasion, and a troublesome itching is experienced. The teeth become dark and loose, and fall out; while a fœtid breath also is an accompani-

* Jourdain, v. 2, p. 334. † Liv. 8, chap. iv. p. 188.

ment. Sometimes the gums present such an appearance that it might be supposed mortification or gangrene had already taken place; but the odor emitted indicates the distinction. As this disease of the gums is so connected with the health of the general system, we shall not enlarge upon the remedial course to be pursued, further than to suggest the removal of all irritating causes in the mouth, such as tartar, diseased and irregular teeth; and the occasional application of an emollient or narcotic lotion, with strict attention to cleanliness.

Scrofulous affections of the gums are generally the result of an hereditary tendency. Internal remedies calculated to affect the general system should be resorted to. Where there seems a necessity for local applications, a wash for the gums, made of extract of Peruvian bark and hemlock, may be used. The gums are generally of a pale color, and soft, in the commencement of the disease, but become turgid and often ulcerated as the disease advances. When the gums have become ulcerated, a weak solution of nitric acid may be applied. Means calculated to brace the general system should be used in this complaint; the patient should reside in a warm, dry situation; while cold bathing, particularly in sea-water, is very desirable. Daily exercise and the whole course of living should be directed to a general strengthening of the constitution.

The following distressing case of scrofulous disease being so remarkable, we have translated it from the "Courier des Etats Unis," a French paper published

in New York, No. 15, vol. 18. M. Dieffenbach, who performed the surgical operation, gives the account.

"It is four years since, that three persons, strangers (a Pole, a Polish lady, and an Italian lady), late one evening demanded to speak with me. The lady was mysteriously veiled. The Italian lady said that the unfortunate person with the veil desired to see me alone; after which the two others withdrew. The veiled lady advanced in silence, with an unquiet, confused step, and then threw off her veil. I have seen frightful things in my life, but for a moment I recoiled with horror; for a death's head was before me, a skeleton face. A thin red skin scarcely covered the bones of the face, in the middle of which was a hole into which you might put three fingers, and through which you might see the tongue and windpipe, with the canals of the nose. The palate bones were destroyed, and the tongue came out of this hideous Acheron, when she attempted to speak. The lower eyelids were turned over, displaying the red inside, and hung down upon the superior jaw. The hole before mentioned, which was three inches in circumference, was surrounded by a flat rim, thin, and of the color of fire. Above this grand central orifice, one other mark of the same color rose as far as the roots of the hair, and divided the forehead and the eyebrows. This is the portrait of a young person of eighteen; a member of an honorable and wealthy family. The cause of this disfigurement, at so early an age, was scrofula. For a moment I looked on the face of this lady, without nose, without voice; for, instead of a human voice,

it was a compound and inarticulate whisper that proceeded from the figure. I comprehended, nevertheless, her wishes. She put her finger on my nose. This demand embarrassed me a little; but that which mortified me more, was the impossibility of affording the least relief to the unfortunate individual. When I had made her understand this by gestures (she understood only Polish), the scene which followed was heart-breaking. I called her friends to her assistance, and she quickly covered herself with the black veil; for she never went without it, even in the presence of her own family.

"I took her brother aside, and frankly, but with caution, stated to him the impossibility of an operation, and recommended the use of a mask; and thus freed myself from this singular apparition, which still lives in my recollection.

"The next day I left for Vienna, and scarcely had I arrived ere I met again the same phantom. She followed me like a ghost. In that city I obtained, at least, for her, from the great artist Corabelli, a superb set of teeth, and a substitute for a palate, which facilitated the process of eating, and rendered her pronunciation more distinct. She returned to her native country, but after some time she came to Berlin to see me once more, and implored of me to furnish her with a nose."

The manner in which this operator, whose humanity equalled his skill, was finally prevailed upon to undertake her case, and succeeded in not only supplying her with an artificial nose, but removing the other marks of deformity, is such as to awaken the admira-

tion even of the most ingenious artist. The success of this operation appears greater, as it has given a new life to the afflicted individual.

"She now goes boldly into society; frequents balls and theatres without a veil, with flowers in her hair. She left Berlin with a light heart, happy that her immovable perseverance had compelled me to an operation which I had believed impossible; and by my success I am more than recompensed."

Gangrene of the Gums. — This may be the result of neglected ulcers, and is most frequently found among the poor and in public institutions, where the air is vitiated; and in damp, crowded parts of large towns, where numbers are forced to live without suitable accommodations, in cellars, &c. Children seem particularly liable to it. The gums, in this disease, swell and become tender; they assume a livid appearance, and the breath is peculiarly offensive. This disease sometimes proves fatal. Internal remedies and general treatment, with strict cleanliness of the mouth, are most to be depended on.

Preternatural Growth of the Gums. — In diseases of this species, not only the gums swell, but the substance of the gum actually increases in size; covers, in some cases, almost entirely the crowns of the teeth, and insinuates itself between them. There is generally a peculiarly troublesome and unpleasant itching sensation which accompanies this growth. In a case of this kind, which came under my observation about a year since (September, 1844, the subject being a gentleman about thirty years of age), I found it necessary

to cut the gums in a horizontal line just below the neck of the teeth; nearly the whole of the arch of the gum being thus affected. I afterwards passed the lancet between the teeth, up to the neck of each, where the gums had insinuated themselves: considerable bleeding ensued. In the course of four days, I found it necessary to repeat the operation. I afterwards removed a considerable quantity of tartar, and also extracted several teeth, which were in such a diseased state that it was unsafe to allow them to remain in the mouth. During the treatment, I directed the mouth to be washed with a lotion of diluted nitrate of silver. Up to this time there has been no reäppearance of the disease. It is particularly necessary that, in this state of the gums, the treatment should be prompt and thorough.

Mercurial Affections of the Gums. — Where the use of mercury has produced ulceration of the gums, mucilaginous decoctions, such as a lotion and soothing gargles, should be used. If the gums remain soft and swollen, aromatic tinctures, such as the spirit of scurvy grass, or the alcoholic tincture of rhatania, may be used. But, as this complaint is usually produced by the abuse or ignorant use of mercury, we shall leave those physicians who get their patients *into* this state, to get them *out* of it.

Having thus glanced over the most prevalent diseases of the gums, we shall close this chapter with a few general remarks on the means to be pursued for keeping the mouth, gums, and teeth, in a healthy condition.

To do this effectually, it would be necessary to have a perfect knowledge of all the articles received into

the mouth. For, as we have seen, diseases of the teeth and gums are often induced by the use or abuse of certain articles of diet, and especially medicines, among which mercury stands preëminent. We do not hesitate to affirm, that every individual would suffer less from his teeth, and preserve them longer in good condition, if he would strictly comply with our advice.

The whole mouth should be washed every morning, on rising, with pure cold water; after which the teeth should be briskly rubbed with a brush so constructed that every part of them can be reached. Brushing horizontally does not affect the interstices; but an upward and downward movement should be used, that the bristles may penetrate *between* the teeth, as well as move on their surfaces. The posterior surfaces of the teeth should be cleaned as frequently and thoroughly as the anterior. This operation should be repeated after each meal, and before retiring to sleep at night.

Sometimes it may be necessary to use a dentifrice, recipes for which we have given in another place. The brushes which are used should differ in size and quality, according to circumstances. For a young child, a small-sized brush with soft bristles, or hair, is necessary; but it should ere long yield to a harder one.

Toothpicks are also very useful in removing any lurking particles of food inaccessible to the brush. These may be of bone or ivory; or a common goose-quill is as good as or better than any other. *Metallic toothpicks should not be used.* Where there are slight fractures of the teeth, they frequently do injury; especially do pins; for, being of brass, they often corrode the

mouth by their continued use. We have heard persons remark, "that it was very strange that dentists should object to the use of metallic toothpicks, while at the same time they use so much harder instruments about the teeth themselves." True, but they do not use them *every day* on the same teeth, nor where more pliable articles would answer the purpose.

Especially to be avoided is the practice of cracking nuts and other hard bodies with the teeth, and of lifting heavy articles with them, as many inconsiderate young men do, "to show their strength;" by doing which they always show their folly. The constant practice of biting threads is very injurious, as it causes abrasion of the teeth; and the biting of strong thread, if the teeth are at all loose, will sometimes nearly draw them out; a jar is sometimes experienced over the whole head by this means, especially if the thread slips between the teeth.

Again, the use of acidulated drinks and mineral waters in large quantities, is injurious, as they tend to set the teeth on edge, as it is termed. Particularly should care be used in the selection of dentifrices for the teeth. On no account should we use those of whose composition we are ignorant, or which are prepared by irresponsible persons.

We cannot avoid, in this place, making an allusion to the absurd and deleterious practice of using snuff as a dentifrice. Not only does it turn the teeth yellow, but small particles of it insinuate themselves into minute fractures of the teeth and under the gums, causing inflammation and disease hard to be cradicated.

Sudden changes of temperature should be avoided; as likewise extremely hot or cold drinks, especially a rapid change from one to the other; as this is very liable to crack the enamel. On this account *smoking* is doubly pernicious. In smoking a pipe, with other consequences, the teeth are abraded or worn away; and smoking of any kind, by which warm air is drawn to the teeth, to be directly afterwards subjected to the cold atmosphere, is a very extensive cause of caries and other diseases of the teeth.

Chewing tobacco has been erroneously considered by some as *preserving* the teeth; and attempts have been made to prove this by instances where the side of the mouth on which the tobacco is chewed, is in a comparatively good condition, while on the other side of the mouth the teeth are covered with tartar. This is to be accounted for by the fact, that the side on which the tobacco is placed is kept in a state of action (as it will be found that persons also eat on the side used in chewing tobacco); while, the other teeth being left in a state of total inactivity, there is *nothing to prevent* the deposition of tartar. It is not, then, that tobacco is a preservative, but that action is necessary to prevent accumulations of foreign matter on the teeth. Tobacco always turns the teeth yellow, and renders the mouth foul and disagreeable in appearance.

There is a *grit* in tobacco, the mastication of which gradually but inevitably wears away the cutting or grinding surfaces of the teeth, by which their nerves become exposed, and pain, ulceration, and extraction often follow.

By attention to the above suggestions, the teeth, mouth, and gums, may generally be kept in a state of health and exemption from pain; unless from constitutional debility there is a great predisposition to disease. But in *every* case where these rules are observed, the progress of disease will be *much retarded*, and pain *alleviated*, if not entirely prevented.

CHAPTER XIV.

MECHANICAL DENTISTRY.

CONTENTS. — Correcting irregularities of the teeth. Different modes of proceeding. Necessity of early attention to the teeth of children.

"But hear the remedy — the dentist's skill
Subjects disordered Nature to his will.
As great commanders hear without alarms
The shouts of battles and the shock of arms,
And, when their troops in broken ranks incline
To wild confusion, bring them into line;
So he — the master of the dental art —
Can order, grace, and symmetry impart,
Where anarchy had else sustained alone
The undisputed title to his throne.
Such benefits this useful science lends
To earliest youth; and yet its aid extends
To following years, assuaging mortal pain,
And oft restoring beauty's flowery reign."

Brown's Odontalgia.

ON CORRECTING IRREGULARITIES OF THE TEETH.

It is seldom that the deciduous teeth are found to be irregular. But occasionally they make their appearance in such a position as to wound the tongue or cheeks; and they may impede the speech, and injure the arrangement of the second set.

A late French writer* has strangely enough remarked, "that the teeth of the first dentition require no particular attention when not affected by *caries*." The obvious incorrectness of this opinion will be appreciated by every one who has observed the manifest influence that the temporary teeth have on the regularity of the permanent. If proper and timely attention be paid to the removal of the first set, we may expect to see the second taking their right position.

Whenever it is contemplated to remove irregularities of the teeth, we should first take into consideration *the age* of the subject; and our success will in a great measure depend on the time at which such operations are performed. The jaws of very young persons are so yielding, that, if a tooth is taken out at a considerable distance from the one that is irregular, the others will give way, and make room for it: thus, if a lateral incisor is out of place, by removing a bicuspid the incisor may be made to take a proper position.

But where the subject is older, and the jaw has become proportionally harder and unyielding in its nature, it is generally found necessary, if the teeth are much crowded, to remove either the offending tooth itself, or one in immediate contact with it. Very often continued daily compression of the fingers will suffice to bring a truant tooth to its proper place; but where it cannot be thus affected, other means, of which we intend to speak, must be applied.

Many young persons, by the sacrifice of one tooth,

* Maury.

have secured to themselves a beautiful and regular set of teeth, when, if it had been allowed to remain, their teeth would have always presented a deformed and unpleasant appearance, and probably would have become diseased. It is highly important that irregularities of the teeth be attended to by the fourteenth or fifteenth year; after this time the operation becomes more painful to the subject, and difficult to the operator. If left till late in life, they cannot be remedied.

In seeking to correct irregularities of the teeth, we should endeavor to enlist nature in our service. This can be done only by regulating them at a time when changes are taking place in the size of the jaws; as the operation will thus be rendered proportionably easy and successful.

The teeth most subject to irregularity are the cuspidati; but, as their presence in the mouth is almost essential to its beauty, and necessary in the enunciation of some sounds, it is better to remove a bicuspid, or even to sacrifice two of these, than to extract the cuspid.

The reason why these teeth are more liable to take a wrong position is, that, with the exception of the posterior molars, they are the last of the permanent teeth that are cut, and consequently are often crowded for room.

The central incisores are sometimes irregular, occasionally both, but oftener only one; which assumes a position that brings its edge outside of the regular arch of the teeth. This may be remedied in the following manner:—A gold band should be fitted to the tooth, to

which ligatures are attached, fronting both the interior and exterior of the mouth, when the band is attached to the tooth; the interior ligature is then brought forward between the lateral incisor and the irregular tooth; then extended on the exterior of the circle to the second bicuspid, and there secured. The ligature that is attached to the anterior part of the band must be carried back between the centrals, and thence to the inside of the arch as far as to the cuspid or bicuspid on the other side of the jaw, to which it must be made fast. It is necessary to tighten these ligatures every few days.

Where both central incisores are thus inclined, it will not do to attempt regulating both of them at once, nor the one immediately after the other. Sufficient time should be permitted to elapse, to allow the one that has been adjusted to grow firmly into the socket before the correction of the other is attempted; else we shall be very likely to bring the first back to its original position.

Where patients have been unwilling to wait the necessary length of time for the regulation of their teeth by bands, springs, ligatures, &c. (all the modes of which we shall not be able here to explain), I have frequently, by partial luxation of the tooth, brought it to its proper position. This means, though much more rapid than the others, is attended with some risk; and its performance should never be attempted by an inexperienced person.

Where the teeth are crowded and rendered irregular by the presence of supernumeraries, these should always be removed.

We might extend this subject by descriptions of varieties of mal-arrangement, and of the means of correcting them; but as this book is not designed exclusively for the profession, and it would be uninteresting and unprofitable to the general reader, we shall not enlarge upon these varieties.

But we cannot forbear urging upon all those, whether parents or not, who have the care of children and youth, not to defer the regulation of their teeth beyond the fourteenth year. It is a duty we owe to our children, to do all that we consistently can to improve their personal appearance: certainly there is no one thing that gives children so disagreeable and sometimes malicious a look as an exhibition of deformed teeth. As we have before remarked, *irregular* teeth are more liable to disease; and, by neglect, pain and suffering are caused which might have been easily prevented.

CHAPTER XV.

SCALING THE TEETH.

CONTENTS. — Prejudice in regard to scaling. Skill required in the operation. Loose teeth. Discoloration of the enamel. Goddard on use of acids. Mechanical means alone admissible.

We have alluded to the means by which this may be effected, in our remarks on the nature and formation of tartar. Constant cleaning of the teeth with a brush, and either pure water or suitable dentifrices, will generally suffice to prevent the accumulation of this substance. But usually the dentist is not consulted till the quantity amassed on the teeth is quite considerable, when evidently a different course must be pursued.

This consists in the removal of the concretion by means of instruments adapted to the purpose. These should be properly tempered; for, if this point is not regarded, either it will be impossible to accomplish the removal, through pliability of the instrument, or, in the other case, there is danger that the instrument, especially in inexperienced hands, will cut the teeth themselves.

Many persons, through misapprehension of the na-

ture of this operation, or more frequently from seeing the ill effects produced by an improper performance of it, feel great hesitation in permitting it to be done. It is, however, of so much benefit, not only to the teeth themselves, but also to the gums and the whole of the maxillary organs, that we shall be somewhat minute and particular in explaining it.

The operation, when skilfully performed, is both simple and unattended with pain, and will be of service to the teeth so long as they maintain connection with their sockets. The removal of tartar, however, requires great care on the part of the operator. The movement in cleaning should always be from the gum downwards, on the superior jaw; thus obviating all possibility of injuring the gum. But it is always preferable to clean the teeth of the inferior jaw first; as during the operation the gums often bleed, and, if the superior teeth were first cleaned, their bleeding would interfere with the progress of the operation.

Where there is a great quantity of tartar accumulated, it should be removed at different sittings; as the process is thus rendered less fatiguing to the patient, and it likewise gives any of the teeth which are loosened, an opportunity of again becoming firm. That which is situated near the gums should be removed first. This will allow the gums time to heal, as they will probably be tender before the completion of the operation.

When a tooth is loose, it will be found necessary to support it by a finger of the left hand, or it may be detached, or so much jarred as to produce very unpleasant

sensations in the patient; besides, the instrument will be liable to slip. Tartar is sometimes so firmly attached to the teeth, that considerable mechanical force is requisite for its removal; but, generally speaking, it requires more care than strength.

It is necessary to discriminate between *discolorations of the enamel* and tartar; for, by carelessness in this respect, many teeth have been ruined. It is not necessary to render the canines and bicuspids as white as the incisores, for they are not so naturally; and if we attempt to whiten a tooth beyond its natural shade, we injure it. For the same reason it is impossible to make all teeth look equally white, for there is a great natural diversity in this respect; some teeth having always a yellowish tint.

The color of the teeth is sometimes affected by internal decay, which gives to the tooth, or portions of it, a dark color: this, of course, it is impossible to remove by cleaning the exterior of the teeth.

Where the teeth are of a loose texture, or have been rendered soft by the action of medicines, they must be treated with great gentleness. But on no account can the use of solvents, or acids, be permitted in removing tartar, or in cleaning the teeth; for experiment has decided, that whatever will decompose the tartar will affect the enamel.

The removal of tartar from the exterior and interior surfaces of the teeth is easily effected; but it is more difficult where it has accumulated and hardened *between* the teeth; and various and different instruments are requisite for this purpose. They must be

so constructed as to remove the tartar with as little force as possible, without jarring or injury to the teeth or gums.

For cleaning the central incisores, for the right and left molars, and for the interstices, entirely different instruments are required; and indeed, according to the varieties of irregular teeth that occur, and the different degrees of consistence of the tartar, many others are absolutely necessary.

If any portions of tartar are left on the teeth after the operation is called complete, it will soon form again, as each little particle left will become a nucleus for fresh deposits. To prevent this, after all has been removed that can be done by instruments, the teeth should be rubbed with a piece of very smooth wood, properly shaped, and dipped in finely prepared pumice-stone.

It is often the case, that after all this has been done, and every particle of tartar removed, the teeth themselves are seen to be of a dark color. To remedy this, it is the constant practice, though known to be eminently injurious, to apply acids for the purpose of whitening the teeth. Some practitioners satisfy their consciences in so doing, because, say they, "our patients expect to find their teeth white after they have been cleaned." But this expectation cannot justify the infliction of permanent injury for temporary satisfaction to the patient. Poor indeed must be the consolation, that their teeth, now full of dark holes and spots, the enamel looking like honey-comb, and morbidly sensitive, were *once* white.

The author of a work on dentistry* recommends the *careful* use of acid; but we are surprised that this intelligent author should impart to the dental student advice so deleterious. *First*, the very care he enjoins in the use of acids implies their pernicious nature; *secondly*, there are other articles equally effectual in removing the tartar without injury, of which we have spoken; *thirdly*, the example thus set by the dentist to his patient, of the use of acids, may be widely known and fatally followed.

It is by the unprincipled use of such solvents, that many intelligent people have imbibed a prejudice against this operation; than which, when skilfully performed, there is none of greater benefit to the teeth, and none more improves their appearance. Though we unqualifiedly condemn *such* means for the removal of tartar, we cannot say with a certain "dentist"(?) we wot of, "*I* use only soap and water in cleaning the teeth." We think it would take considerable water and soap to remove such quantities of tartar as are collected on some teeth; since the best tempered instruments are sometimes broken in removing it.

Though it is injurious to try to *whiten* teeth beyond their natural color, yet it is beneficial to smooth and polish the enamel. This operation prevents the immediate retention of foreign matter; whereas, if the enamel is left rough, it readily retains portions of food, and tartareous concrescence is the result.

* Goddard.

All that can be done with safety, when there are dark-colored spots, or depressions upon the enamel, is to remove them with a piece of fine, smooth-pointed wood and pumice-stone; or, if they are situated on the side, they may be filed off.

CHAPTER XVI.

ON FILING.

CONTENTS. — Objections to the file. Harris on the practice of the Brahmins and Abyssinians. Directions for filing. Filing between the teeth. Children's teeth. Filing excised roots, &c.

The use of the file in dental operations has been most unsparingly condemned in times past; and even now there exists probably more prejudice against it than any other operation. This is to be accounted for, in the *first* place, from the mistaken idea, that filing, whether well or ill performed, has a tendency to render the teeth more liable to decay; and, *secondly*, from the unskilful use and abuse of the file by ignorant practitioners.

That filing the teeth, either in a perpendicular direction or obliquely, does not necessarily cause decay of the teeth, is most abundantly proved from the habits of other nations in this respect. Prof. Harris, in his "Dental Surgery," has introduced some very pertinent remarks on this subject, from the pen of his brother, J. Harris. He says: —

"The histories of the Brahmins of India, and the negroes of Abyssinia, furnish sufficient proof to estab-

lish my last proposition. The Abyssinians are a ferocious and warlike people; and, to make themselves appear more savage, they file their teeth to points, so as to resemble the teeth of a saw, or those of carnivorous animals. It cannot be supposed, from the character of this people, that either much skill or judgment is exercised in the performance of the operation; though it no doubt requires a considerable time to remove so large a portion of the enamel and bony substance of the teeth, without producing pain. The operation with them is of ancient origin; and, notwithstanding the extent to which it is carried, we are credibly informed that their teeth are remarkably sound and healthy, and very rarely decay.

"The Brahmins of India, also, have long been in the habit of using the file, principally, I believe, for the separation of the teeth; but whether for the purpose of preventing decay, or of beautifying them, I have never been able to learn; but, from the circumstance of their having good teeth, it is most likely used for the latter purpose.

"I have mentioned these two people, on account of the contrast between their habits of life, which better elucidates the fact that I have endeavored to establish. If filing the teeth necessarily causes them to decay, why has it not produced this effect in the cases just mentioned? Had I only referred to the practice among the Brahmins, the answer might have been, that they are more skilful in the use of the file than American dentists. But this cannot be applied to the Abyssinians; for it is well known that they are ignorant and

brutish, and totally unacquainted with the arts and sciences."

That great mischief has been done by the indiscriminate use of the file, we are ready to admit, as may be done by every other useful operation, in the hands of the unskilful and careless.

It has been objected by many, and with truth, "that, after teeth have been filed, they begin, in a short time, to decay." But this is not the result of filing, in itself considered; but because the work was not faithfully and thoroughly done. Very often it happens that the operation has been left in an incomplete state, on account of the nervousness and irritability of the patient; who should therefore, if possible, be persuaded to submit to the completion of the operation.

If, through false kindness, or any other motive, the place filed is permitted to remain rough, or any particle of caries left on the tooth, the operation might better never have been commenced; for the rough surface will become a depot for minute particles of food, and the teeth be thus sooner destroyed than if they had never been touched by a dentist.

Filing may with propriety be used to separate teeth that are crowded, but not sufficiently so to justify their removal; where there are irregularities which prevent the teeth from meeting in a proper manner; also in case of caries, which is in such a situation, or of so slight extent, as would prevent gold from being retained, if the teeth were filled; and on some other occasions which we shall mention.

Before the use of the file is determined upon, the

operator should be fully satisfied, that it is the best and only effectual remedy. If, after commencing, it is found that the caries has penetrated to a very considerable depth, the sacrifice of a large portion of sound tooth will follow. It is also necessary to observe, that, in filing the sides of teeth for any purpose, either for the removal of caries, or on account of irregularity, the file should be so directed, that more substance will be removed from the *posterior* than the *anterior* surface of the tooth, as the effect is less observable in the former case than in the latter.

Cases sometimes occur, where, after filing has been carried to such a depth that its continuance would very much injure the shape and beauty of the teeth, a dark spot will remain, and all the surrounding surface be perfectly sound. Under such circumstances, it would be very unwise to continue filing, as thus a large portion of the healthy structure would be unnecessarily sacrificed. To prevent this, the gouge must be resorted to; by this means the spot may be removed, and, if not large enough to be filled, it must be rendered perfectly smooth, and the patient directed to pay particular attention that no foreign accumulation of any kind is allowed to be made there.

It is always the safest plan, in filing teeth where the extent or depth of caries cannot be certainly known, to use the file in such a way that the tooth may be plugged, if possible.

A great variety of instruments, of every degree of fineness and shape, is necessary to perfect the opera-

tion. But discrimination and judgment, added to practice, are still more necessary.

In filing *between* the teeth, the file should not be carried flush up to the gum, as in this case the teeth would in a short time be found to have grown together again. A small portion of the tooth, near the gum, should always be allowed to remain.

Sometimes caries of the teeth is found situated under the gum, which is usually swollen and inflamed. This must be cut away; the pain will be nothing, and, after the removal of the caries, the gum will speedily heal.

As a general rule, children's teeth ought not to be filed; as, on account of the thinness of the walls of the teeth and the size of the dental pulp, the teeth cannot very well bear the action of the file, and there is danger of reaching the dental cordon. But if shallow caries absolutely exist, or if there is imminent danger by the close proximity of the teeth, it will be better to make the attempt to save them.

Where the crowns of teeth have been excised for the purpose of inserting pivot teeth, the file is used to render the edges perfectly smooth, or to reduce them, if necessary.

Some dentists are in the habit of shortening teeth by means of the forceps, where they have been lengthened by the immoderate use of medicines; but to say the least, there is great risk in this; as the teeth sometimes split lower down, or in a different direction from what is anticipated. If it is attempted at all, there should be a horizontal line or groove made at the

place where it is desired to cut the tooth, as this will in some measure secure it from splitting. But the file is by far the safer remedy, though much more tedious. Indeed, where the whole or greater part of the tooth needs to be thus shortened, several sittings will be necessary; but, in every case, the most perfect finish must be given. Not the slightest inequality or roughness should be permitted to remain. If this part of the operation were more faithfully performed, we should soon hear fewer objections to the use of the file.

CHAPTER XVII.

ON PLUGGING.

CONTENTS. — Importance of the operation. Removal of decay. Destruction of nerve. Means of destroying the sensibility of the nerve. Preparation of the cavity. Shape of the cavity. Suitable articles for filling. Amalgams, mineral pastes, &c. Gold, platina, tin. Composition of the D'Arcet amalgam. Destructive nature of mercurial and other preparations. Quack advertisements. Monsieur Lafette's Asiatic Puzzalano. Manner of cutting and preparing gold and other foils, for filling. Process of filling. Drying the cavity. Caries on anterior surface of incisores. Pain experienced after filling — remedy. "Turning dentist." Anecdotes, &c. Itinerant dentists.

This is a most important, delicate, and sometimes difficult operation; though amateurs are apt to imagine that it is a very simple process. To judge from some specimens which we have seen, we should think that the operator, though an adept in the art of *stuffing*, could hardly be said to have taken his first lessons in *filling* teeth.

When it has been ascertained that decay is so deep seated, or in such a position as not to be easily or safely removed by the file, it becomes necessary to remedy the disease by plugging, filling, or stopping, as it is sometimes called. To do this properly, it is necessary, in the first place, to cut away every portion of

decay in the teeth; carefully cleaning it out, and leaving no ragged edges or excrescences on the sides of the cavity; which should then be cleaned out with two or three locks of cotton, until perfectly dry; and the filling having been previously prepared, the tooth, if not too sensitive, may immediately be plugged.

In case of great tenderness of the tooth, or of an exposure of the dental pulp, from the depth of the cavity, it will be necessary to apply some article that will allay this sensitiveness.

Many of the best writers on this subject recommend the use of the actual cautery under such circumstances; the application of caustics, such as sulphuric or nitric acid, liquid ammonia, &c. But we regard such means oftentimes cruel, by causing intense pain, and as exceedingly injurious to the teeth; in the former case (actual cautery), by the inflammation which is likely to follow from the extreme and unnatural heat imparted to the teeth; and in the latter (caustics), from the deleterious influence which strong acids exert upon the teeth, by softening the bone, and not unfrequently by producing inflammation of the alveolar periosteum.

Further, if the nerve is killed, which is not easily effected, except in the anterior teeth, its vitality is gone, and with it, the brilliant appearance of the tooth; so that we prefer, preparatory to filling a tooth, to *deaden* its sensibility to pain; which is partly occasioned by its exposure to the air, and which the filling will in future prevent.

For this purpose, various articles have been applied with different success; such as nut-galls, extract of

opium, camphor, ether, acetate of morphine, nitrate of silver, dilution of arsenic, kreosote, sometimes a mixture of several of these articles, with extracts, essential oils, tinctures, &c.

We are sometimes guided by a knowledge of what the patient had previously applied, as, with carious and aching teeth, people are continually trying various remedies. Those which have been most frequently used are generally the least efficacious, as the tooth becomes accustomed to their action: it is therefore necessary to prepare different applications, and especially with reference to the greater or less degree of sensibility in the tooth.

The success to be expected in the operation of plugging depends greatly on the preparation of the cavity. To have this of the right shape to firmly hold the plug, is a great desideratum; and it is necessary to premise, that, without a good assortment of instruments, as well as judgment in their use, this can hardly be produced.

It is not possible always to reduce a cavity to the shape which is most suitable for holding the plug, viz. the cylindrical; but the nearer this can be approached, the better. The bottom of this cavity should be rounded and concave. It is not always practicable, however, to reduce the cavity to this shape, without sacrificing more of the sound part of the tooth than would be advisable. An oval-shaped cavity should, then, be preferred; but, if this is very shallow, there should be a small groove or depression near the edge, as this will assist in holding the filling more firmly in its place.

When the dental pulp is exposed, the tooth may

sometimes be filled by making a little ledge around the lower part of the cavity, on which can be placed a thin plate of gold (or piece of very fine asbestos), and the filling be immediately proceeded with.

Before we conclude to plug a tooth, we must first decide, if possible, whether the tooth will bear the necessary pressure; for, if the parietes are so thin as to render this doubtful, the tooth had better be extracted, or at least the patient so advised.

The only perfectly suitable article for filling teeth is gold; though numerous other metals and compositions have been and are now used; such as platina, tin, lead, the D'Arcet metal, and various amalgams, lithodeons, royal and other succedaneums, silver, and mineral pastes, &c. &c.

Of the above, platina and tin are all that we tolerate. We use tin, first, where the teeth are not worth filling with any other substance; secondly, where a better material cannot be afforded.

Gold is preëminently the best article for filling teeth yet discovered. If once properly filled, and in season, with this metal, they will be preserved from future decay, will last for years, and often for life.

Platina is objectionable on account of the darkness of its color, but is not so subject to oxydation as the metals, and may therefore be more safely used.

Of all the amalgams and pastes which have been invented for filling carious teeth, we shall particularize only two or three. That of D'Arcet is composed of

Bismuth,	8 parts.
Lead, .	5 "
Tin, . .	3 "

The lead is first melted; he then adds the tin and bismuth, and M. Raynard has *improved* (?) this by an addition of a tenth part of mercury. It can be melted in boiling water, and is generally applied by heating the instrument for using it to 212° F. As the composition softens, it can be placed in the cavity like plaster; or the cavity can be first filled with the composition, and then a heated instrument applied to it. The metal is thus fused in the mouth; but the heat often cracks the enamel and excites inflammation.

The silver paste of Taveau is prepared with virgin silver and mercury. The mercury is saturated with silver, finely powdered and purified, and then worked in a mortar for two hours, to amalgamate the metals; then pressed through kid which has the outer skin removed, and the mercury in part separated. The remainder is a *paste*, which is placed in the cavity cold; the mercury to be evaporated by the heat of the mouth, leaving the silver lessened in size in proportion to the evaporation. Thus an opportunity is given for the entrance of the buccal humors of the mouth; besides which, disease is produced by this evaporation of the mercury, and the breath is rendered very offensive.

Similar to these are the various cements which are sold and used by quacks all over the country, whatever name may disguise their nature.

Many teeth which might have been serviceable for years are thus injured, and extraction becomes indispensable. The indiscriminate use of such articles is a proof either of ignorance, or of a knavish design to

extract money from the pockets of the community, without rendering an equivalent, but inflicting a serious injury on too confiding patients.

The use of the articles referred to requires no mechanical skill or ingenuity; and a mason might just as well be employed to stop up holes in the teeth with such compositions, as holes in a wall with plaster. We always feel inclined to add to the names of such quacks the title of T. M., *Tooth Mason.*

Some of these quack advertisements have amused us not a little; and the wonder to us is, that there have been people enough in the community so credulous as to support such pretensions.

In looking over a file of English papers, we found in the "Liverpool Mercury" of the 3d Oct. 1845, the following specimen of this class of quack advertisements, which we should like to give entire, but shall be obliged to abbreviate:—

"*Improvement in Dental Surgery!*

Monsieur E. C. Lafette, from Paris, *sole inventor* of the ASIATIC PUZZALANO, for filling decayed teeth, *without either pain, heat, or pressure!!* Incorrodible mineral teeth fixed upon HIS system of self-adhesion.

MONSIEUR E. C. LAFETTE,
Surgeon Dentist

To his late Highness Mâhlâ Râjâ Sinh, King of the Soikhs in the Punjâb Hindoostan; and also patronized by Louis Philippe and the Royal Family in France.

* * * Monsieur Lafette is proud to inform

the public, that not one instance has failed during his sojourn in the Eastern countries. He has now turned his attention to England, that the virtues of the ASIATIC PUZZALANO may have a fair trial among the nobility and gentry at large. The Asiatic Puzzalano is applied for stopping hollow teeth, without the least pain or inconvenience, *arresting the progress of caries, curing pain, and at once, as if by miracle, easing the most intense toothache!* One minute will suffice for the application, which becomes actually as hard and durable as the natural enamel.

All persons can use Monsieur Lafette's Asiatic Puzzalano *themselves* with the greatest ease, as full directions are given. Price 5s. and can be sent by post.

The real ingredients are solely the property of Monsieur Lafette, and the composition confined wholly to his own French knowledge and practice. None are genuine [&c. &c.] * * *

His self-adhesion teeth are so contrived as to adapt themselves over the most tender gums or remaining stumps, without causing the least pain, *rendering the operation of extracting or filing quite unnecessary.* * * * Monsieur Lafette had the honor of presenting a set of his mineral teeth to the Beeguan Smarhoo, who died a few years since, and left an immense property to the East India government.

Office 18 Rodney-street. Charges the same as in France."

If there were not a lamentable degree of ignorance on the subject of dentistry, would it be possible for so

barefaced a charlatan to extract money from the pockets of respectable people by such shallow pretensions?

One of the greatest advantages of plugging is to prevent the entrance of the humors and oftentimes vitiated secretions of the mouth into the cavities of the teeth, thus hastening their decay. No composition paste, or "puzzalano," can serve this purpose; for either of which, if put in the cavity moist, is contracted when dry, and ultimately becomes too small for the cavity; admits the atmosphere, fluids, and sometimes particles of solid matter. Thus one of the most important of the ends to be accomplished by plugging is lost.

When gold, platina, or tinfoil, is inserted, the leaves should be cut in strips from half an inch to one and a half wide, and folded a few times. In this way it can be more firmly pressed into the cavity, all the inequalities of which should be well filled. Each successive layer should be carefully pressed around the sides of the cavity with renewed force, so as to render the filling perfectly firm and compact. All above the orifice of the cavity should be levelled, and the surface made perfectly smooth; after which, a suitably pointed instrument should visit every particle of the surface; and if any portion yield beneath the pressure, it should be carefully punctured, and more foil added. The original form of the tooth should be preserved, if practicable. When completed, the filling should resemble a golden pin or bar driven into polished ivory.

A tooth may be prepared for filling, 1st, *Chemically*, by removing the membraneous sensation, or destroy-

ing the nerve. 2d, *Mechanically*, by properly shaping the cavity for the retention of the plug, or by covering its nerve with a gold cap, or arranging the filling so as to form a roof over it. By either process the tooth can be filled without pain, as nothing comes in contact with the nerve. The more compact, the more durable the filling.

A superior dentist can often pack treble the amount, or more, of gold in the same tooth, than an inferior one. Again, one dentist will fill a tooth (by care and persevering gentleness) which another has pronounced impossible, from extreme susceptibility. Dentists, above all others, should be *gentle*men, and we have yet to learn that the profession excludes or excuses its members from being such. No matter how skilful may be a dentist, if he is rough and unfeeling, he will often be obliged to relinquish an operation, which a little kindness and sympathy might have secured. To return from our digression.

To insure the permanency of a filling, an essential point to be remembered is, that not only should the cavity be wiped dry before filling, but should be impervious to moisture afterwards.

It sometimes happens, that after a tooth has been filled, and filled *well*, there will be pain. It is then advisable to try antiphlogistic treatment, with bathing of the feet in warm water. If the pain continues, the filling must be removed, and the process preparatory to filling a sensitive tooth repeated; after which the tooth can be refilled, if the operator is satisfied that the root is not diseased. If it is, it must be extracted.

There is no operation more frequently performed in dentistry than filling; nor any that requires more skill and delicacy; yet we have known individuals direct from the mechanic's shop and the farmer's kitchen, who have turned "surgeon dentists" (as they have elegantly styled themselves), — as though a dentist could as easily be turned out as a shapeless piece of wood can be "turned" into any desired form, — who "fill" and "extract" teeth with a *sang froid* that would be positively amusing, were not the subject more serious than mirthful.

We have now in our mind a certain dentist of New York, whose first subjects in the dental line were a class of Sabbath-school children, whom he invited to spend the afternoon with him, and upon whose teeth, which he extracted gratis, he took his first lessons in the dental art. Another case occurs to us of a dentist, who, a few years ago, was an undertaker, a middle-aged man, who never studied the subject any further than his experiments on his unconscious patients presented opportunity.

Let public opinion place its veto upon the inexcusable practice of certain persons, totally innocent of all anatomical knowledge, and *therefore* incompetent to take charge of the delicately-organized dental apparatus, of assuming the responsibilities of the profession. Such dentists care but little for theories, principles, and treatises upon dentistry. Their little stock of knowledge is amply sufficient for *their* use; and the study of medicine or anatomy quite as unnecessary as that of astrology or psychology.

CHAPTER XVIII.

EXCISION OF THE TEETH.

CONTENTS. — When proper to perform. Age of the subject to be considered.

Excision consists in cutting off the crown of the tooth with a strong pair of forceps; leaving the root entire in the socket. The success of the operation depends mainly upon the age of the subject. It is particularly useful where there is a disposition to hæmorrhage, as it prevents the excessive bleeding consequent upon the extraction of teeth from such subjects.

This practice was at one time quite popular; but, on account of some serious accidents which arose from the bungling manner of its performance, rather than from any thing necessarily dangerous, many are prejudiced against it.

But, as the seat of disease is often in the crown, while the roots are in a perfectly healthy state, we think it may sometimes be performed with great advantage, especially where several teeth have been previously extracted, and where it is desirable to leave to those that remain as much support as possible. They prevent

the absorption of the alveolar process, and the shape of the face is much better preserved.

The teeth, when thus excised, should be made perfectly smooth; and, being flat, there is no opportunity for the deposition of tartar, or any foreign matter, provided moderate attention be paid to the cleanliness of the mouth; and, without this, *no* plan of operations will preserve either the health or beauty of the teeth.

This process is particularly useful, when inserting pivot teeth on the incisors. Where their crowns have to be removed, the process of filing is very tedious, and to many extremely disagreeable.

It is well known that the germ of the tooth is at first but a soft, almost fluid mass,* contained in a sac, of the shape of the crown of the tooth. As time progresses with the child, layers of bone, and afterwards enamel, are formed upon the tooth. It is also known, that in very young subjects, the soft pulp in the cavity of the tooth occupies more space than the osseous part; that, as years increase, the dental pulp becomes less, till, in advanced age, it almost disappears; and in extreme old age is entirely dried up, and its place near the summit becomes ossified, and as hard as bone.

We see, then, the reason why the success of excision is mostly dependent upon the age of the subject; and wherein those who object to it have failed, viz. by performing it without taking the age of the subject into

* The first appearance of which is about the tenth week of uterine life; while the follicles of the permanent teeth are discovered by the eighth fœtal month — not all at the same time, but in succession. — *Cross's General Anatomy*, pp. 228–9.

consideration. If we longitudinally sever and examine the tooth of a child ten or twelve years old, we find the dental pulp very large in comparison with the size of the tooth. If we try the same experiment on a tooth taken from a subject of forty or more, we find the pulp nearly obliterated. Age, then, must be our chief criterion in regard to the excision of teeth. We have found it answer in subjects of thirty years of age, and even less, especially in the incisors. But, as the patient has been younger, we have invariably found the operation more painful; but have never experienced or witnessed any of those dreadful consequences, of which some have spoken.

CHAPTER XIX.

ON EXTRACTION.

CONTENTS. — Universal dread of extraction. Cause. Knowledge of the anatomy of the teeth necessary to insure the safety of the operation. Paré's tooth-mullets. Precautions to be observed. Lancing the gums. Danger from awkward motions of the operator. Examination of the teeth by mirror, sounding, &c. Instruments — directions for use. Method of extracting teeth in Africa. Key, forceps, &c. Variety necessary. Extracting incisors, cuspids, bicuspids, molars, dens sapientiæ, roots of teeth. Temporary teeth. Precautions against cold.

When the patient has not perfect confidence in the operator, there is no service which the latter is called upon to perform that causes so much trepidation in the mind of the patient, as that of extracting teeth.

This arises generally, not from the knowledge that *some* pain must be endured, but from an undefined presentiment that some other and worse evil may attend the operation, than that necessarily attendant upon the loss of the tooth.

The injuries which were once common, and are now not unfrequent,—caused in some cases by the use of improper instruments, but oftener by the ignorance of the operator, — have tended, in no small degree, to excite these fears; and though extraction is always the *der-*

nier resort of the scientific practitioner, yet the recurrence of the operation is so frequent, that the subject becomes worthy of attentive consideration.

To extract a tooth with the least possible pain or injury to the patient, is no very simple operation; and though it requires much more strength than is generally supposed, yet a knowledge of the anatomy of the parts, of the varieties in position and shape of the teeth, of the obstacles that may intervene, and of the consequences which may follow, and a nice discrimination and *tact* in the operation, are much more necessary than mere physical force.

Undoubtedly many accidents have occurred, and will occur, so long as persons are permitted to extract teeth merely because they have the necessary strength, and the presumption to undertake it. But nearly all the accidents which occur, might be prevented by the possession and exercise of the requisite anatomical knowledge and surgical skill.

We have known persons calling themselves dentists, who were ignorant of the existence of cavities in the superior jaw, which some of the fangs of the molar teeth nearly reach. How can such persons always avoid forcing open these thin partitions, and thus causing the patient weeks and months, perhaps, of suffering?

These feelings of fear, in regard to the extraction of teeth, have existed as far back as we have any record on the subject. Indeed, if we consider some of the instruments which were anciently in use, we shall see that there was some occasion for this dread. Even

Paré, in 1700, had no great faith in the practicability of extraction without some accident. He says: "A tooth-drawer should be expert and diligent in the use of his *tooth-mullets;* for, unless he knows readily and cunningly how to use them, he can scarcely so carry himself, but that he will force out three teeth at once; oftentimes leaving the one untouched which caused the pain."

Fortunately, we are not compelled to the use of such "tooth-mullets" as these; but there is much care necessary to prevent the various accidents which may otherwise ensue.

PRECAUTIONS TO BE OBSERVED.

Sometimes it is necessary to separate the gum from the tooth, a little below the edge of the socket. This is not always requisite; but occasionally the gums, in consequence of frequent inflammation, are changed to a tough cartilaginous substance, which, if not previously separated from the tooth, follows it in its removal, thus leaving the jaw partially unprotected by its natural covering. Disease of the alveolar process is almost a necessary consequence. Between the molars especially, the lancet should be passed, as the separation of the fibres and ligaments very much facilitates the exit of the tooth.

By an awkward outward motion, which is sometimes given to the tooth during extraction, it is made to bear upon the concave side of the external alveolar arch; and it is well known that a very slight force applied to

this side is sufficient to break an arch, while the convex is capable of supporting a great weight.

In the *dens sapientiæ*, the processes, especially of the inferior jaw, are so thin that there is great danger of a longitudinal fracture of the jaw, if an outward motion is given to the tooth.

It is necessary, before extracting a tooth, to make a thorough examination of the mouth, to ascertain with certainty which is the offender. It very often happens, that a person suffering with toothache, and desiring extraction, will point out the wrong tooth, sometimes even sound teeth, or one on the opposite side, or in the other jaw. It would on no account be safe to take the word of the patient in this respect, as we might very often take out perfectly healthy teeth, and leave the real cause of the pain in the jaw. In many cases, all the teeth are thought to ache, when in fact only one or two are affected.

To be certain on this point, it would be well in the first place to examine, by the help of a mouth mirror, all the teeth; and, if their external appearance does not plainly enough indicate what we seek, we may press upon them individually with the finger, or strike them lightly with a small instrument; or we may direct the patient to hold cold water in his mouth. By some of these means, we shall discover which should be extracted.

Having satisfactorily ascertained this, we next examine if there be any thing in the case which is likely to present unusual difficulty. If so, the patient ought to be informed; especially if the tooth be very carious,

and likely to break, it will generally be the wiser plan to state the case to the patient; but not to discourage him, or needlessly excite his fears.

Several other precautions might be suggested; but in the variety of cases that arise, much must be left to the judgment and discretion of the operator; and, without these qualities, rules will be of but little use.

KINDS OF INSTRUMENTS TO BE USED, AND MANNER OF PROCEEDING.

The instruments used for extraction by modern dentists, are rather more numerous, and a *little* more scientific, than were the "tooth-mullets" of Paré; and more so than the present means of extracting teeth in some parts of the world. In Africa, where every man is his own dentist, it is the custom, says an African journal,* when a person wishes to get rid of a bad tooth, to set about it as follows: —

"A fine strong cord is made of the fibres of the palm leaf, one end of which is fastened securely round the defective tooth. To the other end is tied a stone weighing from eight to ten pounds, which is lifted up at arm's length, and then let fall. The troublesome member is out in a twinkling; much quicker than it could be extracted with any instrument used by civilized hands; though we should doubt whether it could be quite as well done as by a modern pair of forceps." (Perhaps some one holds him over a precipice when an under tooth is taken out.)

* Liberia Herald.

The success of extracting greatly depends upon the instruments used. The day has gone by when one instrument is found sufficient for every tooth, irrespective of size or position, and when the same old "rough and ready" turnkey was applied by the village doctor, or barber, or blacksmith, for a delicate child, or stalwart ploughman.

There are some dentists who yet use the key, which has certainly undergone improvements; but it is generally persons long accustomed to its use, and to whom it seems as a familiar friend, from whom they dread to part. In our own practice, we have found no tooth which could be removed by a key, that could not be quite as well or better removed by forceps.

But it is not the name of forceps alone that is sufficient. There are many instruments that are made for forceps, and called so, which are very far from answering the purpose or the wishes of the scientific dentist. Indeed, every dentist who is desirous of excelling in his profession, may find it necessary to manufacture his own instruments, or provide drawings and model teeth by which the manufacturer can make them to apply with exactness for peculiar cases.

Though several of the teeth may be removed by a single description of instrument, I have provided myself with one or more, varying in size *for every tooth in the jaw*, with an entire different set for roots. To this, joined with extensive practice, I chiefly ascribe my success in the extraction of teeth.

A skilful person can generally determine for himself how a tooth may be best removed, better than by any

rule whatever. And, as all rules are subject to limitations, the operator must, at all events, frequently be thrown upon his own resources. *More strength than is necessary is usually expended in the extraction of a tooth.* Skill is more effective than strength; for, if power is not properly directed, the greater the strength, the greater the mischief produced. We once saw a person lifted completely off his chair by a desperate "tooth-drawer;" and more than once have seen both operator and patient thrown completely off their balance by the violence of the jerk. This, however, was under the key *regime.* We hope such outrageous practices have had their day.

We have no hesitation in saying, that every individual who has given the forceps a fair trial, will decide in their favor, and against the key; and, as they will, no doubt, ere long, be the only instruments used for extracting, we shall confine our subsequent remarks to their use.

For extracting the *incisors* of the superior jaw, it is only necessary to hold the tooth firm enough to prevent the instrument from slipping; and, as their roots are generally of a conical or rounded shape, a slight rotary motion, with a downward pull, will generally remove them with ease. The points of the forceps must be pressed as far beneath the gums of a carious tooth, as possible. In removing the lower incisors, *the rotary motion should be omitted*, as their roots are more flat.

In extracting a *cuspid*, the rotary motion should be very slight. Greater power is required for its removal;

the instrument should be applied in the same way; it is necessary to take a somewhat stronger hold.

The removal of a *bicuspid* is performed in much the same manner as that of the cuspid; but as this tooth is often decayed on the posterior side, near the gum, much care and skill are necessary in its extraction.

The *molar*, having two or three fangs, is more firmly rooted in the jaw, and therefore needs more force to remove it. Many who use the forceps for extraction in every other case, apply the key in this. But we have found, that, with properly-constructed instruments, any tooth may be more easily removed with forceps. The tooth should be seized as near the roots as practicable; with a firm grasp, a steady pull, with a slight outward and inward motion.

The *dens sapientiæ*, when in a regular position, should be removed in the same way; but often the fangs are so bent and twisted, that it is difficult to extract them without breaking. Their position in the socket often being irregular, the skill and judgment of the operator are more to be relied on than any specific directions.

The *roots of teeth* are generally more easily extracted than whole teeth; but occasionally they present difficulties, from their being buried up in the jaw; in other cases, absorption has so reduced the parietes of the fangs, that there is great probability of their being crushed by the instrument. Occasionally they are strongly attached to the alveolar periosteum, which considerably enhances the difficulty of removal.

Simple roots, or those having only one fang, can usu-

ally be removed without difficulty, except where there is ulceration of the part nearest the neck, so that a firm hold cannot be taken by the instrument.

Where there are *multicuspid roots*, if they are all united together, they may frequently be removed by one operation; but often, by a destruction of the whole crown, these fangs become separated, and then an operation is required for each.

In extracting roots immediately anterior to the *dens sapientiæ*, great caution must be observed; as, from the irregular position which these teeth often assume, and from the slight hold they have to their sockets, they may be forced out in our efforts to extract the roots.

If fangs are not diseased, or productive of pain, it is better to suffer them to remain. The alveolar edges are thus prevented from uniting, and the gums from shrinking; and the fullness and symmetry of the face are thus better preserved.

As we have before made some remarks on the *extraction of the temporary teeth*, we shall not enlarge upon the subject here; but merely remark, that it is not at all necessary to lance the gum, when extracting teeth for young children. As the integuments that hold the teeth have not gained sufficient strength to make any considerable resistance to the instrument, and as it is always desirable to occupy as little time as may be in operating on children, we might find more injury than benefit to arise from it.

We would suggest to parents the impropriety of frightening children about "having their teeth out," &c.; as the timidity and fear of most children prevent the

operation from being performed in so perfect a manner as it otherwise might be.

After the extraction of a tooth, and before the patient encounters a change of atmosphere, a small locket of cotton, saturated with *eau de Cologne*, should be placed in the socket, to prevent any cold being taken.

CHAPTER XX.

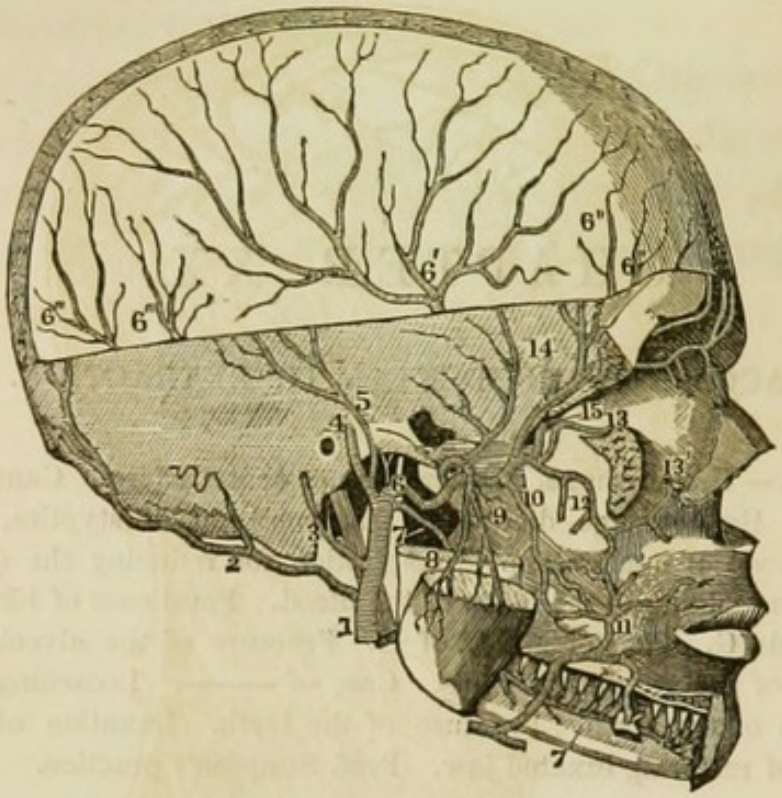
ACCIDENTS INCIDENTAL TO EXTRACTION.

CONTENTS. — Hæmorrhage. Description of dental artery. Cause of hæmorrhage. Hæmorrhage diathesis. Enumeration of styptics, with the proper mode of application. Prescription for reducing the quantity of serum, and adding to the fibrin of the blood. Fatal case of hæmorrhage. Case of Mr. G. Case of Mr. J., of N. Fracture of the alveolar process. Rupture of the maxillary sinus. Case of ———. Loosening the teeth. Luxation of the teeth. Fracture of the teeth. Luxation of the jaw. Method of restoring luxated jaw. Prof. Simpson's practice.

HÆMORRHAGE,

Usually, is occasioned by the rupture of the artery which supplies the dental pulp. This artery, before it enters the fang, is contained in a small cylinder or tube, which fits it exactly, and to which it is attached by its external coat. It passes through the end of the tube to the opening at the termination of the fang. When a tooth first moves in its socket, the moment before it is removed by extraction, this artery is stretched or drawn up, partially, for an instant, before it is divided. This generally breaks the attachment between its outer coat and its tube, into which it contracts, and soon ceases bleeding. But occasionally this attachment is not destroyed, and the artery loses the power of contraction; the blood flows freely and continuously.

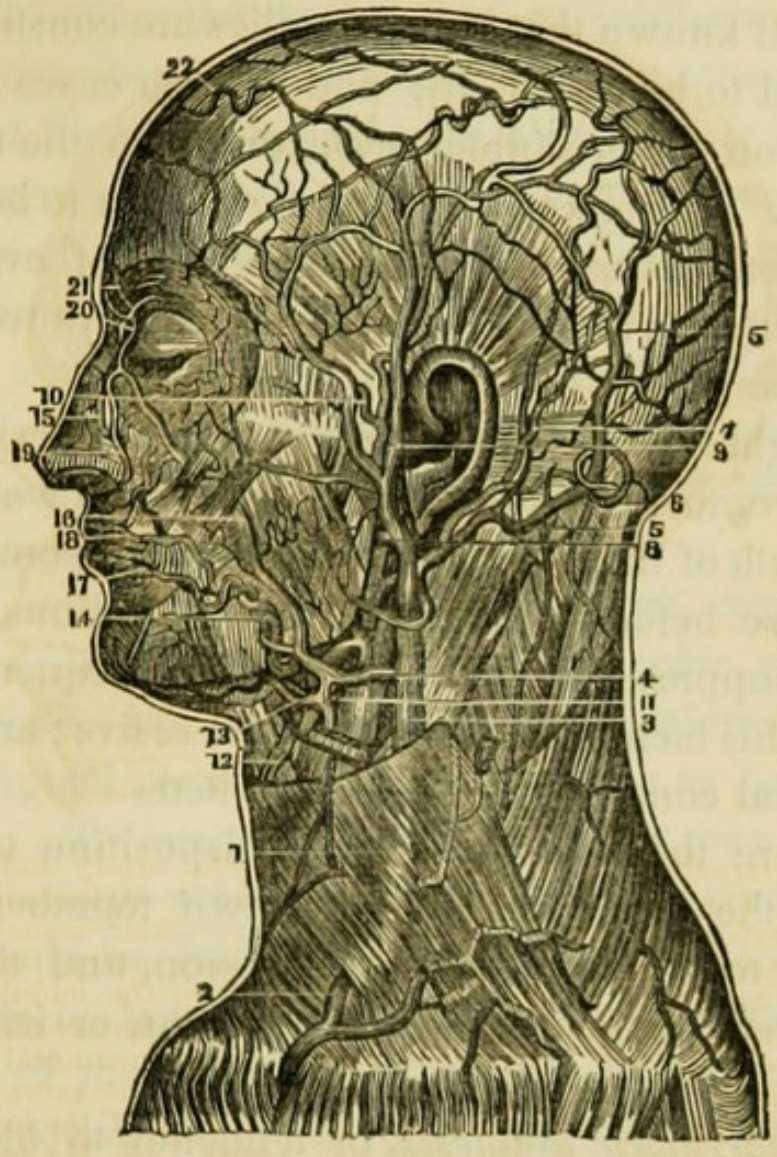
Fig. 19.



1, The external carotid artery. 2, The occipital artery and its mastoid branch. 3, The posterior auricular artery, and its stylo-mastoid branch. 4, The superficial temporal and the anterior auricular branches. 5, The middle temporal artery. 6, The internal maxillary artery, which gives off the middle meningeal artery. 6', The division of the middle meningeal artery. 6'', 6'', The anterior meningeal branches furnished by the ophthalmic artery. 6''', 6''', Divisions of the posterior meningeal artery within the cranium. 7, The inferior dental artery. 7, The same artery in the dental canal, where it sends branches to the teeth of the lower jaw. 8, The masseteric artery. 9, The pterygoid artery. 10, The buccal artery. 11, The facial artery anastomosing with the buccal. 12, The alveolar and posterior dental branches. 13, The infra-orbital artery. 13', The same artery as it appears on the face, passing through the infra-orbital foramen. 14, The deep temporal arteries. 15, The internal maxillary in its passage through the pterygo-maxillary fissure.

Fig. 19 gives a view of those internal arteries which supply the teeth, and fig. 20 (next page) shows their connection with the superficial arteries of the face and neck. This connection accounts for the fact, that, upon the extraction of a tooth, a kind of *drawing* pain is sometimes experienced near the eye, ear, and other portions of the head and face.

Fig. 20.



1, The external jugular vein. 2, The anastomosing branch of the cephalic vein of the arm to the external jugular. 3, The external jugular vein. 4, Communications of the external and internal jugular vein. 5, 5, The occipital vein and branches. 6, The occipital artery. 7, The posterior auricular artery and vein. 8, The point where the external jugular is formed by the union of the temporal and internal maxillary veins. 9, The temporal artery and vein. 10, The frontal branches of the same. 11, The internal jugular vein. 12, The superior thyroid artery and vein. 13, The lingual artery and vein. 14, The facial artery. 15, The point of union between the nasal and facial artery. 16, The facial vein separated from the artery except at its origin and termination. 17, The inferior coronary artery and vein. 18, The superior coronary artery and vein. 19, The ascending nasal vein. 20, The nasal branches of the ophthalmic artery and vein. 21, The frontal vein.

Hæmorrhage may occur after the extraction of a tooth, without any undue force having been applied

and without any deficiency of skill in the operation. It is well known that many families are constitutionally disposed to hæmorrhage; and in such cases it may be excited on much slighter occasions than the extraction of teeth. I have known the same person to be troubled with hæmorrhage after the extraction of every tooth, and members of the same family always to suffer in the same way.

A slight flow of blood after extraction is desirable, and often promoted by the use of a little warm water held in the mouth of the patient; and by allowing some minutes to elapse before tonic or acidulated lotions are used for its suppression. But cases not unfrequently occur, where this hæmorrhage becomes excessive; and serious, nay, fatal consequences have resulted.

Where there is any known disposition to hæmorrhage, the gums should be drawn together with the fingers, to induce a speedy adhesion, and the patient cautioned against sucking the gums, or irritating the part by touching it with his tongue.

Hæmorrhagic diathesis, or tendency to bleed freely on slight occasions, is often hereditary, and then the tendency usually continues through life. It is sometimes only the consequence of peculiar circumstances, especially long illness. It is often very difficult to arrest, and must on no account be neglected.

The bleeding does not always immediately follow the extraction, but sometimes commences hours, or even days, after. When the hæmorrhage is but slight, it may generally be arrested by acidulated washes, gargles, pedulvia, &c.

Various means have been used, and numerous sub

stances applied, to arrest bleeding; but none more effectually than the *matico leaf*, or soldier's weed, so called from its use by soldiers and by others that are wounded, for the suppression of bleeding. It is equally as efficacious in the dried as in the green state; but the difficulty of obtaining it here excludes its general use.

Numerous articles are recommended. *Nitrate of silver* is among the best; it should be used in the solid form. A stick of it may be cut to a point, and pushed into the socket, and there held for a short time. It is productive of very little or no pain.*

Alum, *salt*, *turpentine*, *muriate of iron*, *cuprum*, *tinder*, *powdered agaric*, *resin*, or *gum Arabic*, and many other articles, have been used with occasional success; but continued pressure is the only thing to be depended upon. To accomplish this, some lint may be taken, dipped in some styptic liquor, such as we have named. This should be laid down in folds in the socket, and kept there by keeping the mouth firmly closed, by the pressure of the finger; or, where this is not practicable, as with young children or insane persons, the place should either be bandaged, or something so fixed between the teeth, as to prevent the person's either moving it with his tongue, or sucking it, which is a habit with many.

Filling the socket with *plaster of Paris*, and retaining it in its place until it hardens, has been frequently practised with success.†

These applications will all be found more or less unsuccessful, as the subject is disposed to *hæmorrhagic diathesis*. As local treatment of this kind always has

* London Lancet. † Lon. Med. Gaz.

for its object the closing of the artery, by forming a coagulum of blood, it is found that this can scarcely ever be accomplished in such subjects, unless general and constitutional remedies are also applied.

The blood of persons subject to hæmorrhage is generally poor, or watery, as it is called; that is, the *serum*, or fluid, is more abundant than the *fibrin*, the ingredient which coagulates when blood is drawn and suffered to stand. To remedy this must, therefore, be our object; and we can do so either by reducing the quantity of serum in the blood, or increasing the fibrinous matter, by adding saline ingredients to its composition.

The following preparation will produce both of these effects, and is, therefore, a valuable auxiliary in the treatment of patients predisposed to hæmorrhage:—

Sulphate of soda, . .	1 oz.
Muriate of soda, . .	½ oz.
Chlorate of potash, .	1 drm.

Divide this into six parts, giving one every hour and a half, until purging is produced. An addition of ergot may be made in some cases, as this produces contraction of the capillary vessels. For married ladies, ergot should not be used without great caution; under some circumstances, not at all.

Numerous cases of excessive hæmorrhage have come under our observation, some of which we shall refer to, after recording certain remarkable cases which we have met with in medical works.

In *La Dentiste Observateur*, published in Paris, in 1775, we find the following case, which terminated

fatally, and of which we have made a free translation: —

"A person called on H. G. Courtois, to have a canine tooth extracted. On examining the mouth, it was thought to present a scorbutic appearance; but not sufficiently so to intimidate the operator; nor would the man have consented to delay its removal, for he was suffering intense pain. After the tooth was extracted, it did not bleed more than is usual in such cases. On the following night, however, the operator was called to the patient, who had continued to bleed ever since the extraction. He applied to the socket the agaric of oak bark, which he had usually found successful, and retired. The following day he was again sent for, the bleeding having continued.

After having relieved the mouth from the pledgets of lint, which had been used for making compression at the place from which the blood appeared to ooze, he directed the patient to take some water, to clear his mouth from the clots of blood with which it was filled. It was observed that the blood no longer came from the place where the tooth was extracted, but from the gums.

A physician was called in, who ordered several bleedings* in succession to each other, besides astringents, which were taken inwardly, and gargles of the same nature were used; but these remedies, together with those which he took to give the blood more consistency, were unavailing. It was impossible to stop

* We cannot but think that the physician acted unwisely in ordering bleeding, in a case where the exhaustion from continued hæmorrhage must have been excessive.

the hæmorrhage. The patient died the ninth or tenth day after the extraction of the tooth."

Another case of excessive and obstinate hæmorrhage after the extraction of a tooth, which was successfully treated, we shall give in full; as in this case the excessive bleeding appears to have been induced by the unskilful manner in which the tooth was extracted.

"On Wednesday, the day before Thanksgiving, Mr. G., a respectable merchant, called on me for relief, having been some time suffering from acute odontalgy. The offending member was the second molar tooth on the left side of the lower jaw, and he wished to have it extracted. I referred him to a dentist. The gentleman I named to him being engaged, he waited until the next morning, when again finding him occupied, he submitted himself to another, who extracted the tooth without previously separating the gum from it. A small portion of the inner alveolar process was broken off in the operation, and remained attached to the body of the tooth; and the soft parts in the neighborhood were considerably lacerated. The subsequent hæmorrhage was profuse and obstinate; it continued during the remainder of the day, and abated nothing during the evening and night. In the course of the night the bleeding increased, and the consequent exhaustion was so great that no further delay of medical aid was deemed prudent. Not being able to procure my attendance, another physician was called, who sedulously applied proper local remedies for nearly two hours, but without arresting, and with but little abatement of the hæmorrhage.

"I first saw the patient on Friday morning. The

blood still flowed from his mouth in a continued stream; and he computed the quantity he had lost in twenty-four hours, at two gallons. Judging from what I saw and learned of his case, it could not have been less than as many *quarts*.

"On a minute examination of the parts, I found that the cavity left by the tooth itself was entirely plugged by coagulated blood; and the hæmorrhage proceeded from the vessels that were ruptured by the laceration of the soft parts on the inner side of the jaw. The pulse was small, but not without activity; although the face and hands were rather exsanguious. Considerable prostration of strength was complained of; but only occasionally any sensation of faintness.

"The first step I took was to raise the patient from a horizontal to a sitting posture. A small dossil of cobweb was then moistened in a solution of sulphate of copper, which had been perseveringly used for several hours; rolled and powdered alum was applied with some pressure to the wound, and retained there as long as could be conveniently. Much difficulty was found in this, as the taste was particularly disagreeable to the patient, and every movement of the tongue changed the position of the patulus vessels. This was directed to be repeated as often as necessary, and the patient to be kept cool, and free from excitement and alarm.

"At the expiration of an hour, I found the blood still flowing freely, and without any degree of abatement. I now laid aside all these local astringents; directed cloths wet in cold water to be occasionally held in the mouth; and administered one grain of the powdered leaves of *digitalis*—a medicine that had

seldom disappointed me in any species of hæmorrhage. At the end of another hour, the pulse was less active, and the bleeding had abated, but not much. Two grains of the digitalis were now administered. In an hour after, I found the patient asleep, having been so about twenty minutes, without hæmorrhage. A dose of oil in the evening finished the case. And after taking bark a day or two, Mr. G. returned to his business, and has since experienced no loss of blood, and but little inconvenience from the wound in his mouth.

"This case," the writer adds, "is published because it is thought an instructive one in several particulars; but especially as it illustrates the advantage we may derive from foxglove (digitalis), in circumstances of some embarrassment. If we cannot plug the hose, we can check the movements of the engine." *

Some years since, when the author was at Nantucket, he was called upon by the Hon. S. H. Jenks, to attend his son (Editor of the Nantucket Inquirer), who was suffering from profuse hæmorrhage, arising from the awkward removal of a molar tooth; by which the surrounding gums and socket were lacerated. During the night, he awoke with a suffocating sensation, and found blood flowing from his mouth. He was so weak that it was with some difficulty friends were aroused; and they of course were greatly alarmed.

On perceiving that the blood flowed chiefly from the mangled socket, I placed some pulverized alum on a pledget of lint, pressed it firmly into the cavity, and closed the mouths of the wounded arteries, keeping the

* Bost. Med. Jour.

lint firmly compressed within the socket, and retaining it by fitting a piece of wood between the teeth. The hæmorrhage was immediately arrested, and there was no subsequent recurrence.

FRACTURE OF THE ALVEOLAR PROCESS

Was formerly of very common occurrence, and is so still among those who make use of the key; but it is not exclusively confined to them. Such accidents sometimes occur when forceps are used; but it is a rare case, unless the operator is totally destitute of skill.

But it may ensue without blame to the operator, where the bony portions of the mouth have been softened or rendered brittle by the action of medicine or disease; or again, when the roots of the teeth are either contorted, or hooked into neighboring teeth. So that, however skilful the operator may be, he cannot always provide against these accidents.

In fracture of the alveolar process, portions are splintered or brought away with the tooth. If the fracture is slight, no danger need be apprehended; but occasionally so large portions are fractured, as to cause the loss of several teeth. In these cases much suffering, and sometimes deformity, are the consequence. The following case is related by Mr. Snell, where a barber (who is often in some portions of the country the only dentist) was the operator: —

"A poor man, named Thomas Green, applied to a hair-dresser, famed for his skill in the art, to extract the first molar tooth, on the right side; in doing which, the alveolar process was fractured, to the extent

of three teeth. The bicuspids on one side, and the *dens sapientiæ* on the other; and the two anterior incisors were pressed out of the socket with the shaft of the instrument. Before this case got well, the teeth whose process had been fractured, became so loose as to render their removal necessary. The unfortunate patient, therefore, lost six teeth for his shilling (the barber's fee), instead of one."

We recollect the terror of the key, which we had in our youthful days, having had a dentist (and an M.D. too) spend about five and twenty minutes in efforts to extract a tooth; which finally came away with a splinter of the alveolus more than half an inch in length, leaving smaller pieces to exfoliate for several subsequent weeks.

Where a fracture of this kind occurs, all the particles of bone should be removed; as, by leaving them in the flesh, irritation and inflammation necessarily ensue.

RUPTURE OF THE MAXILLARY SINUS.

This, though an unfrequent accident, occurs sometimes through the awkwardness of the operator. When the fracture is recent, the fragments may sometimes be consolidated, and will knit together again. But, if the bone has been left until ulceration and exfoliation have taken place, it will be necessary to remove every portion of diseased bone, before a cure can be effected.

Rupture of the maxillary sinus is generally the result of too much force being given to the instrument, together with an improper motion. The following well authenticated case is one of the worst that we have met with:—

"A laboring man applied to me with a swollen face, accompanied with a highly offensive discharge of sanies from the mouth, produced by the exfoliation of the lower jaw, extending from the anterior incisor to the ascending spine of the coronoid process. He stated that he had applied to a medical man in the country, to extract one of his teeth in the lower jaw. After applying the instrument and using considerable force, the crown of the tooth was snapped off. A second, though unsuccessful attempt, was made to remove the stump, when the patient distinctly felt the jaw crack, and desired the operator to desist. He persisted, however, in another attempt, which was successful; but it was followed by the most severe and excruciating pain, extending over the whole side of the face.

"On the following day, the face, eyes, and head, were highly tumefied; and the pain was intolerable. These symptoms continued to increase in violence during several days. An abscess formed at the symphysis of the jaw, which pointed and burst externally. The orifice soon healed, and the matter passed into the mouth through several openings.

"At this period I first saw him. Upon examining the mouth, I found a portion of bone extending from the anterior incisor to the *dens sapientiæ*, and comprising the whole base of the side of the jaw, rapidly exfoliating. The mouth was horribly distorted, the integuments having retired from the portion of bone almost to its base; the whole being accompanied by a continual discharge of offensive matter, which, mixing with the saliva, continued running out of the corner of the mouth.

"In six weeks, the bone became sufficiently loose to be readily removed. I directed for his mouth the frequent use of lotions; infusion of roses, with borax, and tincture of myrrh. Healthy granulations were observable, and the part near the symphysis soon healed. A considerable discharge was still kept up from two different sinuses at the posterior portion of the jaw. These were dilated into one, and injections of diluted nitro-muriatic acid were constantly used.

"During the following week, two smaller pieces of bone were extracted, and the whole of the left side of the jaw, from the symphysis to the angle of the base, being now removed, mastication was performed in a very imperfect manner on the healthy side.

"As the parts gradually healed, a substance of cartilaginous consistence could be distinctly felt, situated between the divided ends of the bone at its base. The head was now bound up, so that the remaining parts of the jaw might be kept as nearly as possible in their natural situation; and the former lotion, with infusion of roses, was substituted for the acidulous one. The substance between the ends of the bone gradually increased in size and firmness, and in a fortnight the cavity between the fracture was nearly filled up. The two ends being firmly united, mastication was performed on the healthy side, with scarcely any inconvenience. The discharge soon ceased, and the patient perfectly recovered. The deformity of the countenance was trifling, compared with the extent of the accident; which may be partially referred to the extraordinary rapidity of the cure."*

* Snell on the Teeth.

LOOSENING OF THE TEETH.

Sometimes, in extracting a tooth, the adjacent teeth are loosened; but this is generally the fault of the patient, who pushes the hand of the operator while in the act of extraction, and thus alters the position of the instrument, and the direction in which the tooth would otherwise have come. If the teeth are not much loosened, they may be suffered to remain, and the patient requested to avoid giving them any motion, or eating on that side of the mouth. In this case they will soon grow firm again; but where a tooth is much loosened, it must be treated as in

LUXATION OF THE TEETH.

This is the forcible removal of a tooth from its socket; but not entire extraction. It may be produced by falls, blows, or the awkward extraction of a neighboring tooth. It has been adopted by some as a remedy for toothache; as, by disconnecting the tooth from the nerves, arteries, and integuments which hold it, the pain may be removed without the loss of the tooth. This has succeeded in some few cases; but is always a very doubtful operation.

When a tooth is accidentally luxated, the experiment should, however, be tried. If in a child, it must be replaced with extreme care, and ligatures applied, securing it to other firm teeth; and the child should be cautioned against touching it with its fingers, or moving it with its tongue. Nor should it be suffered to eat any solid food till the tooth has become fixed in its socket.

Replacing is not advisable if the tooth is actually separated from the socket.

FRACTURE OF THE TEETH

May occur either from want of skill in the operator, the brittleness of the teeth, or their extreme softness. The molar teeth, too, are sometimes so firmly rooted, that, in the effort to remove them, they break away near the neck, and sometimes even the instrument applied for their removal is broken. If only the crown of the tooth were diseased, we should be justified in leaving the roots in the socket; taking care to remove any roughness or inequalities by the excising instrument or the file; but where we have reason to believe there is any ulceration or disease of the roots, it must be carefully extracted.

LUXATION OF THE JAW.

Some persons are peculiarly liable to this accident, and, where it has once occurred, the individual is always liable to a recurrence of it, whenever the mouth is opened wide, or by a spasmodic twitching of the muscles, at the time of opening it. By referring to our remarks on the "Structure of the Mouth," it will be seen that a variety of motions are given to the jaw by the muscles employed.

When the mouth is closed, the condyles of the jaw are placed back in the cavities; when the jaw is brought forward in a horizontal direction, the condyles slide forward upon the eminences; and this action

may be performed by them alternately; so that the jaw may be turned from side to side, as in the act of grinding. When the mouth is opened very wide, the condyles are brought forward to the extremity of the articulatory surface, and are raised a little by passing over the convexity. In these motions, the movable cartilage is of great service; it being doubly concave, and thus adapting itself to the rounded head of the condyle, and that part of the articulatory surface which forms an eminence. Steadiness of the jaw is thus acquired in all its motions.

As we have seen, in a preceding chapter, these motions of the jaw are produced by five pairs of muscles; the *masseter*, *temporalis*, *pterygoideus*, *externus*, *pterygoideus internus*, and the *diagastricus*.

When luxation of the jaw occurs, the mouth remains wide open, and cannot be shut by any muscular exertion of the patient. The nature of this accident may be plainly understood by observing, that, when the jaw is luxated, the condyles are advanced so far on the front part of the eminence, that they remove from the proper place of articulation; the posterior edges of the condyloid processes prevent the muscles from drawing the jaw back; being fixed against that part of the eminence where it goes to form the zygomatic process.

In reducing luxation of the jaw, it has been recommended to cover the thumbs with linen, which are introduced between the posterior molars; the base of the jaw should be held firmly by the fingers, and the palms of the hand applied to the chin. The jaw must be pressed down at the posterior part by the thumbs,

and pulled forward a little with the fingers. If the muscles appear to yield, the chin should be raised by pressing it upward with the palms; the condyles thus becoming disengaged from the zygoma, slide back into their proper situations.

Prof. Simpson makes use of a round piece of wood, eight or nine inches long; one end of which is cut into the form of a wedge and introduced between the teeth of the luxated side, with the thinnest part of the wedge as far back as the posterior grinders; when, the the head being secured, and the chin raised, the other end of the wood is pushed upwards, to depress the back part of the jaw with the thin end.

The advantage of this mode of operation consists in the increased power of the wedges over the thumbs.

We have been thus prolix in the description of this accident and its treatment, because, though not usually attended with danger, or very frequent in its occurrence, yet, as every dentist is liable to meet with such a case, he should be prepared to replace the jaw without exhibiting either confusion or alarm; besides that, it has not been fully treated of by most writers on dentistry.

We have thus enumerated the most common and serious accidents that may result from extraction, and shall barely mention two or three more, which sometimes occur. *First*, The extraction of two or more teeth, when only one is intended to be extracted. This can result but from two causes; either gross ignorance and inability on the part of the operator, or from the union of the fangs of the teeth in such a way that the

result is inevitable. In the latter case, of course, no blame can attach to the operator. *Secondly*, It may result from mistaking a sound tooth for a diseased one. This usually results from unpardonable negligence on the part of the operator, and is only equalled by the blunder, which has sometimes been perpetrated, of drawing a permanent, instead of a deciduous tooth. Where it is practicable, teeth thus drawn by mistake should immediately be replaced.

From the multiplicity and serious nature of some of the accidents resulting from the awkward and improper extraction of teeth, we see the imperative necessity of the dentist's being perfectly acquainted with the structure of the teeth, and of the surrounding parts.

CHAPTER XXI.

ARTIFICIAL TEETH.

CONTENTS. — Alteration of countenance from loss of teeth. Appearance presented when the upper, lower, or the whole of the teeth are removed. Objections to the use of artificial teeth. Conscientious scruples, spectacles, crutches, &c. Transplanting human teeth. Teeth from dead human subjects. Various kinds of bone and ivory. Mineral incorruptible teeth. Mineral teeth of French invention. M. Duchateau's first experiments. M. Chamant's continued experiments. Medical Society of Paris. Advantages of dentists' making teeth for their own use.

Notwithstanding all the means to preserve the teeth, very seldom do we find all of them (when decay has once commenced) retained to the end of adult life. Local and general disease, combined with accidents, removes them before we are either willing to remain with a countenance disfigured from their loss, or lose the pleasure derived from their use.

The alteration of the countenance by their absence is material, and known by hollow cheeks, premature wrinkles, extended mouth, and imperfect voice. Frequently the superior incisors are first lost. In this case, the upper lip draws up in the middle; the lower projects, the cartilages of the nose approach, and the point assumes a downward position, which brings the nose and chin in close proximity to each other.

If the whole of the superior teeth are lost, the inferior jaw projects unduly, or appears to do so, on ac-

count of the shrunken and diminished state of the upper. For, as we have before observed, where teeth are lost, the alveolar processes are brought together or absorbed, and thus considerably diminished in size.

Nor is the absence of the lower teeth without its unpleasant effects upon the physiognomy. The lip falls down, or sinks towards the interior of the mouth, and the chin gradually approximates to a point; though the effects in the countenance are not so great as follow the loss of the upper teeth.

When the whole are gone, we perceive, in addition to the above marks, that the cheeks are flattened, become flaccid, and sometimes hang down; the mouth is elongated, the jaws present a square appearance, and the whole contour of the face is altered, and the subject hurried rapidly into old age. Few people long survive the entire loss of teeth. Mastication and digestion is seriously interfered with, and often the person is troubled with an involuntary flow of saliva.

OBJECTIONS TO THE USE OF ARTIFICIAL TEETH.

We have met with some persons who regarded the use of artificial teeth as analogous to the wearing of finger and ear rings, and other ornaments which they condemn. Not long since a lady called upon us, who *wanted* some artificial teeth, but thought it was an indulgence of pride, and that she ought to go without them, and thus mortify the flesh. She was for some time unable to decide between her desire for the teeth, and her conscientious scruples.

Indeed, we have met with persons, who not only declaimed against the use of them, as an evidence of folly and vanity, but even asserted that it was wicked, and contrary to the design of Providence. Only a few weeks since, a person remarked, that, "after the Lord had taken away the teeth, it was presumptuously tempting the Lord to supply their place with artificial ones." Yet this person wore a wig, and used spectacles.

But we deny that, in most cases, it is the Lord that has taken them away. We affirm rather that they have been lost by neglect and carelessness. But admit it a providential dispensation; this is no argument against the use of artificial teeth. On the same principle, if a person lose a limb, he must not get another; if lame, he must use no staff; if his eyes are dim, he must not aid his vision with spectacles; nor use an ear trumpet, if a little deaf.

A conscientious old lady actually advanced similar objections to these, while examining some artificial teeth, through *spectacles*, and hearing my observations thereupon though an *ear-trumpet*.

Such unfounded scruples as these, would, if carried out to their legitimate consequences, do away with every soothing and meliorating compound for the sick and wounded. Teeth are necessary, as masticatory organs, to the full enjoyment of health. We are justified, nay, under obligation, to do all that we can for their preservation, and to supply others in case of their loss.

But again it is urged, that however well artificial teeth are made, they can never perform all the func-

tions of natural ones. This is true; but does it follow, because a man cannot walk so fast nor so far on a wooden leg as he could before losing the original, that therefore the former is of no use to him? Or, because spectacles do not restore to the old man's eye the brightness and vivacity of youth, that therefore he might better dispense with them?

We do not contend that artificial teeth are as good as a strong, sound set of natural ones; but we do say that they are infinitely better than a mouthful of black, diseased, painful, or broken teeth.

HUMAN TEETH

Have been used artificially, by transplanting, or excising the crown, and mounting them upon a metallic basis. The practice of *transplanting* is hazardous, from the number of circumstances necessary to be combined to insure a favorable result; and success can never be calculated on with certainty. A tooth which has been drawn and replaced, does not always grow again in the same socket. Much less likely will a tooth become firm, when fitted, by filing, into a different socket. Again, transplanted teeth decay, generally become troublesome, and often have to be removed. Disease has also been communicated by the transplanting of teeth from one mouth to another.

But a dental millenium has dawned upon us in the consummation so devoutly wished for, of a process by which, from imperishable materials, teeth can be carved or moulded in any way fancy may dictate, or

necessity demand, and with an enamel so translucent and brilliant, that it appears almost as beautiful as that which is so delicately finished by the finger of God.

We think the practice of transplanting teeth morally wrong, and, although we have set thousands, *in no instance have we ever translated a tooth from one mouth to another*, although application has frequently been made to us for this purpose.*

Some time since, a young girl came into my office, closely veiled, and after waiting some time, until the company I was engaged with had retired, she arose, and hesitatingly threw aside her veil, displaying a front row of beautiful white teeth, like a semicircular colonnade of pearls. She observed, "I have a number of teeth that I wish removed, and have called on you for that purpose." I remarked that her front teeth were uncommonly good, and supposed, of course, that the molars were the candidates for removal. But examination revealed no decay on any of them. "It is the front teeth I wish to have extracted, sir," said she, in a tremulous voice, with an effort to speak calmly. "The front teeth?" I inquired; "Do they ache?" at the same time examining their posterior surfaces with a concave mirror, to magnify into visibility any lurking caries. "No, sir." "Pray, why then do you wish them extracted?" said I, gazing at her pure white teeth with

* Only a few years since, human teeth were the subject of traffic to such an extent, that battle fields and hospitals were searched for them; and they were taken from the mouths of malefactors, and the jaws of dead and living slaves; and they were also found to have been forced out of the mouths of those who were "*Burked*" some years since in England.

astonishment. "I wish to have them taken out, and prefer you should perform the operation." "Which?" I inquired. "Oh, commence with the eye teeth," at the same time placing the extremity of her delicate finger upon a cuspid; "and take out these six, the front and eye teeth." I was much surprised, never having met with a similar case; and objected to taking them out. She inquired my price for extraction, and offered me double the usual fee, if I would at once remove them. After some little conversation, she told me that a lady (?) had agreed to give her $30 for her front teeth, stating at the same time that her mother was sick, and that she was anxious to obtain the money.

Intending to test her courage and sincerity, I requested her to be seated in the operating chair. I then took a sharp lancet, and showing her its keen, shining edge, deliberately cut round the eye tooth. Not a muscle quivered. Grasping, then, a formidable-looking but obselete instrument, I requested her to remain perfectly still. She nervously clutched the arms of the chair, and bracing her head back, as the perspiration started from a thousand pores of her face, which more resembled Parian marble than flesh and blood, she closed her eyes, and with martyr-like determination was awaiting the coming struggle; when — I positively refused to extract a single tooth for her. A tear trembled in her eye as she again offered me an increased fee, if I would take out the four front teeth. I endeavored to make her realize the extent of the loss, and reminded her of the pain of the operation; but love outweighed every argument, and kept her resolute.

Finding me immovable in my refusal, and that neither her money nor entreaties could induce me thus to mar the handiwork of nature, the reaction came; the muscles of her face lost their rigidity; she burst into tears and wept like a child.

This is no ideal description, but a truthful delineation of an actual occurrence; and should this page meet the eye of the person who sent that young girl to my office, in order to appropriate those teeth, I can assure her that I can set her six teeth, so nearly resembling the natural, that she will never regret the substitution of porcelain for human; and that while using them (provided they are paid for), her reflections will be much pleasanter than if she had deprived a young person so unnecessarily of hers.

Since writing the above, an amiable lady (daughter of the late Dr. P.) informed me that she saw her in my office, and, from certain remarks, mistrusted her mission, and kindly advised her by no means to have her teeth removed.

MINERAL INCORRUPTIBLE TEETH.

These are of French invention. M. Duchateau, an apothecary, residing in St. Germain, in Laye, had a set of ivory teeth, which caused him considerable inconvenience, and he was therefore desirous of finding some substitute that would be more suitable and agreeable. He conceived the idea, in 1774, of making them with porcelain. M. Guerhard (proprietor of a porcelain factory, at Paris) made some for him; but

they failed through the contraction of the material in baking.

To remedy this, M. Duchateau then used finer porcelain, which vitrified at the temperature of from one hundred and thirty to one hundred and forty degrees (Wedgwood's hyrometer), with which he partially succeeded. He then applied to M. de Chamant, an eminent dentist of Paris (afterwards author of a "Dissertation upon the Advantages of the New Teeth," &c.). To the fine paste already prepared, was added several coloring earths. It was found that these added to the fusibility of the compound, and the process of baking was thus facilitated. After numerous trials, a grayish-white set, with a yellowish tinge, was produced; the best which had yet appeared; the shape being less changed than in previous attempts.

Of these he fitted a set for himself, and was now sanguine about furnishing them for others; but he failed, being no dentist, nor a good mechanic. Afterwards he communicated his process to the Royal Academy of Surgeons, in Paris, and received the thanks of the Academy, and an honorary membership.

M. Chemant, however, continued his experiments, and, by adding to the previous composition marl, red oxyde of iron, cobalt, Alicant soda, and Fontainbleau sand, he finally succeeded in making sets, and twelve years later he obtained from Louis XVI. a patent for the invention; but that honor belonged to M. Duchateau, who disputed the claim, and entered a protest, but failed to make his claim good.

Many of the learned and scientific associations in

Paris encouraged their manufacture by flattering notices, and by offering prizes.

The Medical Society of Paris proposed a series of questions* and offered a medal to any one who would satisfactorily answer them.

Though France may claim the invention of mineral teeth, yet they have never been brought to so great perfection there as in this country. Nor were they, in this country, for some years, made so natural in appearance as at the present time. The chief objection to them at first was, that they did not successfully imitate the natural teeth; but presented a dull, opaque appearance. But within a few years this objection has been obviated, and teeth are now manufactured by myself and others, which, when inserted, it would be impossible to distinguish from the natural teeth.

Since the introduction of porcelain teeth, this branch

* As we have not seen them translated, we now submit them for the benefit of those readers to whom they may be interesting.

1st, What are the grounds of preference for porcelain over animal materials for the construction of teeth?

2dly, What are the most simple and economical means to be employed for composing and coloring the paste, as well as the enamel, and for baking them?

3d, Is the purple precipitate of Cassius (oxyde of gold precipitate, with the muriate of pewter) preferable to all other substances for coloring the gums, as occasion requires? What is the manner of using it?

4th, What metal is used by physicians or chemists, which is more suitable than any other, and can be prepared most easily, to unite the teeth after they are baked?

5th, What are the most advantageous mechanical means for setting the teeth and adjusting them in the mouth, without injury to the natural teeth? — *Traité de la Partie Mechanique de l'art du Chirgien Dentiste*, par O. F. Delabarre, pp. 111 and 112.

of dentistry has become much more popular, both from the greater durability of the material, and the comfort with which they can be worn. It is, therefore, of importance that their manufacture and insertion should be perfectly understood. It is not merely sufficient to understand the general principles of the art, nor to be an expert and skilful mechanic. So great is the diversity of cases presented, that there is greater improbability of two being exactly alike, than of two human faces perfectly resembling each other. Hence the absolute necessity of a dentist knowing how to make particular teeth for particular cases. And though the substitution of artificial teeth is of immense benefit where the work is properly done, yet the insertion of artificial teeth in an improper manner has produced much injury.

Great nicety in the mechanical construction is necessary; but *there must also be correct surgical and anatomical knowledge.* Sometimes the improper and mechanically incorrect insertion of a tooth has caused the loss of the adjacent teeth.

Although it is not *always* necessary for dentists to make their own teeth, yet it is necessary, in order to be prepared for any peculiarity or contingency that may be presented. The manufacture of teeth takes much time, but no dentist of any practice should trust *exclusively* to others so important a branch of his business.

We make most of the teeth that we use, and are always prepared to make them for any case, however peculiar it may be, assured that we can meet it successfully.

To become master of this branch of dentistry, much time, patience, and extensive practice, are necessary; but the satisfaction of seeing our patients improved, both in appearance and health, should induce us to strive for excellence in every branch of our profession.

CHAPTER XXII.

SURGICAL PREPARATION OF THE MOUTH.

CONTENTS. — Condition of the patient's mouth to be considered before insertion of artificial teeth. Time for absorption of alveolar process. Temporary sets of artificial teeth.

Though artificial teeth are prepared with great skill, and fitted with mathematical precision, yet if the mouth, from any cause, be in a diseased state, artificial teeth can never be worn with comfort by the possessor, nor with credit to the operator. It is, therefore, necessary, before insertion, whether by pivot or on gold plate, that the gums and mouth should be faithfully examined, and every thing needed to restore the mouth to perfect health should be scrupulously attended to.

It almost invariably happens, that where artificial teeth are required, unless the natural have been lost by accident, the gums and remainder of the teeth are in a more or less diseased state. Every thing, therefore, that contributes to this state, should be removed; such as old roots, or fangs. Carious teeth should be filled, and the health of the gums especially insured.

Where the roots are wanting, or have been extracted, it is necessary, before inserting teeth on plate, to

allow sufficient time for the absorption of the alveolar process. After the removal of teeth, the maxillary arch contracts; and if teeth are inserted before this absorption takes place, and the gums become hard, although they should fit never so well at first, they will, ere long, be unsuited to the reduced size of the gums, and will be unfit for use. And although patients are frequently unwilling to wait the necessary time, usually several months, no importunity should induce premature insertion; as such work will never give permanent satisfaction. The dentist who values his reputation, will refuse to comply with the *impatient* wishes of his patient.

Temporary teeth may be set on gold, platina, or silver, and worn until the alteration in the maxillary arch is complete, and the mouth is in a fit condition for the reception of the permanent set.

CHAPTER XXIII.

PIVOT TEETH.

CONTENTS. — Preparation of the root. Suitable articles to be used for pivots. Pivots recommended by Maury, Lefoulon, Prof. Harris, &c. The author's plan. Ulceration of root after insertion of pivot teeth — remedy.

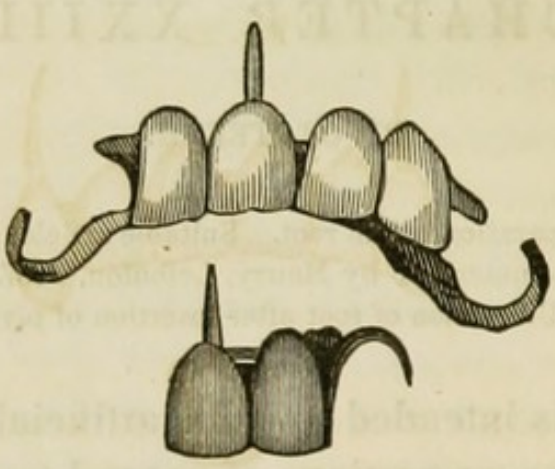
Where it is intended to affix artificial teeth by pivots, the crowns, or portions of natural teeth remaining, must be removed by excising forceps; or, if more convenient, the saw may be used. The process of filing is tedious, and more unpleasant. The roots, however, should be filed, to render them smooth and even with the gums; and care should be taken not to split the root.

If there is reason to suppose that the roots are ulcerated, the pivoting of teeth on them should not be attempted. The roots should be extracted, and teeth on gold plate inserted.

Various articles have been recommended for pivots; as gold, with silk or cotton wrappings, platina, wood, &c. There have been very decided and different opinions expressed as to the propriety of each. Dr. Fitch strongly recommended the use of lead pivots; one objection to which is that lead will oxidize in the mouth.

Maury advocates the use of platina or gold pivots, wrapped around with thread, silk, cotton, or, better yet, filaments of *Betula alba, Lin.* (the birch tree), which he asserts can longer bear maceration without decay. All of these he dips in varnish before insertion.

Fig. 21.



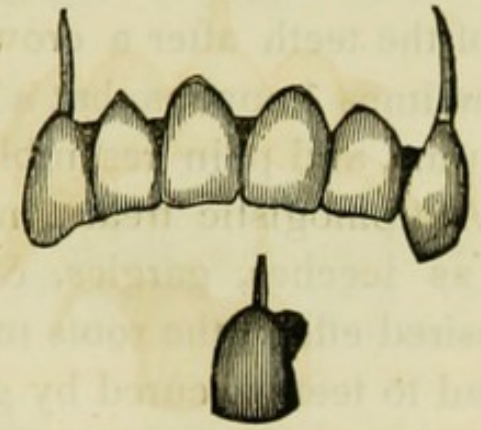
First figure represents four front teeth fastened by one pivot and two clasps.

Second figure, two front teeth, secured by pivot and clasp.

Lefoulon advises the use of gold or platina pivots, wrapped around with gold, lead, or platina leaves. Kœcker says that pivots should be made only of fine gold or platina, and objects strongly to the use of wooden pivots; which, however, have been highly recommended by many, and are referred to by Prof. Harris, as by no means objectionable; while *he* uses a "gold pivot encased in thin layers of wood, made in the following manner: — The gold is first formed into wire, of the proper size, and passed through a screw plate. On one side of it a small groove is cut. A hole of the size of the wire is then drilled lengthwise through the wood as far as may be required. Into this the wire is screwed, and then cut off close to the wood,

which at the end is whittled down to the size of the cavity in the artificial crown, and firmly pressed into it. The wood at the termination of the wire is then trimmed to suit the cavity in the root, and that part of it which covers the groove in the gold wire is removed with the point of a sharp knife-blade."

Fig. 22.



First figure represents the four superior incisors, with the *cuspidati*, to be attached by pivot to the latter.

Second figure, a single incisor, to be inserted in the same way.

We have tried several of these varieties of pivots; but for some time have used a kind, peculiar in its construction, but we think superior. Our plan is — after enlarging the dental cavity by means of the drill, to insert a cylinder of walnut, within which is placed a gold cylinder. A gold pivot, attached to the crown intended for insertion, and fitted to the metallic cylinder, is then inserted.

The advantages of this method are, *First*, that the wooden cylinder prevents the gold pivot from wearing the interior of the tooth; and being lined by the gold cylinder, is protected from the humors of the mouth, and is thus prevented from becoming offensive. *Sec-*

ond, it can be removed at pleasure; the necessity of which, however, may be obviated, by a small hole drilled through the posterior portion of the artificial crown of the tooth, to permit the escape of any purulent matter which may form at the root, provided the *pivot* is cylindrical.

From some undiscovered lurking disease in the gums or roots of the teeth after a crown has been pivoted on, it sometimes happens that a boil, or abscess, forms on the gums, and pain resembling odontalgy is experienced. Antiphlogistic treatment should first be pursued, such as leeches, gargles, &c. If these do not have the desired effect, the roots must be removed, and recourse had to teeth secured by gold plate.

In all cases great care should be taken not to wound the gum, as it may become inflamed. Nor should any portion of dead matter remain in the dental channel. We think by far too many teeth are set on roots, either ignorantly or to save expense; and that they often diminish materially the comfort and health of the patient. The elevation of the profession, and the good of the patient, should be paramount to every other consideration.

CHAPTER XXIV.

ARTIFICIAL TEETH ON GOLD PLATE.

CONTENTS. — Taking wax, plaster, and metallic models. Soldering. Kind and quality of gold to be used in the construction of plate. Teeth attached to plate secured by clasps. Ligatures. Case of a lady. Hooks. Spiral springs. Description of teeth worn by Aaron Burr.

There are various ways of attaching these teeth to give them stability and a natural appearance, viz.: by pivots, springs, clasps, hooks, ligatures, and by atmospheric pressure, each of which we shall notice.

Whichever kind is used, it is first necessary to take an accurate impression of the mouth. For this purpose, wax is usually employed; some use the yellow, others white.* Whichever substance is used, it must first be softened by immersion in warm water or by fire (it must be equally diffused with heat, or it will be brittle); then placed in a tin mould of the form of the jaw, that it may be pressed firmly upon the whole surface of the teeth and gums of which you wish to obtain an

* An eminent French dentist recommends,

White wax,	12 parts,
White lead,	1 "
Oil,	½ "

impression. If a partial set only be required, it will still be necessary to take an impression of several of the adjoining, and sometimes of the antagonistic teeth, so as to be able to judge of their relation to each other. It is necessary to use great care in withdrawing the wax from the mouth, so as not to injure the shape. Wire pins should be placed in each depression, to give stability to the plaster teeth. To color the wax, some dentists add vermillion, cochineal, &c. The wax impression should not be allowed to cool too suddenly. The next process is to obtain a mould of greater consistency. For this, plaster is used; it should be of the finest kind, calcined, and pressed through a sieve. The wax model should be anointed with a little sweet or olive oil, applied with a camel's hair pencil; a raised guard of putty, mastic, or paper, should be placed against the border of the wax. The plaster being mixed with water till of the consistence of cream, is then poured into the mould; additional plaster may then be stirred in. If a little salt is added it will harden more rapidly. The plaster should be poured in slowly, or air-bubbles will be formed. The plaster cast should be made deeper than the wax, and should remain until it has hardened. It must then be separated from the wax; after which it should be thoroughly dried.

To procure now a metallic cast from this plaster impression is our object. Prof. Harris recommends cutting the teeth from the plaster mould before taking a metallic cast, as the plate can be more easily fitted to it. One method of obtaining a metallic mould is the following: — "Take a box with movable cover and bot-

tom, four or five inches square and two or three deep. Place in this the plaster-cast, teeth upwards, over which sift lampblack till the surface is covered; then fill up the box with fine sand, a little moistened with water and molasses; press this down firmly and evenly; put on the cover, and invert the box. The plaster cast should then be removed by inserting in its base a sharp instrument, by which it may be withdrawn without disturbing the impression in the sand. Into this pour your fused metal, and let it remain till cool, when it may be withdrawn." The object of obtaining these metallic moulds is that we may have a substance of the right form, hard enough to shape the gold plate upon. But to do this effectually, we need a counter mould; for to stamp gold plate into a desired form, it must be placed between two bodies more resisting than itself. A counter mould may be obtained by holding the plaster cast in a cup of fused lead until it cools; then withdraw it. Another method is to take a lump of potter's clay, into which sink your plaster cast; then withdraw, and fill up the impression with melted tin, which, when cool, may be easily removed. The counter mould should be of softer material than the cast.

The following recipes for metallic casts and counter moulds, are used by many dentists:—

"For 11 lbs.

Metallic Cast.

5 parts bismuth,
3 " lead,
2 " block tin,
1 " quick-silver.

"For counter model, take of the above 5 lbs. and add 1 oz. of quick-silver to each."

After many experiments, we fuse block tin (in an iron cup), for the model, and lead for the counter model.

We coat the upper surfaces with a little lampblack or whiting, to prevent the union of the two metals, which are easily separated when desired, by a slight blow of a hammer.

After obtaining metallic and counter models, cut a pattern of the alveolar ridge where the plate is intended to fit, and having marked this out on the gold plate, cut and adjust, with pliers and hammer, to the model; anneal it, and place it between the two casts, where it must be fitted accurately for the place intended.

Having shaped the plate to the desired form, place it upon the plaster model, and proceed to arrange the teeth. To secure them in their position, they should be sustained by wax placed behind them. The number being selected and position arranged, adapting them perfectly by grinding, if necessary, we proceed to fit to the back of each tooth, by means of platina rivets, linings, or stays. They must be again fitted to the plate. If block teeth are used, the stay should go the whole length of the block. The work is then transferred to a piece of charcoal. A mixture of calcined plaster and water (to which may be added sand or charcoal) must be applied to the whole of the anterior surfaces of the teeth, and should cover their summits and extend around to the inside of the plate, to the depth of three or four lines. When this becomes hard,

the wax may be removed by a knife, or by melting. Should any interstices be discovered between the stays of the teeth and the gold plate, they should be filled with gold foil.

The parts to be soldered should then be washed with powdered borax and water, while a little piece of solder should be placed at each joint, or place of junction. It is always safest to solder over the rivets.

A diffused heat should be first thrown by the blow-pipe until the plaster is reduced to a red heat; when the flame should be concentrated, in succession, to the required points, until the work of soldering is completed. The plaster should now be removed, and the plate and teeth cleaned, by boiling for a few minutes in diluted sulphuric acid. Then wash in pure water, burnish, &c.

Dr. Bladin, of South Carolina, has recommended the following recipe for decomposing and clearing the plate of the copper which flows on to the surface during the process of soldering: —

" Pul. Nitrate potassa, ℥i.
Muriate of soda, ℥ss.
Alumin, . . . ℥ss.
Water . . . ℥vi.

" After boiling in this mixture half an hour, it should be again boiled the same length of time in six ounces of water and half an ounce of sub. carb. of soda, for the purpose of neutralizing the acid, and again in water to remove the soda."

In every case the plate should be thick enough to support the teeth firmly, without being clumsy or un-

comfortable in the mouth; and gold of the best quality should be used. Clasps, or hooks (which require more strength), cannot be made of so fine material. Silver alloy should be used for the plate, but copper is necessary for clasps, to render them sufficiently hard to retain the required shape.

Fig. 23.

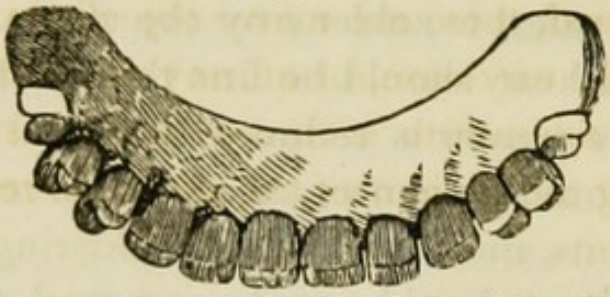


Fig. 23 represents ten upper teeth, to be fastened by clasps on either side to a molar.

Where artificial teeth are *attached to plate, and secured by clasps* to the natural teeth which remain, care must be taken to construct them in such a manner, as to render them perfectly easy of removal as often as is wished for the purpose of cleaning them. It is likewise important that they should not be too tight, or crowded too much upon the other teeth, as they would thereby be injured; being thus rendered loose, and always uncomfortable to the wearer.

One tooth or several can be secured in this way, and attached to such teeth as remain, with perfect ease to the patient, if proper attention be paid to the accurate adaptation of each part of the plate and clasps, to the teeth, and the vacuities of the mouth.

It has been common to fasten artificial teeth in the mouth by means of *ligatures;* which consisted of fine threads of gold or platina, the Chinese root, or threads of unboiled silk twisted, and then drawn out, and

finally covered with copal resin ; Florence hair (or silkworms taken just as they are about spinning), or even common silk threads. Of these, Florence hair, being transparent, is not so plainly perceived upon the tooth ; but it soon stretches, and needs to be replaced. Metallic wires are very objectionable, as they soon cut through the enamel of the tooth to which they are attached. Indeed, there are many objections to the use of ligatures in any case, or of any material; and we should never attempt to secure teeth in this way, without informing the patient of the probable results.

Fig. 24.

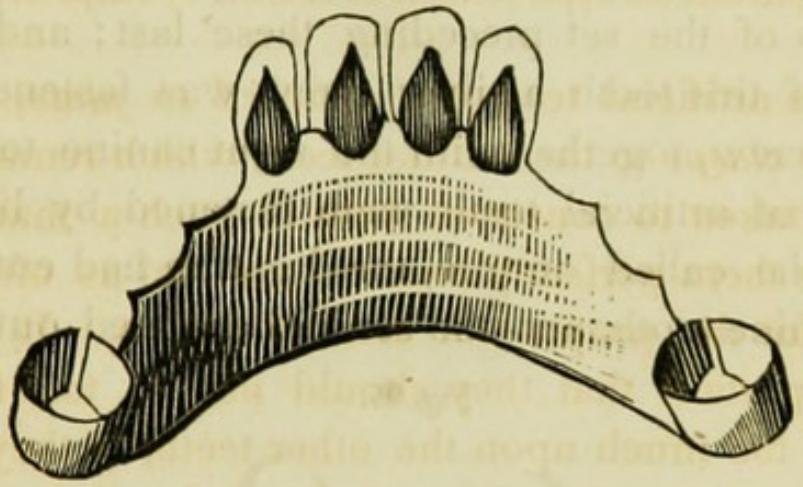


Fig. 24 represents four incisors attached to a plate, to be secured by clasps to the first molars.

It usually follows that the adjacent teeth are either loosened and worried *out* by ligatures, or their crowns excised. It is difficult to remove them for the purpose of cleansing, or for any other object; and if tied sufficiently tight to be firm, are very uncomfortable; and if not so, the teeth are continually being moved by the tongue, and are unpleasing to the eye, and a source of annoyance to the patient.

The following case illustrates the injurious effects of ligatures:—

"A lady had several sets of teeth placed in her mouth at different times; but disease, probably induced or aggravated by her artificial teeth, had destroyed nearly all her back teeth; and the artificial ones had done the same for her front teeth. The canine teeth were so firmly placed in their sockets, as not to be readily moved by the weight of the other teeth; and the ligatures, instead of pulling them out, cut them off. At the time when her last set of artificials were inserted, she had lost all of her upper ones except the right canine tooth. The left canine had been cut off by the ligatures of the set preceding these last; and to the stump of this tooth a silver screw was fastened; and to this screw, together with the right canine tooth, the last set of artificial teeth were fastened by ligatures. When she called on me, the ligature had cut off the right canine tooth, and the set had dropped out."*

Fig. 25.

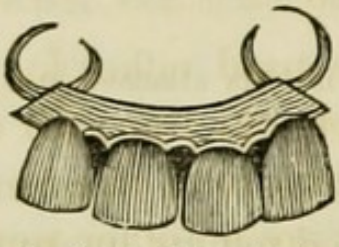


Fig. 25 shows the old style of attaching the teeth by clasps. The awkward appearance they present has caused them to be discarded by scientific dentists.

This is not an unusual case. We have seen tooth after tooth thus destroyed, in rotation, by this reprehensible process.

* Fitch's Dental Surgery.

Hooks are little half-rounded clasps, which are soldered to the plate, and partially embrace the natural teeth, to keep the artificial ones in place. These branches, or claws, when it is practicable, should be placed on the posterior part of the teeth, so as not to be visible when the mouth is opened.

Fig. 26.

Fig. 26 represents three molar teeth with a stay the whole length, and fastened by half clasps, or hooks.

Springs differ from hooks, and are used to attach several teeth; passing between the teeth which intervene, till they reach a posterior tooth, or one which offers a firm support.

Fig. 27.

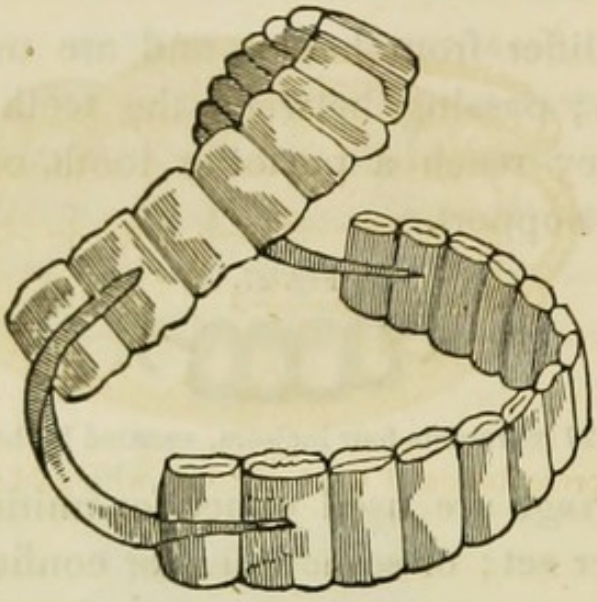
Fig. 27 represents four incisors, secured by hooks.

Spiral springs are used either for uniting an upper and an under set; or sometimes for confining only an under set, or even portions of sets, in the mouth. They are used when there are no other teeth to attach them to by clasps or hooks. When rightly proportioned and properly secured, they are firm and convenient, and in nowise interfere with the action of the jaws. Though they feel awkward at first, the patient soon becomes accustomed to them.

Fig. 28 is a fac-simile of the teeth worn by Aaron

Burr, and the "originals have been washed by many a sparkling glass of old Madeira, and have probably discussed more good dinners of roast beef and plum pudding, than any set of artificial teeth now worn in America, and articulated more accents of the *real poetry* of love, than any *false* teeth ever worn by man or woman. If *with such a set of teeth*, he could, by his soft speech, enamor scores of ladies, married and unmarried, we should certainly be inclined to circumscribe the liberty of the man (old or young) of Burr's temperament, who wore a full set of *modern teeth* in his mouth."*

Fig. 28.



These teeth were made by Fouchard, in 1746. Fouchard was one of the most eminent dentists of the age in which he lived. He resided in Paris, and was one of the first who introduced full sets of artificial teeth to supply the loss of the natural ones. From

* Dental Mirror, for 1845.

1746 to 1825, very little improvement was made in supplying artificial teeth. From 1830 to the present date, the improvements in this branch of dentistry have been wonderful indeed. In this set of Fouchard's, the bare teeth, it is observed, are made to rest on the gums, upper and under. For a moment please examine the full set here introduced (Fig. 29), adapted with spiral springs. The broad, gold plate, perfectly adapted to the gums and mouth, shows in prospective a state of comfort almost to be desired, rather than dreaded.

Fig. 29.

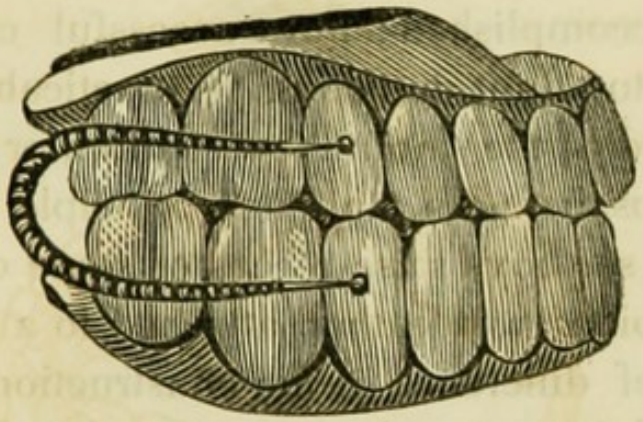


Fig. 29 is a representation of a set of teeth, with gold spiral springs.

CHAPTER XXV.

TEETH SECURED BY ATMOSPHERIC PRESSURE.

CONTENTS. — Great precision in taking model necessary. Advantages of teeth secured by atmospheric pressure.

It was for some time doubted whether this could be actually accomplished; but successful cases are too numerous to admit doubts of its practicability. Teeth are attached to the mouth by suction, or the pressure of the atmosphere, on the same principle on which we sometimes see boys raise pieces of stone or brick, with a circular bit of wet leather, attached to a string.

The chief difference in the construction of plates to be retained by atmospheric pressure, is in the depth of the alveolar border, and the extent of the surface which it covers; but *more depends on the exactness of the fit than the amount of surface.* For the upper set, by this principle, is required a broad, thin plate of gold, exactly fitted to the arch of the mouth, and the ease with which it is sustained is in proportion to the precision with which the plate is adapted. Where the jaws and alveoli are very flat, atmospheric pressure will not be so successful.

Teeth, when well constructed and inserted by this

process, possess great power of adhesion, and are retained in the mouth with more comfort and convenience than those attached by any other means. They are also easily removed and replaced; which is a great advantage, as *artificial teeth* need cleansing as frequently as the *natural*, to prevent the deposit of tartar and the adhesion of particles of food. It often takes weeks, and sometimes months, for that perfect adaptation of the gums and plate, which is requisite for masticatory firmness. For articulation and elegance, they amply repay all trouble and expense, irrespective of *mastication.*

Fig. 30.

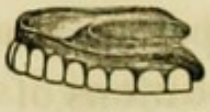


Fig. 30 is a miniature representation of a set of upper teeth, to be attached by atmospheric pressure.

CHAPTER XXVI.

PALATINE DEFORMITY.

CONTENTS. — M. Delabarre on modification of the human voice. Loss of the *vellum pendulum palati*. Obturators sustained by sponge. Obturators with teeth, &c.

M. Delabarre, in speaking of the influence of the palate upon the modifications of the human voice, compares the palatine arch, augmented by a complete series of upper teeth, to the wide extremity of a horn. The player, by closing this wide part, renders the sounds sharper or deeper, according as he makes the closure more or less complete; so also when the palatine arch has been diminished in extent, and especially when it has lost its concavity, the sound of the voice becomes acute and effeminate.

An excessive flattening, produced by the total loss of the upper teeth, gives to the speech the nasal tone, so remarkable in very old people. By only considering the palate relatively to individuals yet in the flower of their age, whose mouths still contain an uninterrupted denture, M. Delabarre affims, that upon its form depends all the infinite variety of voice.

Individuals, whose voice is a common pitch of bass,

have, according to him, regular teeth, and a vast palate, under which the sounds seem to travel at leisure ; while a piping and guttural voice results from a flattened palate, which may be either large or narrow. Finally, a nasal voice proceeds from a mouth, the palate of which, instead of being a rounded arch, presents an angle.

Whether these remarks are correct in every particular, we will not undertake to say, not having examined the matter so thoroughly as the author prefesses to have done. That the palate exerts a great influence on the speech, is ascertained by the voices of those whose palates are deficient or deformed.

Where there is a loss of the *vellum pendulum palati*, the irritation produced by any foreign substance touching the posterior part of the tongue, or fauces, renders the efficacy of any substitute extremely doubtful.

The *ossa palati* are subject to *exostosis*, by which the arched form of the roof is destroyed; a cartilaginous substance is occasionally formed.

Disease of the palate is either congenital, accidental, or produced by disease, either syphilitic, or partaking of that character. In seeking a remedy, great care should be used not to employ any means, which, by mechanical pressure or irritation, would enlarge the cavity, instead of assisting nature to close it. Many of the obturators made have this tendency. We shall mention but one or two of them.

Those sustained by means of a *sponge* were invented by Ambrose Paré. They were formed by making a metallic plate a little larger than the opening; a raised

edge or rim was attached to the convex side of this plate, which was perforated with a number of holes, through which passed a silk thread which held the sponge in its place. Some force is required to attach this; but the greatest objection to it is, that the swollen state of the sponge dilates instead of contracting the orifice, and moreover soon acquires an exceedingly fœtid smell.

Another kind of obturator consists of a metallic plate, upon the convex side of which is soldered a raised rim, to which is attached an oval-shaped plate, a little larger than the orifice. This, too, requires considerable pressure to cause it to assume its intended position; but once inserted, it will sustain the plate in direct contact with the palatine roof, and thus exclude the air from the *dental fossæ*.

The operation of staphyloraphy, for remedying the defect occasioned by a separation of the soft palate from the bones, has been successfully performed. The operation is very delicate, and resembles that employed for hair-lip.

It frequently happens, that with the partial or entire destruction of the palatine apparatus, there is also a loss of teeth. It is desirable in this case to construct obturators with teeth attached. We have different methods for remedying these deformities. A great variety is necessary to meet the various degrees of loss which have been sustained.

CHAPTER XXVII.

ON THE PRESERVATION OF ARTIFICIAL TEETH AND OTHER APPARATUS FOR THE MOUTH.

CONTENTS. — Necessity and mode of cleaning, &c.

No matter how skilful may be the dentist, or how beautiful his artificial teeth; they will never be worn with comfort or viewed with pleasure, unless kept scrupulously clean. If it be necessary to keep the natural teeth clean by frequent washings, it is much more so with those *artificially* constructed.

It matters not how *precious* may be the metal, nor how *incorruptible* the mineral; if suffered to remain without frequent and thorough cleansing, a most pernicious atmosphere is generated. We have seen a set of porcelain teeth, attached to fine gold plate, nearly covered with tartar, and which were as offensive as diseased natural teeth. They should be frequently cleaned, either with spirits, tooth-paste, or aromatized or plain water. Teeth carefully cleansed will last longer, look better, and be more agreeable to the wearer and observer.

CHAPTER XXVIII.

ON GOLD.

CONTENTS. — Pure gold. Standard gold. Value of American, English, French, and Spanish gold. Gold plate for teeth. Alloy. Material. How to melt gold without loss. How to prevent it from adhering to crucible. Appearance when melted. Malleability. To prevent its cracking. Tables showing value of gold, and how to alloy, &c.

Virgin or pure gold is 24 carets fine, and is not hard enough for coin; hence the standard gold of United States, Great Britain, Portugal, and Brazil, is alloyed by $2\frac{6}{3}$ grs. of silver, or copper; $2\frac{3}{5}$ grs. of alloy to every dollar's worth of gold.

An American Eagle, prior to the coinage of July, 1834, weighs 270 grs.; and at $94\frac{8}{10}$ cents per pennyweight, is worth $10.66. Subsequent to 1834, by law, an Eagle must contain 258 grs. of gold; 232 grs. of pure gold, and 26 grs. of alloy, worth $3\frac{95}{100}$ cts. per grain. *French* gold has $21\frac{6}{10}$ grains *pure* gold to each pwt. Standard value, $93\frac{1}{10}$ cts. per pwt. *Spanish*, of the fineness of 20 carets, 3 and $\frac{7}{16}$ grs. or $20\frac{859}{1000}$ grs. pure to 1 pwt. Standard value, $89\frac{9}{10}$.

British Gold. — A sovereign should weigh 5 pwts. 3¼ grs.

Gold plate for teeth should ordinarily be from 18 to

20 carets. Circumstances vary the purity and thickness. For an upper set of teeth, retained in the mouth by "atmospheric pressure," it should be 21 carets fine, and as light as conformity with strength and firmness will admit.

Clasps are required to be firmer than the plate; therefore, the more preferable alloy is 2 parts silver and 1 part copper.

Perhaps there is nothing more wanted among dentists, who melt their own gold, than the art of making the metal malleable, and *without loss* in melting. The following facts were collected during many years' observation and experience.

In the first place, to prevent loss by the gold adhering to the crucible, it may be coated on the inside with *borax*, either wet or dry, before putting it into the *furnace*, or forge. The former will maintain a steadier heat, and with good anthracite coal, it can be raised gradually (which is of much importance) to a much higher degree.

In the second place, it is not safe to alloy gold with copper *coin*, as nine-tenths of *this* coin is adulterated with base metals. English sheet copper, or old sheathing, is very safe, where the prepared or granulated copper is not to be procured.

As soon as the metal is melted, carefully observe whether the surface of the liquid is perfectly clear and mirror-like, with an occasional *convulsive* movement in the whole body, which is, however, scarcely perceptible. But unless these appearances are noticed, on no account commit it to the ingot, as it will invariably

crack in rolling into plate. A clear surface on the liquid metal may sometimes be obtained by throwing into the crucible a piece of sal ammonia of the size of a pea, or a few grains of corrosive sublimate, and raising the degree of heat; in doing which, care should be taken that the crucibles be not tested beyond endurance, as they will perish occasionally by melting or cracking.

If, as sometimes happens with the inexperienced, after following all these directions, a piece of metal should prove unmalleable, it should be placed in a new crucible; and to six ounces of gold add one ounce of saltpetre. The effect of saltpetre is to destroy the base metals that prevent the malleability of the gold. I would here remark, that one of the advantages of anthracite over charcoal is, that you can dispense with the *cover*, and thus be able to note the progress of the operation; which may be of use in subsequent trials.

The crucible should be taken from the fire after the process is completed, and set upon the hearth to cool, and then by breaking it you will find the gold settled at the bottom. The base metal will be oxydized in a solid cake, which can easily be broken off from the gold by a blow of a hammer; and the loss in weight should be supplied at the next melting, with good prepared copper; and it will be perfectly malleable. Many jewellers melt all their gold by the saltpetre process first, and then put in the alloy pure and fresh.

To make Eighteen Caret Gold of American, British, and Portuguese Coin —

To one oz. of coin, add 4½ pwts. alloy.

To make Seventeen Caret Gold —

The Coin, 1 oz.
Alloy, 6 pwts.

To make Sixteen Caret Gold —

To 1 oz. coin add 7½ pwts. alloy.

To make Fifteen Caret Gold —

Coin, 1 oz.
Alloy, 9 pwts. 8 grs.

SOLDERS.

To make Royal Solder * —

Gold, . 15 parts,
Silver, . 7 "
Copper, 4 "
Brass, 1 "

Super-Royal Solder * —

Fine Gold, . 15 parts,
Silver, . . . 7 "
Copper, . . 4 "
Brass, . . . 1 "

Silver Solder * —

Fine Silver, 34 parts,
Copper, . 8 "
Brass, . 3 "

* Goddard.

These last may be used when silver plate is used for *temporary* purposes.

Fine Flowing Gold Solder * —

No. 1.

Gold, 22 car. .	2 dwt.
Fine Silver, .	16 grs.
Roset Copper, .	12 grs.

Fine Flowing Gold Solder * —

No. 2.

22 caret Gold,	1 dwt. 15 grs.
Fine Silver, . . .	16 "
Rost Copper, . .	12 "

* Harris.

COINS *of the United States, Great Britain, Portugal, and Brazil. Fineness,* $\frac{11}{12}$*ths, equal to* 22 *carets, or* 22 *grains pure to each pennyweight of standard. Value,* $94\frac{8}{10}$ *cents per dwt., or* 03.95 *cents per grain. To ascertain the value of a Coin or part of a Coin, weighing* 18 *dwts. and* 6 *grains, look to the square formed by the intersection of* 18, *in the left hand column, with* 6 *in the top line; it will be found to be* 17.30. *By this table the value of any amount of gold, from* 1 *grain and upwards, may be seen at a glance.*

Dwt.	Grs.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Pwt.
	Cts.	0,3.95	0,7.90	0,11.8	0,15.8	0,19.7	0,23.7	0,27.6	0,31.6	0,35.5	0,39.5	0,43.4	0,47.4	0,51.3	0,55.3	59.2	63.2	67.1	71.1	75.0	79.0	82.9	86.9	90.8	
1	94.80	98.75	1,02.7	1,06.6	1,10.6	1,14.5	1,18.5	1.22.4	1,26.4	1,30.3	1,34.3	1,38.2	1,42.2	1,46.1	1,50.1	1,54.0	1,58.0	1,61.9	1,65.9	1,69.8	1,73.8	1,77.7	1,81.7	1,85.6	1
2	1,89.6	1.94	1.97	2.01	2.05	2.09	2.13	2.17	2.21	2.25	2.29	2.33	2.37	2.41	2 45	2.49	2.53	2.57	2.61	2.65	2 69	2.73	2.76	2.80	2
3	2.84	2.88	2.92	2.96	3.00	3.04	3.08	3.12	3.16	3.20	3.24	3.28	3.32	3.36	3.40	3.44	3.48	3.52	3.55	3.59	3.63	3.67	3.71	3.75	3
4	3 79	3.83	3.87	3.91	3.95	3.99	4.03	4.07	4.11	4.15	4.19	4.23	4 29	4.31	4.34	4.38	4.42	4.46	4.50	4.54	4.58	4.62	4.66	4.70	4
5	4.74	4.78	4.82	4.86	4.90	4.94	4.98	5.02	5.06	5.10	5.14	5.17	5.21	5.25	5,29	5.33	5.37	5.41	5.45	5.49	5.53	5.57	5.61	5.65	5
6	5.69	5.73	5.77	5.81	5.85	5.89	5.92	5.96	6.00	6.04	6.08	6.12	6.16	6.20	6.24	6.28	6.32	6.36	6 40	6.44	6.48	6.52	6.56	6.60	6
7	6.64	6 67	6.71	6.75	6.79	6.83	6.87	6.91	6 95	6.99	7.03	7.07	7.11	7.15	7.19	7.23	7.27	7.31	7.35	7.39	7.43	7.47	7.50	7.54	7
8	7.58	7.62	7.66	7.70	7.74	7.78	7 82	7.86	7.90	7.94	7.98	8.02	8.06	8.10	8.14	8.18	8.22	8.25	8.29	8.33	8.37	8.41	8.45	8.49	8
9	8.53	8.57	8.61	8.65	8.69	8.73	8.77	8.81	8.85	8.89	8.93	8.97	9 01	9.05	9.08	9.12	9.16	9.20	9.24	9.28	9 32	9.36	9.40	9.44	9
10	9.48	9.52	9.56	9.60	9.64	9.68	9.72	9.76	9.80	9 84	9 87	9.91	9.95	9.99	10.03	10.07	10.11	10.15	10.19	10.23	10.27	10.31	10.35	10.39	10
11	10.43	10.47	10.51	10.55	10.59	10.63	10.66	10.70	10.74	10.78	10.82	10.86	10.90	10.94	10.98	11.02	11.06	11.10	11.14	11.18	11 22	11.26	11.30	11.34	11
12	11.38	11.41	11.45	11.49	11.53	11.57	11.61	11.65	11.69	11.73	11.77	11.81	11.85	11.89	11.93	11.97	12.01	12.05	12.09	12.13	12.17	12.21	12.25	12.29	12
13	12.32	12.36	12.40	12.44	12.48	12.52	12.56	12.60	12.64	12.68	12.72	12.76	12.80	12.84	12.88	12.92	12.96	13.00	13.03	13.07	13.11	13.15	13.19	13.23	13
14	13.27	13.31	13.35	13.39	13.43	13.47	13.51	13.55	13.59	13.63	13.67	13.71	13.75	13.79	13.82	13.86	13.90	13.94	13.98	14.02	14.06	14.10	14.14	14.18	14
15	14.22	14.26	14.30	14.34	14.38	14.42	14.46	14.50	14.54	14.57	14.61	14.65	14.69	14.73	14.77	14.81	14.85	14.89	14.93	14.97	15.01	15.05	15.09	15.13	15
16	15.17	15 21	15.25	15.29	15.33	15.37	15.40	15.44	15.48	15.52	15.56	15.60	15.64	15.68	15.72	15.76	15.80	15.84	15.88	15.92	15.96	16.00	16.04	16.08	16
17	16.12	16.16	16.19	16.23	16.27	16.31	16.35	16.39	16.43	16.47	16.51	16.55	16.59	16.63	16.67	16.71	16.75	16.79	16.83	16.87	16.91	16.95	16.98	17.02	17
18	17.06	17.10	17.14	17.18	17.22	17.26	17.30	17.34	17.38	17.42	17.46	17.50	17.54	17.58	17.62	17.66	17.70	17.74	17.77	17.81	17.85	17.89	17.93	17.97	18
19	18.01	18.05	18.09	18.13	18.17	18.21	18.25	18.29	18.33	18.37	18.41	18.45	18.49	18.53	18.56	18.60	18.64	18.68	18.72	18.76	18.80	18.84	18.88	18.92	19
20	18.96	19.00	19.04	19.08	19.12	19.16	19.10	19.24	19.28	19 32	19 35	19.39	19.43	19.47	19.51	19.55	19.59	19.63	19.67	19.71	19.75	19.79	19.83	19.87	20

After many experiments in melting gold, we have found the draught furnace, recommended by Dr. Elliot, to be the best. Its diameter is ten inches; depth, eight or ten. Fill this half full of hardwood coal, and ignite. Put in the crucible which contains the metal, a little borax, and place over it an iron cover, and around and upon it some additional coal; fuse the gold and remove the coal from the top; of nitrate of potassa, drop in a quantity of the size of a pea for each ounce of gold; cover, and heap up the coal as before; keep the gold well fused until the scoria passes off, which will usually happen in from six to ten minutes; drop in another bit of nitrate of potassa, and at that instant seize the crucible, and rapidly pour the gold into a warm soapstone mould, half filled with oil. The ingot cools first at the edges; hence the edge of he mould should be concave, and as the gold shrinks from the middle, the centre will not be thinner than the edges. Roll and occasionally anneal the plate.

To purify gold filings or dust, first pass a magnet through, to remove all steel and iron; secondly, melt with carbonate of potassa; thirdly, with nitrate of potassa. Carbonate of potassa is the best, if not the only flux for consolidating particles of gold; when it is not used, you may look for your gold in small globules among the scoria.

The malleability of gold is destroyed by the presence of lead, tin, or zinc; the nitrate of potassa separates these metals. If there be copper with the alloy, part of it (copper) may be found in the scoria; but silver

does not so escape. Copper mixed with the silver may be separated from the alloy by the use of nitric acid. "First, the proportion of silver of the alloy should be three times the weight of the gold; second, the copper should not exceed one-third the weight of the gold; and lastly, the strength of the acid should be such as to give it a specific gravity of about 1·310; or in other words, a pint of acid should weigh at least twenty-one ounces. If the alloy contain less than twice as much silver as gold, the particles of gold will protect the silver and copper from the action of the acid; and if it contain too much copper, the parting will be found more difficult.

"For separating the alloy, roll it into thin sheets, and place it in a deep glass or earthen vessel; add two or three times its weight of nitric acid; the whole may then be heated until ebullition takes place; and after boiling five minutes, the acid should be carefully poured off, and new acid used for the same length of time; then the last acid may be poured with the first, and the gold washed with pure water. The silver of the alloy will now be found in the acid, and may be thrown down in its pure state, by plunging into the solution, plates of copper.

"The silver powder may be collected, washed, and melted with a little carbonate of potassa; the gold may also be melted with the same flux, and both metals will be found in a perfectly pure state; the copper, if there were any in the alloy, is still held in the solution, and may be deposited in its turn by plates of zinc."

CHAPTER XXIX.

ON STEEL.

CONTENTS. — Conversion of iron into steel. Cement. How to temper steel instruments. Appearance of well-tempered instruments, &c. &c.

Every dentist should understand the working of steel sufficiently to enable him to make and repair many instruments. We have thought best to make a few suggestions on this branch of mechanics, as connected with dentistry.

Iron is converted into steel by a process called cementation; which is performed by enclosing small pieces of metal in an iron box containing leather, bone, dust, or any other carbonic material, and exposing them to heat. The following is an excellent cement: —

"Take one part of powdered charcoal, one half a part of wood ashes, well mixed together, two parts charcoal moderately powdered, one part of bones, hair, or skins of animals, burnt in close vessels to blackness and powdered, and half a part of wood ashes."

The bars of iron to be converted into steel must be placed upon a stratum of this cement, and covered over

with the same, the iron vessel containing them perfectly closed, and exposed to a red heat for eight or ten hours. Iron thus treated is susceptible of the finest polish. Bar iron may be changed to steel by "fusion," plunging a bar into melted iron, and retaining it there a short time.

Good cast steel presents a fine, uniform, and silvery appearance, and is easily wrought. It should not be heated above a bright red, nor hammered after it ceases to be red by daylight. In the construction of small instruments, it is very essential to observe this, as the steel will otherwise be destroyed and rendered almost useless. In flattening and curving small points, the anvil should be placed as near the fire as possible, and while hammering, the steel should be held about the eighth of an inch above the anvil, except at the moment it receives the blow. Treated in this way, a small point will remain at the desired temperature much longer than if it be allowed to rest constantly on the anvil.

Articles manufactured of steel for the purpose of cutting (as are many dental instruments), are generally taken from the forger to the hardener without any intermediate process. This is wrong. The act of forging produces a strong scale, or coating, which is spread over the surface of the instrument. This scale is sometimes unequal in thickness, varying in proportion to the degree of heat received by the steel in forging. It is almost impenetrable to the action of water when immersed for the purpose of hardening. Hence the different degrees of hardness which we find in instru-

ments. The remedy is easy. Instead of hardening from the anvil, let it be passed to the grinder. A slight application of the stone will remove the whole of the scale or coating, and it will then be properly prepared to undergo the operation of hardening. The obstacles to the immediate action of the water on the body of the steel being removed, the latter becomes equally hard, from one extremity to the other. It is also certain, *that the lowest possible heat* at which steel becomes hard is *indubitably the best.**

"Steel, to be hardened, should not be heated above a cherry red; and the degree of hardness it acquires in quenching depends principally upon the temperature of the bath into which it is plunged. Pure cold water answers the purpose better than any other liquid we have tried. Polished steel, when exposed to heat, takes the following colors in succession — straw, yellow, dark-yellow, copper-color, purple, blue, whitish blue. The different tempers are correctly indicated by the color assumed by the metal. The first of these tempers is suitable for a gum lancet; the second for broaches and scaling instruments; the third for rose drills; the fourth for excavators; the sixth for springs; and the seventh for filing instruments. This last temper is used merely to give to the piece a greater degree of firmness.

"In hardening an instrument, not only the cutting part, but as much of the shank as requires strengthening, should be plunged into the bath; and in drawing the temper the point should first be partly polished, so that

* Mechanics' Assistant, vol. i. No. 11.

the colors produced by heat may rapidly be distinguished; and while the temper of the shank is being reduced to a whitish blue, in the flame of a spirit lamp, the point should be held between the beaks of a pair of large pliers, to prevent it from being drawn too low, and then it may be released from the pliers and the heat allowed to run down until the point assumes the required shade.

"Such points as do not admit of being polished after hardening, previously to being put into the fire, should be covered with a paste composed of a saturated solution of common salt, and some coarse flour. This coating, if carefully put on, prevents the point from oxydizing; or, as mechanics term it, prevents the point from scaling. Rose drills, extracting screws, and all other denticulated instruments, are more or less injured by being heated to a redness with this covering."*

* Am. Jour. Dental Science.

CHAPTER XXX.

MAKING WHOLE SETS OF TEETH.

CONTENTS. — Taking impressions. Trimming for turning edges. Making models. Metallic dies. Swedging plates. Fitting teeth. Articulator. Soldering. Springing of plate. Finishing plate.

The following is the process of making whole sets of artificial teeth, by Drs. G. G. Hayden and D. P. Wilson, Dentists, 23 Tremont Row, Boston.

Set the patient upright. Fill a mouth cup with coarse French plaster, mixed with warm soft water, of the consistence of batter (the muscles of the mouth being perfectly relaxed); then press it firmly against the jaw, until sufficiently hard to be withdrawn without injury. The outside edge, which comes up beneath the lip, is then trimmed to give the proper depth to the plate, and also the right bevel to the impression, which is to turn the edge of the plate down upon the artificial gum.

In a similar way take an impression of the inferior jaw. Trim the edges, anteriorly and posteriorly, as the width and depth of the alveolar ridge may require. The muscles about this plate require more play than those of the superior; consequently the impression must be cut so as to make a plate more flaring

than it would be made by the impression, with the principal baring upon the top of the alveolar ridge. These plates should extend as far back on the jaw as possible.

Fig. 31. Fig. 32.

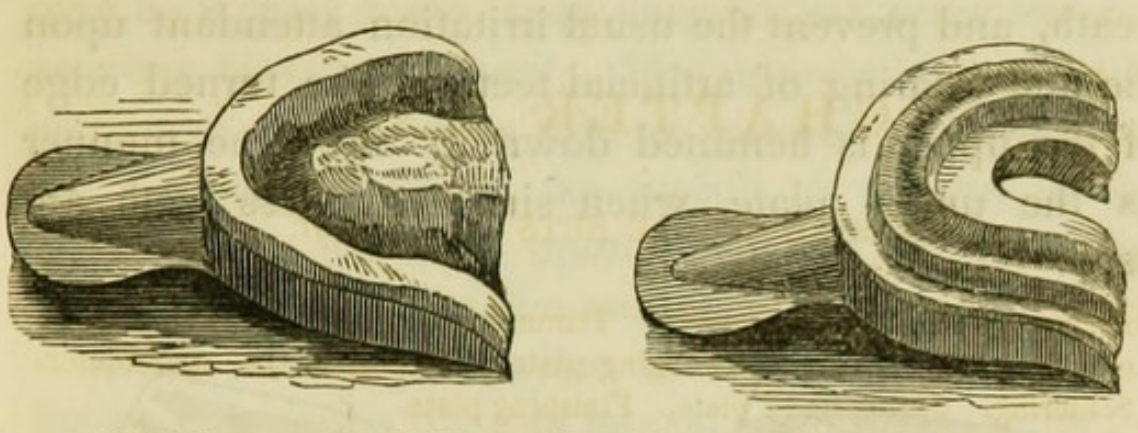


Fig. 31 represents the impression of the upper jaw, trimmed.
Fig. 32 represents the impression of the lower jaw, trimmed.

A slight coating of lard is then laid over the surface of these impressions with a camel's-hair pencil. They are then filled with fine French plaster, about the consistency of cream, and to about the depth of two inches. When separated and properly trimmed, they are varnished with a solution of shelac in alcohol, and are the models from which the metallic dies are made, by moulding in sand, such as founders use. These dies are made of a compound of copper and zinc, one part of zinc and four of copper, and cast by copper and brass founders. When these founders are not accessible, dies may be made of simple *zinc* or *tin*.

Counter moulds, two or three in number, should be made of lead. But these will not always bring up the plate, particularly in the crease where it turns. This must be effected with a chasing tool. If single gumless teeth are to be put upon the plate, the edges that have

been turned up may be hammered thin upon the extreme edges, and hemmed down upon the body of the plate by soldering, and thus form a smooth round edge, to rest easily upon the soft muscles and gum beneath, and prevent the usual irritation attendant upon the first wearing of artificial teeth. The turned edge of the upper is hemmed down in the same manner as the under plate, when single gumless teeth are used.

Fig. 33.

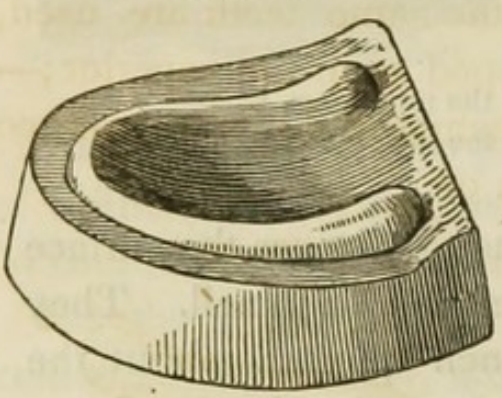
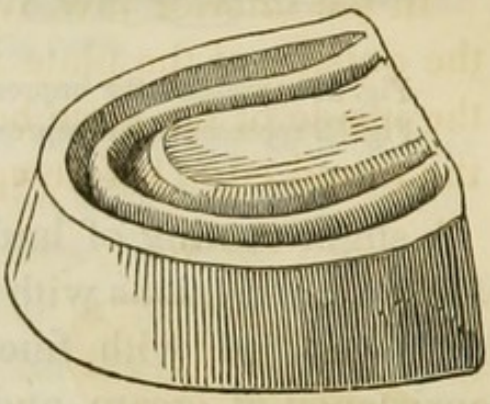


Fig. 34.



Figs. 33 and 34 represent the forms of the models and of the metallic dies.

When teeth in blocks are pivoted to the plates, as is most common in whole sets, the inferior plate should correspond with the blocks in width, independent of the turned edge, which should be burnished to the sides of the blocks. Thus they will be held in a kind of box, which, with the pivots passing through them, will be secured with great firmness. These blocks are sometimes secured to the pivots with fusible metal, and also wood sockets, through which they, being smaller than the sockets, pass; and when moistened by the fluids of the mouth, are kept swollen, to secure the teeth firmly to the plate. While fitting, the blocks are held

to their places by shelac, or common wax, and should be often put into the mouth to secure their true position.

In the superior plate, when single gum teeth are required, and are to be soldered to the plate, the edge may be lapped down upon them in the same manner as when blocks are used. The upper edges of artificial gums should be as thin as possible and produce the desired fullness of the mouth, to prevent the lip from resting too hard upon them, and thus pressing them from the roof of the mouth.

In the inferior jaw, when the same teeth are used, the outside of the plate is lapped as in the superior;—the inside of the plate being hemmed down to produce the round edge before spoken of.

Fig. 35.

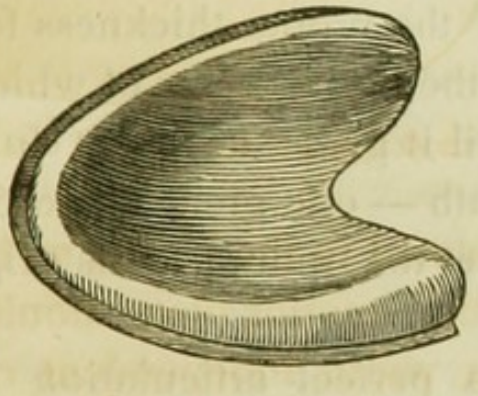
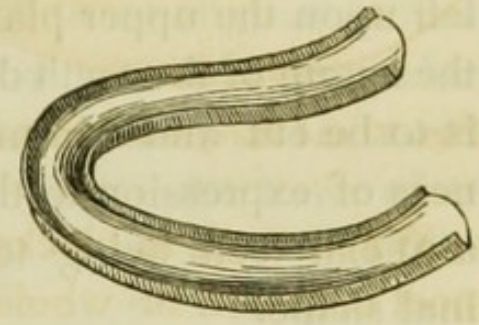


Fig. 36.



Figs. 35 and 36 represent the plates with the edges turned by the dies, and in a proper form to receive gum teeth of any kind, when the edges are to be turned entirely down upon the body of the plate. A new counter mould should be made for that purpose.

The plates being formed, we are prepared to make an articulator, which shall guide in getting at the perfect action of the teeth, either in whole or half sets.

When a half set is required the plate is to be covered with wax, of the proper thickness to give the length of the teeth. Insert it into the mouth, which is then

closed with great care, giving the exact position of the under teeth in the wax, the form of the upper being already secured by the plate.

The impression made in the wax should then be filled with plaster, letting it extend back to give sufficient length to form a handle, and also a point of union with the plaster that is to be put in the upper plate. But before the upper is filled, the lower should become hard, and countersunk in one or two places, to form points of attachment for the upper, that its motion may more nearly resemble that of the natural jaws. When oiled, it may be *filled*, to correspond with the under.

When these are separated, the wax taken from them should be trimmed on the under side, until the wax left upon the upper plate is of the proper thickness for the length of the teeth desired, the front surface of which is to be cut and trimmed until it gives the exact fullness of expression to the mouth — one great object in artificial teeth being to restore the mouth to its original shape.

The process of securing a perfect articulation of both jaws, where whole sets of teeth are to be inserted, requires a much longer description than we have space to furnish. Indeed, it would be impossible to give thorough instruction respecting it; practice alone can give a proper idea of the various points which must be carefully observed. We will give a short description, and leave the operator to his own ingenuity to supply what is deficient.

In very many respects the process resembles that

adopted for the single or half set. The wax should be soft, and as large as can be inserted into the mouth. The plates should be sunk into it even with their surfaces. The whole should then be put into the mouth, and the patient directed to close his mouth a little — the hands being moved about upon the outside of the face, to assist the wax and plates to take their position on the jaws. The whole should then be taken out and trimmed considerably on all sides; again put it into the mouth, and direct the patient to close the mouth as naturally as possible (this is very difficult, unless he maintain an upright posture), a little more than he did at first. Again the wax should be removed and trimmed; and so proceed until the mouth has been closed to the proper point, and the wax so trimmed as to restore the mouth to its original fullness. Find the proper place for separating the wax, which should be performed with a small iron wire, in such a way as not in any manner to injure the form of the wax. The operator does not *yet know* that the patient has *closed* his mouth *right*. To prove this, varnish the wax where it has been separated; put the mould into the mouth, which should then be closed several times, with each plate setting firmly on the jaws, and if they be right they will meet evenly; if not, on one side. If they meet improperly, ascertain what is required, and trim accordingly. Then put the under plate into the mouth, find its centre, and trim it so as to give the proper shape to the molar teeth, and also the proper position to the front. Then put it into the mouth with the upper, which should be trimmed to cor-

respond with it, and the mouth properly closed ; the wax of each jaw should then be secured with two pins, and the whole removed.

The plaster articulator should then be made by filling both plates with stucco, as has been described in the case of the half set.

Fig. 37.

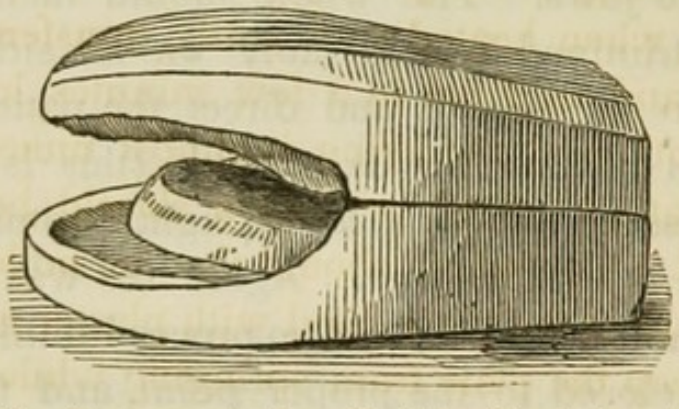


Fig. 37 represents the articulator of a whole set.

From this articulator, or mould made in a similar manner, artificial teeth can be made to meet any case which may occur ; it being made in every instance where teeth are inserted, cannot fail to guide to perfect and happy results. When single teeth are to be selected for the case, the wax of the under jaw should be cut off just the thickness of the teeth ; they should then be selected and ground in by the upper wax. The superior should then be selected and ground to articulate perfectly with the under. The wax and teeth should then be taken from the articulation, and the teeth embedded in plaster mixed with sand. When hard, the wax should be removed, and the backs or linings placed upon the teeth without their being removed from the same. When they have been cleansed from the wax and dried, the solder should be placed upon

them. The pins coming through the backs, should be bent together with a pair of pliers, and not riveted at all; leaving them open, that the solder may flow around them. After the whole has been sufficiently boraxed, and that part of the plate exposed to the flame, on which you do not want the solder to flow, has been slightly coated with whiting, to prevent it from oxydizing, it may be placed in a suitable furnace, and, when heated sufficiently, transferred to the blowpipe, and soldered in a few minutes, leaving the work smooth, and rendering it almost unnecessary to use a file at all. Such perfection should be attained if possible. The whole should then be boiled in acid, and one side of the plate filled with plaster mixed with sand, to keep the plate from springing while finishing. Avoid burnishers; they can do no good, and may do great injury to the shape of the plate, or flatten out the little points which you have taken so much pains to raise with the dies. The plates are first polished with Scotch stone, and pumicestone and oil; then with rottenstone and oil; and lastly with rouge.

Before finishing the plate, place it in the first mould, to see that it fits; if it has sprung in the least, it must be brought back by firmly binding it to the copper die. Covering the teeth with the plaster and sand, place the whole in the fire, and anneal the plate thoroughly. When cold, remove the whole, and it will be found to be in its perfect shape.

Those who have not copper dies, should take care to secure one of plaster and sand, which will answer the purpose very well.

CHAPTER XXXI.

CONCLUDING REMARKS.

CONTENTS. — Preservation of the teeth. The teeth in infancy, manhood, and old age. Table showing the average time of digestion of different articles of food.

We think none who have carefully perused the preceding pages, will longer feel that the preservation of the teeth is a matter of small moment. We have seen that many of the most distressing and protracted diseases are immediately produced, or greatly aggravated, by a diseased state of these organs. Indeed, the fact that such care and skill are exhibited in their production and structure, is conclusive evidence of their value.

We watch the germ of the tooth in the fœtus, and see it gradually proceeding from a nearly fluid to a solid state, hardening and increasing in size, while particle after particle of earthy and bony matter is deposited, and layer after layer of enamel is exhibited, until the absorption of the gum renders its egress to the surface possible. Months pass away, and we see a row of little pearl-like substances adorning the mouth of the infant, sufficient in size, number, and strength, to

masticate the food which is or should be received by it.

After a few years, when the frame of the child has become strengthened by exercise, and he begins to need a more solid and nourishing diet, we find that nature is again at work, to provide him with more suitable organs of mastication than his infancy furnished. The small temporary teeth, one by one, are removed, and their place is supplied with larger and stronger teeth, as well as an additional number of them, to meet the increasing power demanded by his altered diet.

When, at last, by reason of extreme age, these teeth become worn away, or loosened, and fall out, we find that provident nature has still a remedy. As the individual advances in years, the gums, which in early life are soft and vascular, harden, until at last we find them, in very old persons, so divested of sensibility that they become a substitute for teeth; being hard enough to masticate such food as the very aged system requires.

Can any thinking person ponder on these facts, and remain unconvinced that our Creator evidently thought the teeth of some value? Else, why these constantly advancing processes of nature, to keep man provided with just the kind and number of teeth fitted to the different stages of his existence?

Does it become us, then, to neglect and despise that in which so much contrivance and skill are displayed by Him who knows the value of each member of the body? If we despise and neglect his works, do we not virtually despise Him?

Revelation often teaches great principles by the relation of isolated facts, or the promulgation of single commands. Of this nature is the expression made use of to dissuade the jailer from his contemplated self-destruction — "Do thyself no harm."* If it is true, as has ever been affirmed, that this is an express injunction against self-murder, then it is likewise prohibitory of all those things, the use or endurance of which tends to undermine health and destroy life. If it would have been wrong for the jailer to "*take a sword* and kill himself," it would have been equally wrong for him to use *any other means* which would produce the same effect. And what would have been criminal in him, must, of course, be equally so in us. So that health is injured, or life destoyed, it matters not whether the means employed are more or less speedy. In the view of civil law, it would not in the least diminish the guilt of the prisoner, that he murdered his victim by slow, deliberate means, rather than by the hasty bowie-knife, or vengeful pistol-ball. The longer the time consumed, the more enhanced the guilt, as evidencing premeditation. The just inference then, is, that if we use any means to injure our bodies, no matter of what description, we are guilty of violating the command of God. From this it is clearly deducible, that it must be equally wrong to *neglect* any means which it is in our power to use, by which health and life may be preserved.

As, then, we have demonstrated the necessary and

* Acts 16: 28.

intimate connection between the health of the teeth and the rest of the body, it follows that the most scrupulous surveillance should be directed to these "thermometers of the health," that no lurking enemy find shelter there. From the above it is clear, that where disease has already entered, and is undermining the health, whether by means of decaying teeth or otherwise, it is clearly our duty to take the most speedy and effectual means of cure.

The connection between the dental and digestive apparatus is so intimate, that we have thought it not improper here to insert the results of Dr. Beaumont's experiments on digestion (alluded to in Chap. VIII), made upon Alexis St. Martin, whose stomach was perforated by a gun-shot wound.

TABLE *showing the average Time of Digestion of different Articles of Food.*

		h.	m.
Rice,	Boiled,	1	00
Sago,	Boiled,	1	45
Milk,	Boiled,	2	00
Milk,	Raw,	2	15
Pigs' feet, soused,	Boiled,	1	00
Tripe, soused,	Boiled,	1	00
Venison Steak,	Broiled,	1	35
Turkey, domesticated,	Roasted,	2	39
Turkey, domesticated,	Boiled,	2	25
Turkey, wild,	Roasted,	2	18
Goose, wild,	Roasted,	2	30
Pig, sucking,	Roasted,	2	30
Liver, beef's, fresh,	Broiled,	2	00
Lamb, fresh,	Broiled,	2	30
Chicken, full-grown,	Fricasseed,	2	45
Eggs, fresh,	Hard boiled,	3	30
Eggs, fresh,	Soft boiled,	3	00

		h.	m.
Eggs, fresh,	Raw,	2	00
Custard, baked,	Baked,	2	45
Cod Fish, cured dry,	Boiled,	2	00
Trout and Salmon, fresh,	Boiled,	1	30
Bass, striped, fresh,	Broiled,	3	00
Oysters, fresh,	Raw,	2	25
Oysters, fresh,	Stewed,	3	30
Oysters, fresh,	Roasted,	3	15
Beef, fresh, lean, rare,	Roasted,	3	00
Beef, with salt only,	Boiled,	3	36
Pork, fat and lean,	Roasted,	5	15
Pork, recently salted,	Boiled,	4	30
Mutton, fresh,	Roasted,	3	15
Mutton, fresh,	Boiled,	3	00
Veal, fresh,	Broiled,	4	00
Veal, fresh,	Fried,	4	30
Fowls, domestic,	Boiled,	4	00
Fowls, domestic,	Roasted,	4	00
Butter,	Melted,	3	30
Cheese, old, strong,	Raw,	3	30
Soups — beef, vegetable, and bread,	Boiled,	4	00
Green Corn and Beans,	Boiled,	3	45
Bread, wheat, fresh,	Baked,	3	30
Cake, corn,	Baked,	3	00
Dumpling, apple,	Boiled,	3	00
Beets,	Boiled,	3	45
Turnips,	Boiled,	3	30
Potatoes, Irish,	Boiled,	3	30
Cabbage head,	Raw,	2	30
Cabbage, with Vinegar,	Raw,	2	00
Cabbage, with Vinegar,	Boiled,	4	30

Water, *ardent spirits*, and most other *fluids*, are not acted on by the gastric juice, but pass from the stomach soon after they have been received.*

* Mechanic's Assistant, Vol. I, No. 12.

A

TREATISE

ON THE

INHALATION OF ETHER

FOR THE

PREVENTION OF PAIN.

BY MAYO G. SMITH.

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PREFACE.

The interest felt in the subject of ethereal inhalation, and the demand for information concerning the history, safety, and process of its administration, as a lethean for painless surgical operations, has induced the author to give publicity to such facts and observations concerning this pain-obliterating agent as he has been able to collect from various sources, and to make known the results of its use in his own practice, and its varied effects on the system, and to suggest the manner, in which the patient, through its administration, may be conducted to a favorable and happy issue. For some important facts and suggestions, the author is indebted to the British Foreign Review, the Boston Medical and Surgical Journal Prof. Simpson, of London, Profs. Warren, Hayward, and Channing, of Massachusetts Medical College, Prof. Jackson, Drs. Morton and G. G. Hayden, and others.

Errata. — The explanation under Fig. 2, page 42, belongs under Fig. 3, page 43, where it should have been inserted.

INHALATION OF ETHER.

CHAPTER I.

CONTENTS. — Introduction of the lethean. Observations of Davy, Brodie, and others. Effects of ether. Drs. Jackson and Morton's claims to the discovery. Dr. Horace Wells's opposition. Nitrous oxide. Dr. J. C. Warren's testimony. Objections to the use of ether considered. Dr. Kissam. Properties of ether. Its introduction into Europe. Profs. Miller and Syme. The lethean tested. Ether in verterinary practice. Apparatus for administering it. Directions for use. Ether in certain complaints. Advantages of ether. Usual effects.

INTRODUCTON OF THE LETHEAN.

Since the first introduction of the Lethean to the public, by Dr. Morton, of Boston, in September, 1846, it has been the subject of much discussion, involving much personal and professional feeling, and is still rejected by some, cautiously entertained and suspiciously examined by others, but hailed with joy by the mass of the people; and many of the most scientific and experienced surgeons and dentists of this country and Europe unite in feelings of gratitude and thankfulness to the discoverer of a process by which the infliction of pain and the endurance of suffering may be avoided.

But as there exists a difference of opinion on this subject, we shall impartially examine it, and weigh the principal objections which have been urged against the use of ether. It will be our present endeavor to ascertain with certainty, whether this apparent good be one in fact, — a positive evil in disguise, — or of doubtful utility. And in order to do this, we shall go back to the first experiments with ethereal and other vapors; trace the history of experiment on the subject of inhalations as medicinal agents, and by a vast amount of facts which have come to our knowledge from other sources — not a few by our own experience — endeavor to establish the true value of this pain-obliterating agent.

It is not, perhaps, known to some, that the idea of inhaling ethereal and other vapors has been recommended and adopted occasionally for medicinal and other purposes.

"Medicated inhalation has often been directed to the amelioration of various pulmonary affections, with indifferent success. Instruments called *Inhalers* were employed long ago, by Mudge, Gairdner, and Darwin; and the apparatus fitted up by Dr. Beddoes and Mr. James Watt, for respiring various gases, has given birth to some octavo volumes. More recently, Sir Charles Scudamore has advocated the inhalation of iodine and conium in phthisis, and the vapor of tar has often been inhaled in the same disease. The effects of stramonium, thus administered, have been noticed by Sigmond.

"*The inhalation of the ethers* has been recommended in various maladies, among which may be mentioned

phthisis and asthma. "On sait que la respiration de l'ether sulfurique calme souvent les accidents nerveux de certains croups."*

I find that mention of the inhalation of this agent is usually coupled with a caution against its abuse, grounded apparently upon two or three cases, quoted and requoted. Of these the first is from Brande's Journal of Science, where it is thus reported: — "By imprudent respiration of sulphuric ether, a gentleman was thrown into a very lethargic state, which continued from one to three hours, with occasional intermissions and great depression of spirits — the pulse being for many days so low that considerable fears were entertained for his life." Christison quotes the following from the Midland Med. and Surg. Journal, to prove that *nitric* ether in vapor is a dangerous poison when too freely and too long inhaled: — "A druggist's maid servant was found one morning dead in bed; and death had evidently arisen from the air of her apartment having been accidentally loaded with vapor of nitric ether, from the breaking of a three gallon jar of the Spiritus Æth. Nitric. She was found lying on her side, with her arms folded across her chest, the countenance and posture composed, and the whole appearance like a person in a deep sleep. The stomach was red internally, and the lungs were gorged." The editor of the journal in which this case is related, says he is acquainted with another instance, where a young man was found completely insensible from breathing air

* We know that the respiration of sulphuric ether will quiet the nervousness attending certain diseases of children. — *Dic. des Sc. Med.*

loaded with *sulphuric ether*, remained apoplectic for some hours, and would undoubtedly have perished had he not been discovered and removed in time. Ether is now very commonly administered *internally* as a diffusible stimulant and antispasmodic, in a dose of one or two drachms. But here, also, we have the evidence of a few experiments, that ether is capable of producing grave results under certain circumstances. Orfila killed a dog by confining a small quantity in the stomach by means of a ligature around the œsophagus. Jager found that ʒss. acted as a fatal poison to a crane. It was for a long time supposed to be injurious to the animal economy. The old Edinburgh Dispensatory, republished here in 1816, explicitly states that it is to be inhaled by holding in the mouth a piece of sugar, containing a few drops, and also that regular practitioners give only a few drops for a dose; "though," it adds, "empirics have sometimes ventured upon much larger quantities, and with incredible benefit." p. 566. Nevertheless, it was known to have been taken in correspondingly large doses with impunity. The chemist Bucquet, who died of scirrhus of the colon, with inflammation of the stomach and intestines, took before his death a pint of ether daily, to alleviate pain (he also took 100 grs. of opium daily); — and Christison mentions an old gentleman who consumed for many years ʒxvi. every eight or ten days. Such facts probably led Merat and De Lens, in their Matiere Medicale, to question its grave effects when swallowed. Mentioning the case of Bucquet, they say, even of its inhalation, that it produces only "un senti-

ment de fraicheur que suit bientôt une legère excitation."*

"This variety of evidence tends to show that the knowledge of its effects, especially those of its inhalation, was of uncertain character. Anthony Todd Thomson well sums up what I conceive to have been the state of knowledge at the time upon this subject, in his London Dispensatory, of 1818. "As an antispasmodic, it relieves the paroxysm of spasmodic asthma, whether it be taken into the stomach, or its vapor only be inhaled into the lungs. Much caution, however, is required in inhaling the vapor of ether, as the imprudent inspiration of it has produced lethargic and apoplectic symptoms." In his Materia Medica and Therapeutics, of 1832, however, omitting all mention of inhalation, he uses the following words:— "Like other diffusible excitants, its effects are rapidly propagated over the system, and soon dissipated. From its volatile nature its exciting influence is probably augmented; as it produces distension of the stomach and bowels, and is thus applied to every portion of their sensitive surface. It is probable that it is absorbed in its state of vapor, and is therefore directly applied to the nervous centres. It is the diffusible nature of the stimulus of ether which renders it so well adapted for causing sudden excitement, and producing immediate results. Its effects, however, so soon disappear, that the dose requires to be frequently repeated.'"

That many persons have made experiments with

* A feeling of coolness that follows a slight excitement.

ether and other gases, there is no doubt. Probably many individuals have approached almost the consummation so much desired, and at last so happily found; but all who have thought, all who have experimented on a given subject, even though the results have been partially or wholly successful, cannot be acknowledged as discoverers so long as they keep the secret locked up in their own breasts. It is he that not only thinks, studies, and experiments, but who also promulgates his discoveries to the world, and applies them to practice, who will ever be looked upon as the real benefactor of his race.

Among the claimants of the honor belonging to the discoverer of this antidote to human suffering, are found some individuals in France and England, as well as those who have opposed the patentees in this country.

In Paris, "a Mr. Granier de Cassagnac has published an article in the *Presse*, claiming to have made the discovery seventeen years since, and published an account of it in the *Journal Politique et Litteraire de Toulouse.*

"His pretensions fell dead, without any one even offering to contradict them."

It has also "been claimed by R. H. Collier, M.D., of England; but the most which his claim amounts to is, that of having published, in 1843, an account of the unconsciousness which may be produced by the inhalation of ether; but this, as we have already stated, was long since known."

It is worthy of remark, that Sir Humphrey Davy, at

one period of his life, was much interested in the "pneumatic medicine," as it was then called, or the inhalation of gases — some of his experiments with which nearly cost him his life.

In John Davy's edition of his works, the following remarkable passage occurs: — "As nitrous oxyde, in its extensive operations, appears capable of destroying pain, it may *probably be used with* advantage during surgical operations, in which no great effusion of blood takes place." Vol. iii. p. 349.

A London paper says of this discovery, — it has been asserted "that our most eminent surgeon, Sir Benjamin Brodie, by some former experiments on the effects of inhaling ether, led the way to this great discovery; but witness a passage in his discourse delivered at St. George's Hospital, so lately as the 1st October, 1846. He is speaking only of mesmerism: —

"There is no greater desideratum, either in medicine or surgery, than to have the means of allaying or preventing bodily pain, not only in cases of surgical operation, but in other cases also; but there is too good reason to apprehend that it has not been reserved for the revival of animal magnetism under a new name, to accomplish that for which all physicians and surgeons have been looking in vain, from the days of Hippocrates down to the present time."

Dr. Pearson, so early as 1795, recommended the inhalation of ether, as beneficial in pthisical cases. "It abates," he says, "the hectic fever, checks the sweats, removes the dyspnœa, and greatly improves the quality of the expectorated matter." It was his custom to put

a small quantity of ether in a saucer, or any convenient vessel, and permit the patient to draw in the vapor with his breath, till it was exhausted. He also added flavoring and other medicinal substances. It does not appear, however, that these inhalations were designed to, or that they did, produce unconsciousness.

In the year 1815, Nysten strongly recommended the inhalation of ether in diseases of the lungs, on account of its anodyne property. He also speaks of an instrument for inhaling it, but of what it consisted we do not know.

In the 1223d number of the London Lancet, p. 164, a case is related of an old gentleman, who used the vapor of ether as a sedative. It seems that a varied and not strictly moral life had brought him to desire some means of quieting the uneasy feelings and "compunctuous visitings with which he was affected; and in the fumes of ether to seek oblivion from all intruding thoughts." His plan was to put an ounce or two of the article in some open vessel, and, as it were, "snuff it up." He often declared it to be "soothing to an immeasurable degree." But it does not appear to have occurred to him or his friends, that it is capable of assuaging bodily as well as mental pain.

In Brand's Journal of Science and the Arts, 1818, a writer speaks of "the effects of inhaling the vapor of sulphuric ether," with the best manner of using it, and precautions in regard to it, &c.

In France, likewise, during the reign of Charles X. a proposition was submitted to the Academy of Medicine in Paris, by an English doctor named Hinchnam,

to render patients, about to undergo surgical operations, insensible, by means of "inhalations;" but whether of ether or something else, we are not informed.

Indeed, it appears that experiments with vapors and gases have been extensive and numerous, approaching so near to the character of those which induced Messrs. Jackson and Morton to make a public announcement of their discovery, that instead of being astonished at their success, we only wonder that of the many who have stood upon the threshold, all should have turned back, and neglected a further prosecution of their researches.

That ether was known to produce unconsciousness is readily conceded; but the idea of using it as a sedative agent in operative surgery, is *the* idea for which we are indebted to the American patentees.

Since Dr. Morton first published his discovery to the world, in Boston, in September, 1846, not a few individuals have set up claims to priority of discovery; but up to this time, Messrs. Jackson and Morton have, we think, fully substantiated their right to be considered the inventors. We would, by no means, impugn the motives of all who have set up counter claims; but we must say, that if any individual *had* made so valuable a discovery, calculated, as we may reasonably anticipate, to confer so great a benefit upon almost every individual to be found in civilized society, at the present and in all future time, the person is hardly excusable who should withhold the information from the public. A discovery which involves *only* pecuniary benefits, might very properly be withheld by the discov-

erer until every arrangement had been made to secure the profit to himself. But an invention or discovery which is destined to alleviate the sufferings of poor dilapidated humanity, the medical profession have a right to know about ; and this the world have a right to demand. While, therefore, we admit the probability that many others have, by experiment or otherwise, arrived at *nearly* the same results as Dr. Morton, we must maintain, that not having put them to any practical use, they have no right to claim the invention. But there is another class "in every community, and probably always will be, of persons constantly on the look out, ever ready and eager to avail themselves of the labors and inventions of others. When they are about to seize upon the improvement of some one else, they commonly begin by crying out that they thought of it before, — they first attempted or accomplished it themselves ; — and then proceeding to appropriate the benefit of it to their own private use, they endeavor to make the most of their 'ill-gotten gains' — as long as they can set justice at defiance, or hold on with impunity."

One of the most determined and persevering opponents of Messrs. Jackson and Morton's right to the patent, is Mr. Horace Wells, of Hartford, Connecticut, who has published a pamphlet containing affidavits, from respectable sources, tending to show priority of discovery ; but he is met by Dr. Morton with a letter, over his own signature, in which he speaks of the discovery as Dr. Morton's, and suggests to him to make arrangements for disposing of *his rights.* After an

examination of the statements of Dr. Wells and his friends, we have arrived at the conclusion that Dr. Wells rests his claim to the discovery on his use of *nitrous oxide gas*, which he states that he had used a number of times *in preference to ether*, which he considered more dangerous, but neither of which he used for any length of time, not finding them to answer the purpose he expected. Dr. Wells, however, went to Europe, and succeeded in convincing Dr. Brewster, and some others, of his right to the discovery.

In regard to the use of nitrous oxide, by Dr. Wells, we may remark, that it was nothing more than an application of what Sir Humphrey Davy discovered long ago. Mr. Edward Warren gives the following account of it, and the effect it had upon Davy : —

" The nitrous oxide gas (known to chemists as the *gaseous oxide of azote*, or the *protoxide of nitrogen*), differs from atmospheric air only in the proportions of its ingredients, air being composed of twenty-seven parts of oxygen and seventy-three of nitrogen, while the nitrous oxide consists of thirty-seven parts of oxygen and sixty-three of nitrogen. Sir Humphrey Davy first discovered that this gas could be safely inhaled, and that, for a short time, it would support respiration. He was surprised to learn, as he did by experiments on himself, that it produced a species of intoxication. In breathing it, he says, ' The first inspiration caused a slight degree of giddiness. This was succeeded by an uncommon sense of fullness in the head, accompanied by loss of distinct sensation and voluntary power, — a feeling analogous to that produced in the first

stage of intoxication, but unattended by pleasurable sensations.'

"At another time, on returning from a fatiguing journey, he was shut up in an air-tight breathing box, in which he became habituated to the gas, by its gradual introduction. After breathing it an hour and a quarter, during which eighty quarts were forced in, he came out, and began to inhale twenty quarts of pure nitrous oxide. As respiration went on, a thrilling was felt, from chest to extremities, until, as the pleasurable sensation increased, he lost all connection with external things, and seemed to exist in a new world. 'When,' says he, 'I was awaked from this same delicious trance, by Dr. Kinglake, who took the bag from my mouth, indignation and pride were the first feelings produced by the sight of the persons about me. My emotions were enthusiastic and sublime, and, for a moment, I walked round the room, perfectly regardless of what was said to me. As I recovered my former state of mind, I felt an inclination to communicate the discoveries I had made during the experiment. I endeavored to recall the ideas; they were feeble and indistinct. One recollection of terms, however, presented itself; and, with the most intense belief and prophetic manner, I exclaimed to Dr. Kinglake, — Nothing exists but thoughts; the universe is composed of impressions, ideas, pleasures, and pains.'

"Sir Humphrey also says (in his Researches, p. 465), that, on two occasions, the inhalation of nitrous oxide *removed headache.* Furthermore, he found that it

greatly *mitigated, or wholly removed*, the pain he experienced while cutting a wisdom-tooth."

The first recorded instance of the extraction of a tooth, without pain to the patient, he being under the influence of vapor of sulphuric ether, occurred at the rooms of Dr. Morton, in Boston, September 30th, 1846.

J. C. Warren, Professor of Anatomy and Surgery of the Massachusetts General Hospital, also certifies "that he had never heard of the inhalation of sulphuric ether as a means of preventing pain in surgical operations, until it was suggested to him by Dr. W. T. G. Morton, in the latter part of October, 1846." Also, Dr. C. F. Heywood, House Surgeon of Massachusetts General Hospital, certifies that he "assisted in the administration of Dr. Morton's preparation to two patients, operated upon by Drs. Warren and Hayward, at the Massachusetts General Hospital, on the 16th and 17th of October, 1846 — the operations lasting from five to ten minutes, without suffering to the patients, who speedily recovered."

It is generally known that the patent was taken out in the names of Charles T. Jackson and Wm. T. G. Morton, and bears date 27th October, 1846.

Subsequently Dr. Jackson claimed the sole merit of the discovery, inasmuch as he *suggested to Dr. Morton the inspiration of ether*, as a means of allaying the pain of operations upon the teeth. But upon Dr. Morton's acting upon his suggestion, Dr. Jackson disclaimed all connection with it, fearing dangerous results. Both had made experiments; but Dr. Morton having the earliest and best opportunity of testing it

upon his patients, soon demonstrated the result which Dr. Jackson had pointed out; though it is but justice to Dr. Morton to state that he had, previous to the hint from Dr. Jackson, been experimenting for months with ethereal and other gases, chiefly with a view to being able to extract teeth without pain. Dr. Jackson has been long and favorably known as an experienced chemist and geologist. Dr. Morton was formerly his pupil, and until he devoted himself to the profession of dentistry.

Objections to the use of ether, from interested and disinterested sources, have been many and various. One of the first that attracted our attention, was an article published by Mr. Richard Kissam, in the Journal of Commerce, an influential newspaper of New York. He avers,

1st, That our physical organization is such, that if the sensation of pain were obliterated, we should be liable to destroy our bodies and limbs, where now we are warned to preserve and shield them, by the suffering consequent on any injury.

2d, That when a wound or other external injury is received, the pain which usually follows stimulates and sets in action the recuperative process, which much facilitates the cure, while, in cases where pain at the time of injury is not felt, on account of strong mental excitement, from the presence of alcohol, or other stupefying articles in the system, the danger of death is much more imminent, the cure always retarded, and the subsequent pain much greater.*

* During the recent bombardment of Vera Cruz, a soldier was wounded, and amputation of both legs (at the thigh) was found necessary. He sur-

We admit the first proposition as an universal affirmation, but perceive no applicability to the medicinal use of ether. It is not proposed that persons should keep themselves constantly under its influence, with the idea of being invulnerable to pain. The use of the article, *as such*, would be highly improper, and productive of more injury than benefit. But that its occasional use, under the direction of an experienced person, for some specific purpose, has any such tendency, we do not admit.

The second proposition is fallacious. The idea "that the absence of pain during an operation — or, the *external exhibition* of *feeling* nccessarily causes greater subsequent pain," demands consideration; for, if it be true under all circumstances, we should look upon any article, designed to allay pain, as of *very* "doubtful utility." He affirms, that during the excitement of battle, soldiers sometimes do not feel their wounds; but that, after the excitement is over, they suffer most severely. He states, also, as a fact (which is hardly susceptible of proof), that "a person under the influence of strong drink may receive severe injuries, and not be sensible of them at the time; yet, on recovering his senses, his tortures are exceedingly augmented." To prove this, it would be necessary for the same individual to receive exactly the same amount

vived the operation of amputating one limb, but so great was the pain, that the surgeon declared that the amputation of the other limb would produce death. He inhaled ether, and it was removed. During the operation, he was unconscious of pain, and finally recovered.

Now if pain be necessary to a cure, how much quicker would the soldier have recovered without ether?

and kind of injury with the same state of general health, and every other attendant circumstance, in a state of sobriety. One reason why inebriated persons may suffer greater injuries from the same apparent causes, which less affect a sober man, is that their *power of resistance* to falls and blows is less ; but that their recovery from the same kind and amount of injury is more painful and difficult, is a mere assertion without proof.

In cases of wounds or injuries, in which pain is not experienced during surgical operations or otherwise, through the influence of strong mental emotions, or where, through pride, all *expression* of pain is subdued, we are aware that the nervous system subsequently suffers.

We recollect the case of a lady, who endured, for three or four hours, some exceedingly painful operations upon her teeth, without exhibiting the least symptom of pain, though at times it must have been very severe. She had made up her mind to preserve perfect calmness, and succeeded ; but a subsequent reaction was the result, and more than a week of nervous prostration and debility was the penalty.

But neither theories nor facts, showing that absence of pain, by reason of some all-controlling nervous excitement, renders more severe and difficult the curative process, militate against the use of ethereal vapor, as an anodyne ; for, if these facts prove any thing, they prove too much ; for, if the extraordinary excitement of one set of nerves does a subsequent injury to another set, and thus retards the restoration of

the general health, we should say that those individuals, who, by superior power of brain, quell pain, or the exhibitions of it, and thus aggravate future suffering — *they* are the very individuals who should use, not a partial anodyne, like opium, nor a stimulant, like alcohol, but an agent like the ethereal vapor, which tranquilizes, not one class of nerves at the expense of another, but *all*, — and diffuses its benign influence over the whole system.

But, admitting the presence of pain to be necessary for the healing of wounds, &c., many minor operations, such as the *extraction of teeth*, are exceptions; for, unless the surrounding parts are diseased, there is no subsequent pain occasioned by the extraction of a tooth, when the operation is properly performed. So that though it might be improper to use the vapor in operations in general surgery, it would not necessarily be improper in dental operations.

We have thought proper to answer these objections at some length; for, although they are plausible, they are sophistical, and therefore calculated to mislead those who are not in the habit of thinking for themselves. We will dismiss Dr. Kissam with one question: — *If pain be so necessary to the curative process, why have intelligent physicians in all ages sought for an agent to remove it?*

But the most serious charge consists in the allegation that *ether* is in itself injurious; that it is liable to produce headache, sickness at the stomach, delirium, asphyxia, death. Statements have been made in the

public journals (whether true or false, we know not), respecting injuries, more or less serious, from its use.

We have administered it in several thousand cases, to both sexes, and to persons of all ages, and of every temperament, and under a great variety of circumstances, and we have yet to hear of the first instance of injury KNOWN *to have resulted through ethereal inhalation, in our practice.* We believe, therefore, where injury has resulted, that either the ether was not pure, or it was improperly administered.

In regard to the preparation of ether, it is necessary to observe that there are many different kinds; and that which was entirely unsuitable for the purpose may have been administered, in some cases, through ignorance; and experiments may sometimes have failed in consequence of a want of confidence by or in the operator; and this shows why such different results have been produced by *what is called* sulphuric ether.

Ether is the name *of a class* of very light, volatile, inflammable, and fragrant spirituous liquids, obtained by distilling in a glass retort a mixture of alcohol with almost any strong acid. Every acid modifies the result in a certain degree, whence several varieties of ether are produced.

There are several methods of preparing it; one, where the whole quantity of acid and alcohol is mixed at once, and directly subjected to distillation; by another, the alcohol is gradually admitted into a body of acid, previously mixed with a little alcohol, and heated to 220° F.

The theory of etherization demonstrates that when

strong sulphuric acid is mixed with alcohol, there is formed, on the one hand, a more aqueous sulphuric acid; and on the other, sulphovinic acid is decomposed, its dihydrate of carbon combines with the alcohol, and constitutes *ether;* while the proportion of sulphovinic acid progressively diminishes.

Pure ether possesses the following properties: It is limpid; has a specific gravity 0·713, or 0·715 at 60°; has a peculiar, penetrating, and strong smell; a taste at first acrid, burning, sweet, and finally cooling. It has neither an acid nor alkaline reaction, and refracts light strongly. It is very volatile, boiling at 96° or 97° F., and produces, by evaporation, a great degree of cold. At the temperature of 62·4 the vapor of ether balances a column of mercury fifteen inches high, or half the weight of the. atmosphere. When ether is cooled to 24° F., it begins to crystalize in brilliant white plates; and at 47°, it becomes a white crystaline solid.

Ether alters gradually by contact with air; absorbing oxygen, and progressively changing into acetic acid and water. Ether should, therefore, be preserved in bottles perfectly full and well corked, and kept in a cool place; otherwise it becomes sour, and is destroyed.

Ether acts as an exhilarant or sedative, according to it purity. Common sulphuric ether was used as an anodyne in Guy's Hospital, London, in 1811, but abandoned, as it was found in many cases to excite, instead of composing the nerves. The difference between pure sulphuric ether and that commonly obtained from apothecaries, will be seen when the process of manufacture is described.

"*Pure sulphuric ether* is regarded as an oxide of ethule, and is represented by the formula C4 H5 O; its symbol is, therefore, Ae O. It is prepared by decomposing highly rectified alcohol, by means of sulphuric acid, or oil of vitriol. Five parts of alcohol, of 90 per cent., are mixed with nine parts of oil of vitriol, in a vessel of copper or iron, placed in cold water, so as to cool the mixture. The action of sulphuric acid on alcohol is catalytic; bisulphate of oxide of ethule is formed, which, by elevation of the temperature and brisk ebullition, is decomposed, and the oxide of ethule passes over in vapor; the sulphuric acid remaining with a portion of undecomposed alcohol, the water which passes over in vapor no longer uniting with the ether. Alcohol is repeatedly added to the sulphuric acid, which would decompose an indefinite quantity of it, were it not diluted by the water introduced — ten per cent. of which is conveyed to it by common alcohol.

"The distilled liquid is next to be treated with an alcoholic solution of potash, to neutralize the acids, and to render it slightly alkaline. It should then be redistilled in a water-bath, and the operation is to be arrested as soon as the ether has attained a specific gravity of 0·72 at 80° F. The specific gravity may be still farther reduced, by allowing it to stand for some days over dry chloride of calcium, and then redistilling it in contact with that hygrometric substance. Its boiling point is at 96° F. It has a penetrating, aromatic odor, and is highly inflammable. It should not change the color of blue litmus paper."

Common ether is made by pouring a quantity of sulphuric acid upon an equal weight of rectified spirits of wine, which ingredients are, by agitation, intimately mixed. This mixture is heated rapidly in a glass retort. Boiling generates the ether, which is preserved condensed, and offered for sale. Now, sulphuric ether, thus prepared, is always mixed with alcohol. It differs from it, only in being destitute of water; the formula of this ether being C4 H5 O, while that of alcohol is C4 H5 O H O.

Individuals ignorant of the difference, have used the latter. And here we have an elucidation of most of the difficulties which have occurred.

Inhalation of the purest ether, without a proper admixture of atmospheric air, will produce asphyxia, and subsequently, death. With a properly constructed inhaler, the possibility of such results is avoided.

In Stockton's Dental Intelligencer, of May 1st, 1847, after enumerating the objections proposed by the "dissenting dentists of Boston," a statement is made, that "fatal results have supervened after the administration of ether; and that uterine hæmorrhage and abortion have been produced;" but no particular cases are cited, no facts are given, no proof of the truth of the assertions adduced. Hence we feel at liberty to suppose these cases *ideal* instead of actual — especially as we have frequently administered it to pregnant females, suffering from toothache, and always with the best results.

Dr. Morton is opposed because he did not at once give the world its benefits gratis. Be it so. But does

this prove he was not the discoverer? Was it to be expected that he would transfer a knowledge of his discovery to an institution to which he neither felt indebted, nor expected aught, until he had first secured any pecuniary or honorary benefits which might arise from it? Dr. Morton, we believe, did not, after the first few experiments, pretend to keep the article "secret;" the very opposite of "patent," which means to open, or spread. And when a patent is granted by Congress, any person, for a shilling, can examine the records of the office, and obtain an exact description of any article which is patented. Some, no doubt, have honestly opposed this anodyne, who would now be very happy to retract, if the Lethean itself could be applied to the record of their opposition, and its existence become the subject of asphyxia. Had the discovery been made in another way, and by some other persons, its reception with many individuals would probably have been extremely different. We would, by no means, be understood as objecting to medical or dental institutions, *as such;* we regard them as indispensable to the prosperity of the profession; but we merely express what we have long felt,—that these institutions, through the ignoble spirit of minor members, have generated a spirit of exclusiveness, which has caused learned and intelligent men, *without the pale*, to look upon them with a *little* of that distrust, so *much felt by themselves*, for that large but unfortunate class without their honors.

The most intelligent of the medical profession are the least illiberal; while those with nothing but the empty

honor of a graduation-ticket, frown upon all who cannot pronounce the "shibboleth" of their *alma mater*, and who cling to their diploma like drowning men to straws. Such men would naturally scout the idea of so great a discovery coming "out of Nazareth," instead of a medical college. Was it for fear that "*Mister*" Morton might have been the discoverer, that certain members of the profession were so much incensed, because their reasons for disproving it were few?

Ether, as a lethean, was thus introduced into Europe on the 28th of November. Dr. Bigelow, of Boston, writes to his friend, Dr. Boott, in London, announcing the "new anodyne process," and giving instances of its success.

On the 14th of December, Dr. Boott sends Dr. Bigelow's letter to Mr. Liston, naturally anxious to make so important a communication, without loss of time, to one so preëminent in the operative department of surgery. And that distinguished surgeon, worthy of the confidence reposed in him, speedily tested the matter, in the hospital of University College. His success was most complete, on the 21st of December. On the morning of the 23d of December, his former pupil, Prof. Miller, of Edinburgh, was not a little surprised, doubtless, to receive the following epistle:—

"An American dentist has used ether (inhalation of it), to destroy sensation in his operations, and the plan has succeeded in the hands of Warren, Hayward, and others in Boston. Yesterday, I amputated a thigh, and removed, by evulsion, *both* sides of the great toe

nail, without the patient's being aware of what was doing, so far as regards pain. The amputation-man heard, he says, what we said, and was conscious, but felt neither the pain of the incisions, nor that of tying the vessels. In short, he had no sensation of pain in the operating theatre. I mean to use it to-day, in a case of stone. In six months, no operation will be performed without this previous preparation. The ether must be washed.

Thine always,

R. L."

This was read by Prof. Miller to his class, within an hour after its receipt; and a somewhat similar announcement was also made by Prof. Syme, in the after part of the day.

A few days after, Prof. Simpson visited London, and witnessed the effect of ether in the Hospital. He procured the best inhaler, and returned to Edinburgh, where, in the Royal Infirmary, an arm was amputated, without pain to the patient, who was under the influence of ether.

THE LETHEAN TESTED.

As, after all, the value of this discovery must be decided by experiment, we shall proceed to give a collection of facts, giving a fair average account of the effects produced by its administration. We commence with an account of the first cases which occurred in the Massachusetts General Hospital.

"*Operation for Tumor on the Face.* — The ether was administered at the Hospital, by Dr. Morton (on the 16th October, 1846), to a man, upon whom Dr. Warren was to operate for a tumor on the face. The effect, in this case, was not complete; the suffering, however, was very much less than it would have been under ordinary circumstances; and the result was, on the whole, so satisfactory, that a second trial was made on the following day."

"*Removal of Tumors.* — The patient to whom the ether was administered on the 17th of October, was a female, with a fatty tumor on the arm, between the shoulder and the elbow. At the request of Dr. Warren, Dr. Hayward performed the operation. The patient was insensible during the whole time."

Amputation of the Thigh. — In the third case, "the patient was a girl of twenty years of age, named Alice Mohan, who had suffered, for two years, from a disease of the knee, which terminated in suppuration of the joint and caries of the bones. For some months before the operation, her constitutional symptoms had become threatening; and the removal of the limb seemed to be the only chance for her life. The ether was administered by Dr. Morton. In a little more than three minutes, she was brought under the influence of it; the limb was removed, and all the vessels were tied but the last, which was the sixth, before she gave any indication of returning consciousness or of suffering. She then groaned and cried out faintly. She afterwards said that she was wholly unconscious and insensible up to that time; and she seemed to be much

surprised when she was told that her limb was off. *She recovered rapidly, suffering less than patients usually do after amputation of the thigh*, regained her strength and flesh; and was discharged as well, on the 22d of December."

The following case is reported by Dr. A. L. Cox, of New York: —

"*Operation for Tumefied Glands.* — On the 8th of this month (December, 1846), I was present, by the polite invitation of my distinguished friend, Dr. Mott, at an operation which he performed on a lady, for the removal of a cluster of tumefied glands from the right axilla. After inhaling the vapor, for a sufficient time to induce a state of insensibility, an incision four or five inches in length, was made, parallel to the edge of the pectoralis major; and after some progress had been made in the operation, the patient was asked by Dr. Kimball, how she felt. She replied, 'Very comfortable.' 'Do you feel any pain?' 'No.' To the same question, repeated after a short interval, a similar reply was made; and after a further lapse of time, the patient, partially arousing, inquired, 'Have they begun the cutting?' — thus manifesting her total unconsciousness of what she had passed through, up to that period. Afterwards, the sense of pain appeared, for some time, considerably blunted; but she became gradually more conscious of what was being done, until, at last, the sense of suffering seemed to be entirely natural."

"*Amputation of the Leg.* — An accident recently occurred to a man at the St. Helen's Auckland Colliery, requiring the amputation of his leg. The inha-

lation of the vapor of ether soon produced insensibility, and the operation was proceeded with, the first steps of which were not attended with the slightest pain. Consciousness returned before the operation was quite completed, when the usual amount of pain was experienced. The medical men present, Messrs. Hutchinson, Jobson, and Kilburn, were satisfied with the wonderful effect of the ether, and attributed the partial failure to the imperfection of the apparatus procured on the emergency."— *Newcastle* (*England*) *Journal.*

"*Cæsarian Operation.*— The subject was a dressmaker, aged twenty-seven, of mild disposition, and only four feet one inch in height, on account of the great distortion of the pelvis and lower limbs, from rickets during childhood. Her general health good. She was not aware of being pregnant until the seventh month; when she consulted a surgeon, who, conscious of her dangerous position, sent her to Mr. Sakey, under whose care she was admitted into St. Bartholomew's Hospital. It was recommended, no operative proceeding should be adopted until the full period of utero-gestation; and that the Cæsarian section would then be the most proper measure. The nature of the case being fairly and fully explained to the patient, she readily consented to undergo any operation which offered the best chance of relief. At two o'clock, in the morning of the 25th of January, she was awakened from sleep by the commencement of labor. The operation, therefore, was no longer delayed. The vapor of ether was inhaled by the patient for six minutes, be-

fore its effects were manifest; an incision, eight inches in length, was made down to the linea alba, commencing two inches above the umbilicus, and terminating two inches and a half above the pubes. The linea alba was then divided to the same extent on a broad dinetor. Adequate pressure over the front and sides of the abdomen was necessary to prevent protrusion of the intestines. An incision, from five to six inches in length, was then made into the lower axis of the uterus, from which a well-formed, healthy-looking female child was easily removed. The placenta was extracted shortly afterward. Thus far, the operation lasted six minutes. Immediate contraction of the uterus to one-half its previous size, followed the removal of the child. The free venous hæmorrhage which took place from its cut surface, was arrested by cold water and pressure between the hands. In half an hour, the uterus had contracted to such a size as to render its replacement within the abdomen, safe. It may be as well to observe, that the inhalation of the ether produced insensibility to the pain of the first incision. Its prolonged exhibition was not allowed, lest it might possibly interfere with the contraction of the uterus.

"Without ether, the pain in this case must have been most severe, and, from the circumstances mentioned, of more than ordinary duration; but, happily, the patient was spared it all. The apparatus employed, was one invented by Mr. Bell, chemist, of Oxford Street, who was present, and assisted Mr. Tomes in his application." — *Lon. Med. Gaz.*

Vapor of Ether applied to Veterinary Practice.— The following cases are introduced to show that the wonderful effects ascribed to the new anodyne, are totally distinct from those produced by mere operations upon the imagination, and that they bear no analogy to the Mesmeric, and similar influences, to which have been ascribed results very nearly resembling those of the inhalation of ether.

"The vapor of sulphuric ether was employed at the Royal Veterinary College, Camden Town, on a sheep and a horse, with the most decided success. The first-named animal was, and had been for many months, affected with an incurable disease of the hock-joint. The pain was so severe, that the poor sheep was quite unable to put her foot to the ground without experiencing much suffering. On being brought into the theatre, she was caused to inhale the vapor of ether through a tube, and in about five minutes after, it was evident that she was under its influence. The leg was then amputated by Mr. Simonds at the thigh, without the slightest indication of any pain whatever. The operation occupied about six minutes; and within twenty minutes from the commencement, the animal was removed from the theatre restored to sensation and consciousness. The horse was laboring under a chronic affection of the near fore foot, commonly known by the name of the "naricular disease," for which the operation of "unnerving" is generally resorted to as a remedy. This is necessarily a very painful operation; and oftentimes the operator has to contend against the violent struggles of the animal, particularly at the in-

stant when the division of the nerve is effected. In this case, the ether vapor was inhaled for about thirteen minutes, when the horse fell forwards, and the nerve on each side of the leg was divided by Mr. Spooner, without the least manifestation of pain; a slight convulsive action of the limb, similar to that which takes place when a nerve of a recently killed animal is cut through, alone giving indication of any sensation. Within twenty-three minutes, this animal, also, had perfectly recovered from the effects of the ether. No restraint whatever was resorted to, to keep the animals in the required position for these operations."

"*Reduction of Dislocation.* — A stout, healthy carpenter applied at the Massachusetts General Hospital, one afternoon, with a dislocation of the left shoulder. The accident happened the evening previous, from slipping down. Ineffectual attempts at reduction had been made by a practitioner, at first unaided, and afterwards with the assistance of several other persons of fair bodily power, by means of a sheet, &c. In the absence of Dr. Hayward, the visiting surgeon of the Hospital, I was immediately sent for, to take charge of the case. The dislocation was *sub-coracoid*, presenting the usual appearances. The pullies and counter-extending band being applied in the customary manner, the inhalation was commenced under the superintendence of the house physician, Dr. Bertody, by an apparatus furnished by Dr. Morton to the Hospital. After about two minutes, its influence was seen to be established; indicated not so much by any decided apparent insensibility, as by a certain incoherence of manner; unattended, however, by any attempt at

resistance or the like; the patient said he 'had got enough.' Traction was commenced, and after, say a couple of minutes, the head of the bone was felt to move, and at once entered the socket with an audible snap. During this time, not a groan escaped the patient; neither was there the slightest resistance felt, on the part of the muscles, in the vicinity of the joint. The patient's manner continued slightly incoherent for a few moments, but he soon recovered himself, and denied having experienced the slightest pain, though he remembered the sensation of the snapping of the bone into its place. I need not say, that, having already experienced the pain of previous, ineffectual, and somewhat prolonged attempts, he expressed himself highly delighted, and was profuse in his compliments.

"The power exerted by the pullies was very slight; and I feel confident that I could have reduced the bone, unaided by them, with my hands alone. I am in the habit, every year, of producing this dislocation, among others, upon the dead subject, for demonstration in the lectures of Dr. Warren; and it is worthy of remark with what ease these factitious dislocations are reduced; in fact, it is hardly possible to handle the limb, without the head of the bone flying into the socket — showing the muscular power to be the chief, if not the sole obstacle, in these cases, in the living. In the instance above detailed, so utter was the abolition of the muscular power, and so easy was the reduction, that I was strongly reminded of my experiments upon the dead body.

"The application of this agent to this class of cases,

has undoubtedly suggested itself to every one who has seen its employment; and it only remains to apply it to a dislocated hip joint, to add another to its triumphs. In cases of dislocations, it will probably not only annul pain in the patient, but render unnecessary those violent exertions, on the part of the surgeon, which are by no means agreeable to the by-standers to witness, or to himself to make. S. PARKMAN, M.D.

Dec. 9, 1846. *Surg. to Mass. Gen. Hos.*"

"*Case of Operation of Lithotomy in England.* — At the Middlesex Hospital (England), the efficacy of the ether was put to as severe a test as it has yet been subjected to. A man of sixty-eight had been admitted, with symptoms of stone, and diseased bladder; so much pain, straining, and struggling attended the attempts at sounding, that it was with difficulty satisfactorily accomplished. The verical tenesmus was incessant, amounting to total incontinence of urine. Endeavors were made, for several weeks, to allay this extreme irritability, so that some urine might be retained, or some water received as an injection, but in vain; neither could be endured; lithotrity was consequently out of the question, and Mr. Arnott determined to perform the operation of lithotomy, unpromising as the case was, but, if possible, whilst the patient was under the influence of the ether. In seven minutes from the commencement, but in reality only two from the effectual inhalation, its influence was obtained. The catheter was then introduced, and some water attempted to be injected; but not above two or three ounces could

be borne, and this, retained by pressure, was ejected immediately on the introduction of the staff, which, owing to the state of the parts, was effected with some difficulty, and consequent delay; the bladder was cut into; the stone was grasped at once, but crumbled under the forceps, requiring their reintroduction several times; the scoop was employed to remove calculous matter like mortar; and lastly, the bladder was injected four or five times, so as to wash it out. During the whole time, from first to last, the patient gave not the slightest indication of suffering; indeed, it was not until he was removed to bed, and had been some time in it, and taken some brandy ammonia, that he did so, and then of soreness merely. Nor was the influence of the ether limited to this; its anodyne effect was maintained during the evening, the man remaining in a dreamy and 'very comfortable state,' as he termed it. He declared he suffered no pain; he knew that something was being done, but he recollected nothing distinctly, 'after blowing the horn.' Up to the evening of the third day, he was going on very favorably."

"*Removal of Tumor of the Breast.* — On the same day, a large assemblage of the professional gentlemen of this vicinity, took place at the Suffolk General Hospital (England), to witness the operation of removing a tumor from the breast of a female, while under the influence of ether. Some difficulty was experienced in bringing the patient fully under the influence of the ether; but she was laid back on the pillows in a state of complete insensibility. The operation was then

commenced, and the tumor, about the size of an orange, was rapidly removed by Mr. Image, the patient making only an indistinct moaning noise. As some dissection was necessary in order to separate the diseased part, the woman had a second application of the inhaler, so that the insensibility was maintained as long as was required. And now came the most interesting part of the procedure. A towel having been laid over the bosom, so as to conceal the effects of the operation, and the patient having recovered her senses, she was asked how she felt, and whether she was ready to undergo the operation. She replied that she was quite resigned and willing; that she knew that it must be painful, but that Mr. Image might commence as soon as he liked. This answer was elicited from her several times by Dr. Ranking, that the spectators might have a full opportunity of ascertaining that she was perfectly unaware of any operation having been performed. Dr. Ranking then informed her that the tumor had already been removed, and that nothing more was to be done; upon which her countenance put on an expression of delight and grateful astonishment, which it is impossible to depict. In fact, she appeared quite incredulous, until she had raised her head, and herself inspected the wound, when she could not sufficiently thank those around her, for having been spared an amount of suffering which, she had justly supposed, would, under any ordinary circumstances, be extreme. Nothing could, in the estimation of the majority present, have been more demonstrative of the power of this agent, than the present case. It

was one which required careful dissection, and was not, therefore, so rapid as others. The expression of willingness to submit to the supposed impending operation was genuine, as were also the incredulity and subsequent gratitude. The woman has since positively declared, that 'she *felt nothing*, but was in a dream, and taken away from the present world.' Her pulse and general aspect were not like those of a person who had so large a portion of the body excised."

"*Insensibility to Pain from a hot Iron.* — An exhibition of extraordinary interest to humanity occurred at the Massachusetts General Hospital, in Boston. A patient was presented — *a man somewhat advanced in life* — who, we understand, was laboring under paraplegia, having its origin in a caries of the lower dorsal vertebra, for which Dr. Warren proposed the actual cautery. After the patient had inhaled the lethean, Dr. Warren passed an iron rod, heated to a white heat, to the length of about two feet, up and down the back, on each side of the spine, — burning two lines on one side and one on the other, — and then carried it zigzag across, between the spinous processes, the same distance. As the flesh smoked, and the hot iron hissed on the surface, the spectators were filled with admiration at the entire immunity from pain, and the perfect stillness of the patient while subjected to this most painful and appalling resort of surgery. On his return to consciousness, he was quite ignorant that the operation had been performed, and said he had been in a delightful dream, and that his sensations were more agreeable than they had been for a year."

"*Removal of Cicatrix from Lip.*— A boy, twelve years of age, in vigorous health, was brought to me by his parents, on account of a scar on the upper lip, about an inch in length, which had been caused by a contusion. The red part of the lip had united irregularly, and produced considerable deformity. The operation necessary for the relief of this accident, was likely to be painful, protracted, and to require much delicacy. It was important, therefore, that the patient should be kept in the most perfect state of quietude. This was not likely to be the case, as he stoutly resisted the idea of submitting to any suffering. His parents were, therefore, very desirous for him to take the ether.

"During the operation, which consisted in dissecting out the cicatrix from the lip, he remained immovable; not the slightest shrinking or muscular action, of any kind, being perceptible. He recovered from this insensible state while the edges of the wound were being adjusted and the sutures inserted, but did not make any complaint. The pulse was now found to be slow (say sixty in the minute); the pupils dilated. He vomited a little, and was faint for half an hour; but when I saw him in the afternoon, he had quite recovered from the effects of the application." — *Dr. J. Mason Warren.*

Application in Insanity. — One of the many interesting and singular results that have followed the inhalation of ether, is recorded in a foreign journal — the subject being a *mad girl.*

"The vapor was administered at the Insane Asylum at Pau, by Dr. Cazenovia, to a girl who had been mad for five months, and had not slept during that time.

After five inhalations, the irritation of the patient was allayed, and she sunk into a sleep, which continued twenty-five minutes, when she awoke, with no appearance of her disorder remaining; nor, up to the last accounts, had she any relapse."

"*Ether in Mania.* — In the licensed lunatic wards of the St. Marylebone Infirmary, Dr. Boyd has tried the inhalation of sulphuric ether in four cases, one chronic and three acute, of violent mania, amongst females, with excellent effect, and without any unfavorable results. The tranquilizing effect was produced at various intervals of from two to ten minutes; at a time too, when the patients were unusually violent. All of them appeared to become intoxicated. Before this effect was fully produced, their anger in every instance seemed turned to joy; a soporific effect was the utmost that was produced in any case." — *Lancet.*

APPARATUS FOR ADMINISTERING ETHER.

The apparatus which we have improved, and now use for administering the ether, is a glass reservoir, large enough to hold about a quart. The reservoir has two circular openings, from one and a half to two inches in diameter, to one of which is attached a tube with a glass mouth-piece, flattened, at the extremity, to suit the shape of the mouth. To this tube, near the orifice, is attached a valve, by which the expired air from the lungs is prevented from returning to the vessel, and is dissipated. This valve is covered with wire gauze.

Fig. 2.

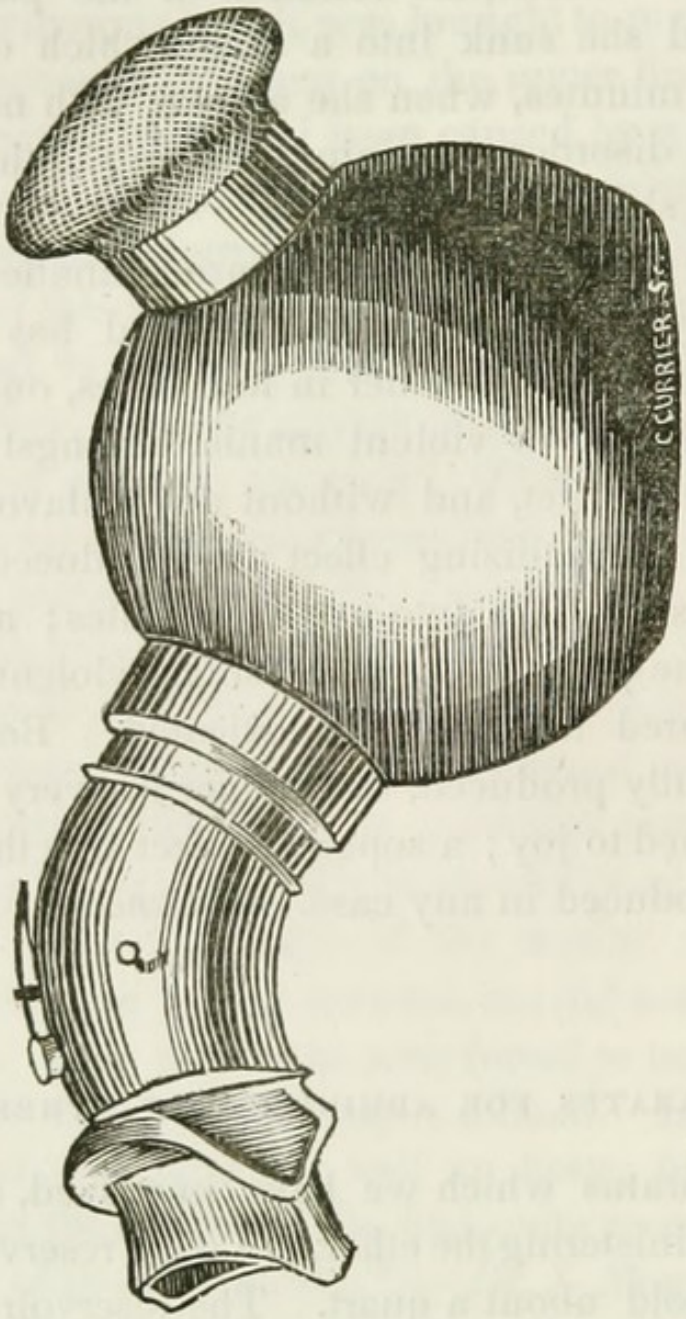


Fig. 2 represents an inhaler we have received from Paris. This is supposed to be the only instrument of the kind in this country, excepting the one now in the possession of Dr. Hayden, of Boston, who also has used it with great success.

The other opening should be provided with a glass stopper, and is used for the admission of atmospheric air. We have made a wire gauze cap, as a safety-valve by lamplight. By this improvement, ether can-

not explode or ignite. Around the elevation which bounds the orifice of the tube, a French apparatus is sometimes affixed—a simple apparatus for compressing the nose of the patient. It consists of spring wires, padded and covered, which clasp the nose with a gentle pressure, and prevent the too large inspiration of atmospheric air. In the reservoir it is only necessary to place a sponge, well saturated with the ether, for a brief operation. If the process of inhalation has to be repeated, a small quantity, from one to one and a half ounces of ether, may be placed in the reservoir. Some have recommended the use of linen folds instead of sponge; but we have found the latter best adapted to the purpose, as it presents a larger evaporating surface.

Fig. 3.

1, Inhaler. 2, Admits air. 3, Emits ether and air. 4, Admits air. 5, Allows the ether and air to pass into the tube. 6, Orifice of tube to admit air. 7 and 8, Tube with valves for inhalation. 7, Admits air. 8, Valve for expired air to escape.

We have often used a sponge, but the patient is not so readily affected by its use; and where a large quantity is administered, the atmosphere of the room is filled with ethereal vapor, and the *perpetual* inhalation of

so much of it, by the operator, is rather unpleasant. Having used the ether in our practice ever since its use in the Massachusetts General Hospital, during which time we have administered it to a great number of persons each day, we feel to speak with some degree of confidence as to its effects.

DIRECTIONS FOR USE.

1*st*, The patient should always be placed in the position he is to occupy during the operation.

2*d*, If a sponge be used, it should be concave, and bell-shaped, and large enough to cover the mouth and nostrils. A portion of it may be covered with a piece of kid or oil skin, or a folded towel, to prevent the too rapid liberation of the ether; but care should be taken, in all cases, not to exclude entirely the atmospheric air; this is very essential.

3*d*, Before using the apparatus or sponge containing ether, the patient should be instructed how to "draw," or "breathe." If an instrument is to be used, the patient might practise breathing through the tube, before putting ether into the reservoir.

4*th*, If there be witnesses present, they should preserve silence after inhalation has commenced. Nothing more retards the process, than talking, questions, and exclamations; especially, if the subject be at all timid; in which case, the operator should kindly encourage the patient with assurances of the perfect safety of the operation. All unnecessary movements, such as opening and shutting doors, moving chairs, &c., should be avoided. All noise tends to disturb and retard the process.

5*th*, Where *instruments* are to be used in labor, operations for stone, &c., they should always be applied *before* inhalation is commenced, as the risk of doing injury is thus avoided. The operator can easily distinguish the complaints produced by injurious malposition of an instrument, and those caused merely by the new and unpleasant feeling of its introduction.

6*th*, Sometimes the patient declares that the ether "chokes him," he "can't breathe it," &c., and that the smell offends him. He must then be persuaded and encouraged to try again. Insist on his persevering, and in a short time he will be so much under its influence, as to be indisposed or unable longer to resist. A winning deportment almost always produces the effect; but sometimes it is necessary to speak out loudly and sharply, to enforce inhalation.

7*th*, The progress of inhalation is generally more rapid when the eyes are kept closed, as the attention is thus not diverted.

8*th*, The operator must always have confidence in himself, exhibit no embarrassment, coolly meet every emergency, and closely watch the first indication of ethereal effect.

9*th*, Let each step of every operation be persevered in with the utmost composure, and the abiding conviction that the state which ether has produced may be surely and with safety continued as long as the circumstances may demand.

10*th*, By a rapid, steady, full inspiration, the best effect is produced, and the least quantity of ether required. When the inhalation is abrupt and irregular,

and the patient restless, much of the ether is wasted, and the process protracted; friends are sometimes alarmed, and the patient discouraged. Again, if a sedative result on the general circulation be wanted, bleeding in the arm should be resorted to; but it is found that many ounces of blood are required when it is drained slowly away; but when from a large orifice in the vein it is rapidly abstracted, "*pleno rivo*," the patient soon faints, and less blood is therefore necessary. It is the sedative effect that is wanted in surgery, and we have ever found, in our practice, that the quicker an individual could be etherized, the better; particularly in the case of nervous patients.

Usually, the first few inspirations produce the effect. It is at first a decided stimulant, and afterwards operates as a powerful sedative; like opium, which, when taken in small quantities, causes excitement, but becomes a powerful narcotic when taken in large quantities. Some inhale just enough ether to become excited, when the operation is unwisely relinquished.

11*th*, For the extraction of teeth, the patient should commence to inhale with the mouth open; as some persons obstinately refuse to open their mouths when under the influence of ether. We have sometimes placed a cork between the teeth, to keep the jaws apart. In some instances, the mouth can be forced open, but this is impossible in others.

12*th*, If the pulse should rise above one hundred and forty, or sink to fifty-five pulsations in a minute, ether should be used with great caution. We were once called upon to extract a very bad tooth, present-

ing uncommon difficulty, for a middle-aged lady (of very nervous temperament), who was anxious to take the ether; which I gave her, and painlessly removed the tooth. This was done in the presence of Drs. Cross and Warren, the latter of whom kept his fingers continually upon her pulse, but could detect no variation in the movement of the heart.

It has been supposed, that ether should not be administered in certain cases, and to those affected with certain complaints; that it should not be used in the following cases: —

1*st*, Disease of the heart; on the supposition that fatal syncope would result.

2*d*, Where there is a tendency to hæmorrhage of the lungs, apoplexy, or congestion of the brain.

3*d*, To highly nervous persons, females subject to hysteria, &c.

4*th*, Cases of chronic bronchitis, or where any irritation of the air-passages exists.

5*th*, Cases of tubercles of the lungs.

6*th*, Epilepsy, mania, and delirium tremens.

7*th*, Operations for deep-seated tumors of the neck.

8*th*, Very young subjects.

9*th*, Those subject to convulsions.

But the safe inhalation of ether, by persons affected with *these complaints*, proves these objections to be purely ideal. The following, among many cases, indicates the advantage and even benefit of ether, in *mania a potu*: —

"Dr. Upham, of Boston, has contributed to the Boston Medical and Surgical Journal, an account of the

successful treatment of a case of delirium tremens, by the inhalation of ether. The patient was in a high state of nervous excitement; and after the usual treatment by opium, in the form of morphine, had failed to induce sleep, on the day of the experiment, he was still in a state of wakefulness and high delirium, but so much exhausted as to make it a matter of the highest moment to induce sleep immediately. In this state it was determined to resort, as a last experiment, to ethereal inhalation, and the ether was accordingly administered by a sponge. Dr. Upham thus details the result: —

"The patient was very refractory, and required to be held by assistants, in the mean while struggling, raving, and cursing. After inhaling the vapor for the space of ten or twelve minutes, he appeared quiet, and was thought to be fully under the ethereal influence; but upon removal of the sponge, he sprang up and commenced raving anew. The process was repeated, and continued for ten minutes more, at the end of which time, the patient was brought fairly under the desired influence, and fell asleep. From this state of artificial sleep, he passed, without waking, into a quiet, deep, and untroubled slumber, which continued without intermission for four and a half hours.

"He was seen several times during the continuance of this sleep, and within a few minutes after he awoke. He then appeared perfectly rational, called for cold water, and asked to have his leg dressed (he had bruised it badly during the delirium). In the course of half an hour he fell again (as was anticipated) into a

quiet sleep, which continued, with few intermissions, during the afternoon and night.

"Next morning (Saturday) he appeared perfectly rational and well, though weak. He had no recollection of any thing that had happened, from nightfall on Monday, to the time of his first waking on the Friday afternoon."

We hold in our possession a statement of Mrs. W., of Mobile, formerly of F—— Street, N——t, and who has been for years laboring under stricture and hæmorrhage of the lungs, and to whom we administered much ether, several times, on different occasions, for three months, and without the slightest injury.

An operation has been performed, with ether, at the Massachusetts Medical College, on a child only three months old; and in Europe, young children have been painlessly operated upon, and in no instance injuriously affected by ether.

A patient in London, was translated, as it were, to the realms of bliss, immediately after a painful operation. Four verses of a psalm were sung by him very loudly, with his eyes fixed, his body in a tremor, and intense fervor shown in every movement. He would not be interrupted, and could scarcely be prevailed on to leave the operation-room, seeing that he found himself so wonderfully happy there. He said he had been in heaven, and had seen his Saviour; on reaching his bed, he fell on his knees and was wrapped in prayer.

It has always been a leading object, in practical surgery, to diminish, as far as possible, the amount of

suffering during the manipulations of that art. Accordingly, in some operations, tight pressure has been made above the part to be cut, applied by a tournequet, by bandaging, or by the powerful grasp of an assistant.

"In medical practice, wine, whisky, and brandy are every day given (even for long continuance) in such doses as must prove more or less intoxicating; in low fevers, for example, or in threatened sinking, after severe shocks by injury. And here the saving of life, is held to justify the means. Employed as a mere experiment, their use would assume more than a doubtful character. In the time of the cholera, when it raged in its first onset, a late physician in Edinburgh, attached to one of the hospitals, experimented largely in the injection of saline matters into the veins; and with no indifferent success. One old man resisted the ordinary injection; and, in a reckless moment, it was resolved to inject whisky into the veins instead. The effect was electrical. The man — before cold and clammy, and blue; without voice, or pulse, or power of motion — rose up in bed, a living corpse; fancied he was in a change-house; called loudly for more drink; trolled merry songs; and, after a few minutes of ghastly gayety, fell back, and sank again, and died."

The *advantages* of ether, besides the mere removal of pain, are numerous; and

1*st*, Among these, is the *removal of fear*, by which many diseases may be cured, that would otherwise be permitted to progress to a fatal extent, through dread of a surgical operation. For it is well known that per-

sons of the most undoubted courage, who have faced death upon the battle-field with an unblanched countenance, and calmly braved the "perils of the deep," and boldly risked the contagion of hospitals and "pestilential climes," have instinctively shrunk from an operation requiring the surgeon's knife, and permitted a fatal disease to progress, rather than submit to a surgical operation.

2*d*, The prevention of those *shocks* to the system which are *always* produced by the suffering of pain; for, in the cases in which ether is successfully administered, no pain is felt; that which is mental or emotional, being avoided; for all anticipation of pain is removed. There is, however, another kind of shock, that produced on the spinal and ganglionic systems, which may remain after the use of ether. But the certain prevention of mental shocks, and those produced by suffering, greatly facilitate recovery; as there is not then that strong reaction to contend against, which usually follows surgical operations — a reaction or exhaustion of the system that tends to inflammation, or irritation, caused by overtasking the nervous system to bear up under the excitement of an operation.

3*d*, Not only does the etherized patient avoid suffering *during* the operation, but the pain which follows is materially mitigated by the soothing effects of ether in the system. Neither is the mind afterwards haunted by the recollection of suffering: *hence, those who have undergone surgical operations by the inhalation of ether, in the Hospital at Boston, have recovered quicker than the same class of cases without ether.*

4*th*, The advantage to the operator of a *passive* subject, in most cases, is immense.

5*th*, The reduction of dislocation is found much easier. "The patient may be calm, and anxious to assist the surgeon; but when violent extending force is applied to the limb, he strains himself greatly, and renders the muscles connected with the displaced joint as rigid as if they were of wood or plaster."* Etherization removes this rigidity.

6*th*, In hernia, which may be called the dislocation of the bowels, "it prevents the straining of the patient, which every experienced surgeon knows is so greatly obstructive of reduction. In a recent case of rupture, the bowels were constantly protruding from the wound, and could not be replaced, on account of the great and incontrollable action of the abdominal muscles; ether was administered, the patient became unconscious, the abdomen lay quiet, and the protruded parts were then, without the slightest difficulty, replaced and retained."*

USUAL EFFECTS OF ETHER ON THE PATIENT. RESTORATIVES. DANGEROUS SYMPTOMS.

Upon the first attempt at inhalation, the patient is often affected with a tickling and burning sensation in the throat, especially if there has not been admitted with the ether a full supply of atmospheric air. Sometimes violent coughing is induced; to this may succeed nausea, or even vomiting. This, however, sel-

* B. and F. Review.

dom happens, unless the vapor is received into the stomach, which may always be avoided, by giving the patient proper directions how to "breathe" the vapor. When the patient begins to feel the influence of the ether, there is a loss of voluntary muscular power; the eyes close, and the hands drop; if requested to open his eyes, the patient either neglects the request entirely, or, if he endeavors to comply, it is with an effort, and he soon closes them again; at this time the pupils of the eye will be found dilated, sometimes turned up, or fixed; sometimes the countenance is red, and in other cases unusually pale. The pulse is generally increased in rapidity and power; if, however, the pulse falls to sixty in an adult, or in a child to seventy-five or eighty, the ether should be withdrawn. A flow of saliva, with unconsciousness to surrounding objects, loss of sight (though the eyes may remain open) and of hearing, are also accompanying symptoms of the full effects of ether. If the countenance assume a livid appearance, with heavy, irregular, and labored breathing, the inhalation should be immediately discontinued. Cold water dashed forcibly into the face, is often the best and quickest restorative; the introduction of oxygen gas into the lungs, or the internal exhibition of *aqua ammonia*, will effect the same purpose. Sometimes, with hysterical females, a cold shivering will come on, accompanied with weeping. In such a case, the patient should be laid in a horizontal position, and warmly clothed; the hands should be rubbed, and warm wine administered; if heat be not soon restored, warm applications should be applied to the feet.

The above are the *external* symptoms; those which are unpleasant or dangerous occur but rarely, and no one person exhibits them all. A minor operation, such as the extraction of a tooth, does not require so full etherization of the patient, as where the operation is more severe and of longer duration.

The *internal* effects of ether are as various as the outward symptoms; and in the cases which we shall present that have come under our own observation and that of others, it will be seen that they are as various as the persons who received it. When fully. etherized, the patient often sinks into a dreamy revery, in which his mind is employed in recalling the reminiscences of the past, or enjoying some imaginary delights of the present.

CHAPTER II.

USE OF ETHER, ETC.

CONTENTS. — Use of ether in labor. Cases in Paris and Edinburgh. Cases related by Drs. Townsend, Channing, and others. Author's experiments on men and animals. Effects. Experiments on bees, frogs, leeches, fishes, dogs, chickens, &c. Result. Operation of ether. Phenomena. Case at Newburyport.

As this subject is so important, we have devoted much inquiry to it, and present the following facts for consideration. It has been said by an eminent physician (Dr. Merriman), "that there is no operation in surgery more painful than that of labor." His description is truthful and vivid. "The pulse increases in quickness and force; the skin grows hot; the face becomes intensely red; drops of sweat stand upon the forehead; perspiration, sometimes profuse, breaks out all over the body; frequent violent tremblings accompany the last pain, and, at the moment that the head of the child passes into the world, *the extremity of suffering seems beyond endurance.* Or, take the picture of the sufferings of the mother in the last stage of natural labor, as portrayed by the most faithful of living observers, Prof. Neagele, of Heidelberg: 'The pains,' he observes, 'of this stage, are still more severe, pain-

ful, and enduring; they return after a short interval, and produce a far greater effect upon the patient than those of the previous stage. Their severity increases so much the more from the additional suffering arising from the continually increasing distension of the external parts. They convulse the whole frame, and have hence been called the *dolores conquassantes*. The bearing down becomes more continued, and not unfrequently there is vomiting. The patient quivers and trembles all over. Her face is flushed, and, with the rest of the body, is bathed in perspiration. Her looks are staring and wild; the features alter so much, that they can scarcely be recognized. Her impatience rises to its maximum, with loud crying and wailing; and frequently, expressions are used which, even with sensible, high-principled women, border close upon insanity. Every thing denotes the violent manner in which both body and mind are affected.' "

Under the influence of ether, in labor, not only has all pain been removed, but the most exquisite pleasure has been enjoyed; and many mothers have blessed God for the removal of that curse introduced through the disobedience of Eve, upon her exodus from Eden; since which, that fiat of the Deity, "in sorrow shalt thou bring forth children," has been inseparable from childbirth, until now graciously removed by this "last best gift" to woman.

Cases are reported of instrumental labor, in a Paris hospital, under the use of ether, which were fatal, in consequence of the supervention of puerperal fever; but this will hardly be ascribed to ether, or urged as

an objection to its use, as puerperal fever existed, at the time, at the hospital; and all who are acquainted with that disease, know how readily it extends itself from patient to patient, in hospitals. "I have not in memory," says Dr. C., "a single case of instrumental labor of so much severity as that of Mrs. H. (reported in another place), from which recovery was so rapid, and so complete, and in which suffering was so slight."

Not only in Paris, but in Edinburgh, also, ether has been used in labor. To no one is the profession more indebted in this respect, than to Dr. Simpson, professor in the Edinburgh University.

Forbes's Medical Review, the leading authority in medical literature in Europe, contains the following: —

"In a communication which we have received from Edinburgh, dated 22d March, Dr. Simpson states that he had, up to that date, used etherization some forty or fifty times, with the most perfect safety and success. His first application of ether, was to a difficult case of turning, in a deformed woman. A painful operation had to be performed within the womb; and then the child had to be pulled forcibly away. Much force was necessary, and, in ordinary circumstances, much pain must have been endured, and the recovery must have been tedious. In this case, during the whole process, there was either very little or no pain, and the recovery was rapid and perfect.

In one case, he kept a person etherized four hours, and in another six, without the fœtal heart varying above ten or twelve beats during the time. The mother, in both cases, recovered perfectly, and both were, of

course, astonished, at being delivered without being aware of it.* Dr. Channing, of Boston, also kept a person etherized for *nine* hours.

He reports a case of Mrs. S., aged twenty-three. By inhalation from a sponge, in one minute she was unconscious. "In the first efforts with the instrument, instead of a *bearing-down* effort, an opposite one was made by the patient. The lower limbs were straightened out with much force, and the instrument drawn inwards into the pelvis. This was very striking. But a very short reäpplication of the sponge obviated this difficulty entirely, and the child favorably descended, and no farther organic resistance to delivery occurred. The head was born. The child breathed, and every thing promised well. But pains did not occur for some time. As happens not unfrequently after the accomplishment of delivery thus far, after very severe labor, contractions cease as from exhaustion, and the child remains in great peril. Perhaps as many children are lost in this way as from any other accident in delivery. At length, however, an arm was brought down, the womb acted, and very slowly the child was born. Some time elapsed before the placenta was

* On the 22d of February, Baron Paul Dubois, Clinical Professor of Midwifery at the Faculty of Paris, read a paper to the Academy of Medicine in that city, detailing his experience of etherization in the practice of midwifery. His conclusions are the following: — 1. It has the power of preventing pain during obstetric operations; such as turning, application of forceps, &c. 2. It may momentarily suspend the pains of natural labor. 3. It does not suspend uterine contraction, nor impede the synergetic action of the abdominal muscles. 4. It appears to lessen the natural resistance which the perinæal muscles oppose to the expulsion of the head. 5. It has not appeared to exert any bad influence over the life and health of the child.

detached, but this came naturally away. The child was alive, and cried. It was a boy, and weighed nine pounds.

She said she remembered nothing, from the first inhalation to the moment when the afterbirth was taken away. I told her she had talked, had described her feelings after inhalation, had told us where she had been, &c. &c. Well, she said, she did not know any thing about that. She could only repeat what she just said, that she remembered nothing about it; not a word, not a syllable. I asked if she did not recollect that I was there, and used instruments, and endeavored to bring to her remembrance other matters. She said, again and again, she remembered nothing about it. In Mrs. H.'s case, I stated that she had *sense*, but not *feeling;* that she knew she was alive, and that people were about her, and assisting her, &c., but that she felt nothing — had no pain.

Let it be especially borne in mind, that insensibilty to pain, a perfect unconsciousness in regard to suffering, may be present, while the patient may be perfectly conscious of other things; namely, of persons about him, what is doing, &c. This it is which makes one of the most curious facts in etherization, and demands the special notice of the practitioner. The application of ether in labor has been made because its fullest agency does not interfere with the involuntary agencies, the action of the womb, on which delivery depends. The womb acts under the fullest effects of ether, just as regularly as does the heart or the lungs. Nay, I have observed obviously good effects during ether-

ization, in the absence of voluntary efforts, the *bearing down*, to which the patient is so strongly tempted, in order to bring to a more speedy close the extreme suffering that is experienced. There has been far less exhaustion after labor, from the absence of the voluntary effort; and the danger of graver accidents is much diminished. Effort is in an important sense proportionate to the demand, and relaxation goes on steadily, and in harmony with the pressure which demands it. Professor Simpson thinks he has seen that an increase of uterine effort, where it was demanded, has been the result of etherization.

June 18. *Case of Mrs. R.*, aged eighteen. In labor; great pain; refused the ether, but finally consented to breathe it; was unconscious in one minute; pain returned; she got hold of the sponge, without being seen, and breathed at it with great avidity; so much so, that it was found difficult to remove it when discovered. The child was born in four or five pains after etherization. The placenta was soon thrown off — the womb contracted well, and a swathe was carefully applied.

The return to consciousness was slow. There was exhibited more excitement than I have before met with. There was a full expression of previous most perfect freedom from suffering. A state of entire pleasure was expressed. She sung, talked, raised her arms high in the air. She did not recollect me, or anybody about her. Her child's cries, which were very loud, strongly attracted her notice. She passed her hand over her abdomen firmly, as if to learn what

had happened, and her countenance expressed much surprise. Pulse continued natural; complexion good; temperature as during labor. Some hæmorrhage, but not enough to do harm. She said she was very hungry and thirsty; and took, with much relish, gruel and water. After-pains occurred, in about half an hour after labor was over, with much severity, and for which I prescribed camphor and opium in pills; I left her otherwise comfortable. Slight hæmorrhage. June 13, she was perfectly well.

Case of a lady aged twenty-five. When etherized, she exclaimed, 'I am dying, I am dying!' I had my finger on the wrist, and carefully examined the pulse. It was about ninety before etherization. It rose to ninety-eight, and this was its number, with temporary changes, during the whole of the labor after ether. Excitement soon passed by, and a pleasant calm succeeded. The expressions were now of pleasure only. 'How beautiful! how beautiful!' was the language she used. The state of etherization was moderately sustained during the whole day. Mrs. W. had some latent feeling about the remedy which much influenced the case. She would vehemently demand the sponge, and that it should be thoroughly wet with ether. She would put it aside as soon as she began to feel its effects. At times, however, she would experience its full effects. She was thus by no means wholly unconscious; I mean in that degree of it as to be unaware of people and things around her. Sometimes she would say, 'I know you, Dr. C. 'I know you, Mrs. F.,' &c. &c.; as if to let us understand that though

she was unconscious of pain, she knew all other things. She would say, when demanding the sponge, 'Do n't be afraid of hurting me. I know just how much I want, and will tell you when to take it away.' And this was done after a manner which I have seen in no other case. The labor was delayed by the state of the perineum. It was very wide, leaving the os externum very small. Through this protruded a round mass of scalp, and a conical-shaped bony mass of scull. The occiput had fairly cleared the arch of the pubis; still delivery did not take place. After an ointment of ext. of belladonna and simple cerate was liberally used inside the vagina, and over the perineum, dilatation took place readily, and the child was born. There was perfect abolition of pain in this closing period of labor, and when suffering is, I may say, always so great. The womb contracted well. The placenta was easily detached by natural effort, and, with some coagula, was expelled. A swathe was applied. Child, a female, weighing seven and a half pounds. It did not breathe immediately after its head was born, but soon breathed after cold water was dashed on its face and breast, and did perfectly well. During the labor, 3 j. ergot was infused into about 6 oz. boiling water, and the tea without the powder taken. Some increase of pain undoubtedly followed its use. The bladder was emptied with the catheter once during the day.

Labor began in this case at twelve the preceding night, and was ended at six, P.M., the following day. The ether was first inhaled between eight and nine, A.M., and its influence was sustained, as above de-

scribed, till nearly five, P.M. Mrs. W. described her state, when consciousness returned after labor, as one of perfect ease and enjoyment. She had hardly had a pain. She had little memory of pain. The ether had made tolerable, what she thought she could hardly have lived through without. She had been in pain, she said, during the three preceding weeks; her nights disturbed, and her days most uncomfortable. She expressed her gratitude for this means of her comfort, through a whole day, after a manner which I have not heard paralleled. Her pulse was calm, her manner natural, and her head free from all pain."

Another case of a lady, aged thirty-six, delivered with instruments. "It seemed impossible for Mrs. A. to express the gratitude she felt for the pleasure and the ease afforded to her by the ether. It was astonishing to her, that she who had always suffered so much in labor, and for so many nights and days, in this last one, and who after former labors had been in such distress — it seemed most wonderful to her to feel now so easy and so happy."

"The action of the womb, in some cases, in the absence of all voluntary agency, was very striking. Not only was there natural expulsatory effort, which aided the manual, but the effort was marked occasionally by its audible expression, the bearing down, which is so well known. I was reminded of this effort during insensibility, by a case of most severe puerperal convulsions, which came under my notice the day after the above case. The organic effort, in the entire abolition of voluntary power, was most striking. I have known

a child born by this organic agency, without the least apparent consciousness of the event on the part of the mother at the time, or any recollection of it afterwards. In view of the facts established by so many and such varied observations, at home and abroad — and of the fact of efficient uterine action, during the full effect of a well-known agent, ether — the use of which has thus far been so safe, and the application and *modus operandi* of which, a wider observation will do more and more to determine, — may we not, in view of such facts, look with confidence to the time when labor will be accomplished with an ease and a freedom from suffering, contrasting strongly with the pain which has accompanied it, and which hitherto has been regarded as its necessary condition?"

Drs. Townsend and Channing relate a case of delivery by forceps. Before the birth, not the least complaint was made. The case was very difficult, and the pain ordinarily intense during the process of delivery. The ether was exhausted, and the patient made most earnest demands for more. So great was her agony, that more ether was procured, and entire relief afforded. The child was born without her knowledge!

"So difficult was her case," says Dr. Channing, "I have not in memory a case of instrumental labor of so much severity, from which recovery was so rapid or so complete, and in which suffering was so slight, at the time or afterwards."

Profs. Simpson and Channing say that they have observed no harm whatever to result from the use of ether in labor, either to mother or child. Prof. Simp-

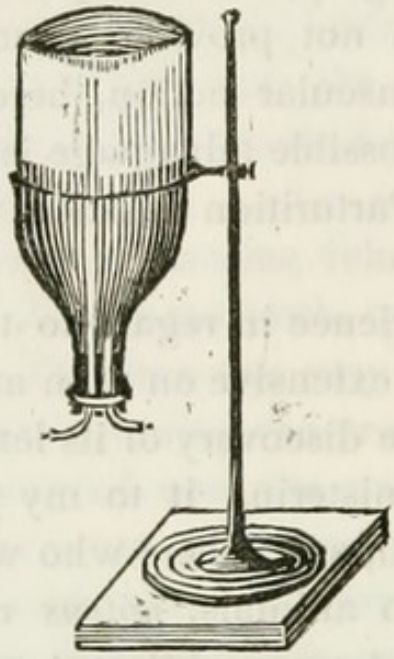
son says of one case, "On the fourth day, the patient walked out of her room to visit her mother." In several cases of extraction by forceps, the results of etherization have been equally satisfactory. In every case, the uterine contractions continued as regularly after the state of etherization as before. In some cases, the pains appeared to have increased as the consciousness of the patient became diminished. This occurred where ether was combined with tincture of ergot, or contained a solution of its oil. And thus, though in some cases of surgery, ether may seem to labor under a disadvantage in not proving a successful opponent of involuntary muscular action, here, in the obstetric art, the greatest possible advantage is derived from that circumstance. Parturition is shorn of pain, and yet not ratarded.

Our own experience in regard to the administration of ether has been extensive on men and animals. Immediately after the discovery of its letheanic properties, and before administering it to my patients, I experimented on myself, and others who were willing to receive it, and upon animals, *nolens volens*, to find out the particular effect upon different constitutions, temperaments, &c. Without knowing at that time, how the sulphuric ether was prepared for inhalation by the patentees, we knew by our own experiments, that different qualities of sulphuric ether produced, in the same persons and animals, different results, as the ether was more or less free from alcohol. Knowing the affinity of alcohol for water, we instituted a series of experi-

ments for separating the former from the latter. After a series of experiments, we think the following the most simple and effectual: —

Take a common decanter with a cork stopper, through which pass two glass tubes; one to admit air, the other to emit fluid. The former may reach nearly to the bottom, while the other terminates at the inner end of the stopper, as exhibited in Fig. 4. Both outer ends of the tubes may be provided with cork stoppers.

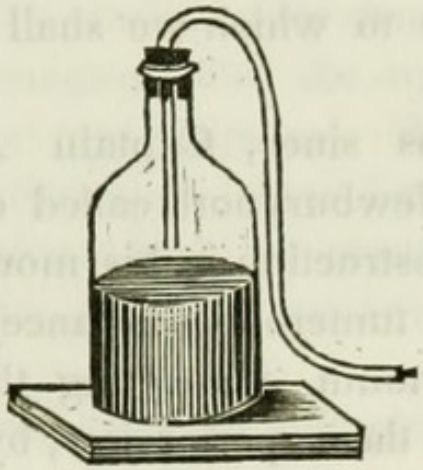
Fig. 4.



Put in equal quantities of water and ether, and intimately mix them by shaking. In a few minutes the ether separates, and, being the lightest, floats on the top, as represented in Fig. 4. By inverting the vessel, and holding it in the hand or in a retort, and removing the corks from the tubes, the water and alcohol can all be drawn off, and the pure ether retained or put into another vessel. The ether is now washed.

Another way to draw off the ether is, by bending a glass tube (over a lamp) into a syphon, as seen in

Fig. 5.



To prove that the alcohol has united with the water, apply a lighted match, and it will burn.

Ether can be extemporaneously and thoroughly washed by mixing water and ether in any narrow-necked, transparent vessel. Invert, and let the fluids separate, to allow the water to pass through a perforated cork, and arrest the ether when the water has escaped.

Out of the immense numbers to whom we have given the ether, of course we can particularize but a few; but, in selecting the cases for publication, we shall have particular reference to the important object of obtaining a correct general result; not choosing from one sex, class, or peculiar disposition, but giving an average, by which correct conclusions may be drawn as to the value of the application. And in order to do this, we shall not limit ourselves to dental operations;

as the general effects upon the system may be better learned by ascertaining its effects under a great variety of circumstances; so extensive a field, of course, could not be found in the dental profession.

The first case to which we shall allude, is that of Captain Adams.

Some months since, Captain A., a respectable shipmaster, of Newburyport, called on me for advice concerning an obstruction in his mouth. On examination, I found a tumerous substance running horizontally across the mouth, connecting the dexter and sinister portions of the superior jaw, by union with the alveolar periosteum adjoining the necks of anterior and posterior molars. Its length was one and a half inches, circumference one inch, form cylindrical, texture firm, surface smooth, and not painful to the touch.

Suppose a cord, passed through the interstices of the two upper double teeth, carried across the mouth, and resting on the gums between the corresponding teeth on the opposite side of the jaw, drawn tight, and firmly secured. This furnishes a good idea of this physiological curiosity. Through this eccentric canal, which spanned the palatial chasm, the blood pulsated regularly, as it was propelled through the arteries from the heart. The surrounding parts preserved their integrity.

We recommended an operation, to which he assented; he also wished the lethean, which we administered; only about two minutes inhalation of which sufficed to render him unconscious of what was going on around

him. Taking a piece of strong silk, waxed, to prevent premature decomposition, we tied it firmly round one extremity of the tumor, by which the circulation was cut off; applying a similar ligature around the other extremity, we found by the pallid appearance that the tumor assumed, that the connection with the general circulation was destroyed. We then took a lancet, and, equi-distant from either ligature, divided it; both portions immediately contracted, retaining the horizontal position; a few arrested drops of blood only were discharged.

A few moments after the completion of the operation, the patient awoke to consciousness, having suffered nothing from the compression or excision of the tumor. In two or three weeks, the remaining portions sloughed off, and, hanging by a small peduncle, were easily removed. No symptoms of any reappearance.

This substance originated some ten years since, when Capt. A. was on a sealing voyage round Cape Horn, where the continued stimulus of salt diet debilitated the venous and absorbent systems, and produced *scorbutic* affection. Ulcers formed in his mouth, and he was unable to speak. Struggling to do so, on one occasion, the ulcers broke, and the mouth healed. But he discovered a thread-like substance, stretched across his mouth, which had been increasing in size ever since, until at last the obstruction materially interfered with his speech.

All to whom he had applied for removal, fearing hæmorrhage, declined the responsibility.

The gentleman now enjoys good health; nor could any one detect, on examination, the slightest evidence that such an anomaly had ever existed. Nor have I been able, after much research, to find a precedent.

A young lady, the wife of an officer in the navy, a resident of Portsmouth, N. H., seeing an advertisement concerning the ether in a newspaper, immediately came to my office at Newburyport, to have a tooth extracted. While under the influence of the vapor, she seemed to be travelling the distance over again; thought she was in the carriage with her husband, talking with him as to the probability of her going through the operation devoid of pain.

Mrs. S——, the wife of a methodist clergyman, after taking the ether for some moments, suddenly arose, and wished one of the young ladies accompanying her, to play a tune on the piano, and she would dance.

On this occasion, the ether was unwashed. On a subsequent occasion, when pure ether was administered to the same lady, she exhibited highly excited religious feeling. "The glories of heaven were open to her view; she no longer saw through a glass darkly," &c.; and, devoutly clasping her hands in ecstatic raptures, cried out, "Glory to God! *this is* happiness; thanks, eternal thanks to God, for my creation, for making such enjoyment for me; my soul is full of bliss," &c.

In the case of Mr. H., while under the influence of lethean, he "thought he was trading in horses, and that he told the man with whom he imagined he was trad-

ing, that he was going in to Dr. Smith's, to have a tooth taken out; that he came in, showed me the tooth, and took the operating chair. *After the tooth was removed*, some one came to the window and knocked for him, when Mr. H. answered, "*hold on until my tooth is out.*"

In this, as in many, if not most cases, the dreams are connected with that idea or impression which is most prominent at the time when inhalation commences.

"Where am I?" "What have you been doing?" are the most common exclamations of persons recovering from the effects of lethean, in the manner of a person who has fallen asleep in a strange place, and at an unusual hour. On awaking, they gaze around in amazement, bewildered and perplexed, not knowing what they have been doing, nor how much time has elapsed. Especially, on recognizing the operator and the room, their astonishment is increased; and they frequently suppose weeks, months, and sometimes even years, have elapsed since they entered the apartment.

One peculiarity exhibited by patients having inhaled lethean, is the amount of time apparently consumed during the almost momentary operation.

A stage-driver, who was under its influence not more than two minutes, supposed he had driven through his entire route, more than twenty miles.

It is said that Mahommed lived several years in one of his visions, travelled thousands of miles, &c.; though he had, in fact, been confined to the precincts of a tub of water, into which, for a moment, he had thrust his head, while in fancy he had roved almost illimitably.

Any one who administers the lethean, will find that the race of Mahommed is not yet extinct.

Gave the lethean to a young lady, aged nineteen, the daughter of a highly respectable gentleman in Ipswich, and under its influence removed four diseased teeth without pain. She subsequently declared to her father, who was bending over her, "that while *he* could hear nothing but the crushing of mouldering bones, she heard the most enchanting music that ever charmed the human ear;" and while the merciless forceps were deeply buried in, and moving about swollen and inflamed gums (searching out objects of creative anguish), and the blood from fractured arteries was pouring from her mouth, she lay reposing, like some sleeping fairy, totally unconscious of the progress of the operation.

Strange indeed is that subtle power, which so delightfully steals through the frame, binding the giant like a "strong man armed," and by its invisible but entrancing effect, locking up every sense from consciousness of pain, but diffusing, through countless nerves which everywhere radiate and ramify the body, the most delightful sensations, when, without its agency, the keenest torture must be endured.

Ordinarily, every nerve is as a telegraphic wire connected with the brain, the great "station," conveying instant intelligence of the most trifling injury which the body receives. But under the influence of the lethean, every nerve has a holiday; and with almost delirious rapture every little truant sentinel forgets its duty, and even the brain itself reposes quietly, or revels in gor-

geous day-dreams, while the body, placed under its guardianship, is subjected to all the horrors of the actual cautery, or the surgeon's knife.

Gave the lethean to a sailor. After inhaling it for about five minutes, he began to show a little restlessness; but being apparently insensible, we removed the mouth-piece, and extracted a large molar tooth. After making some significant gestures with his hands, he jumped out of the chair, and, looking very fierce, muttered some unintelligible threats. In a few moments, he returned to consciousness. He stated that he thought he was in Liverpool, in Mother Baker's cellar, taking a glass of wine, when some little trouble occurred, and a landlubber threw a tumbler at his head. "Shiver my timbers!" said he; "I sprang from the table to knock the fellow down, when I was brought up all standing, snug at home, right side up on this side the pond." He mistook the crashing of a rotten tooth for the breaking of a tumbler.

Gave the ether to a very large, stalwart man, of uncommon muscular power. Nearly ten minutes elapsed before he was sufficiently under the influence to justify commencing operations. Soon after, he appeared stupefied; and, though he made some resistance to opening his mouth, I succeeded in extracting the tooth requiring removal, when he immediately sprung from the chair, much excited, and threatened to knock me down. I asked him for what? "For extracting my tooth so easily." He swore the tooth was not out; that we could not fool him; "I know what you are about; you have just put your nippers into

my mouth and made a motion, and now say the tooth is out. You don't humbug me so." Seeing that opposition, in his present excited state, would only increase his irritation and tempt him to violence, I soothingly replied, "Well, perhaps I am mistaken; I will examine again;" and taking his hand, placed his finger in the vacuum lately occupied by his tooth, which I picked up from the floor. This seemed partly to recall him to his senses; and between laughing and crying, he clasped me round the neck, kissing me, and lifting me like a child's toy from the floor, till I released myself from his grasp. Gradually he calmed down, finally declaring that he knew nothing of the extraction of the tooth; nor could I convince him that he had threatened me with violence. In this case the unwashed ether was used.

The ether inhaled in this case, was Fah's best concentrated sulphuric ether, but it was unwashed.

But the purest ether will sometimes similarly affect some peculiar temperament; and to guard against any unpleasant occurrence, we have given directions respecting it in another place.

A lady who coughed while taking ether, thought she was coughing in Mr. Dewey's church, New York, and was apprehensive of disturbing him.

One evening a carriage was driven rapidly to our door, and a gentleman alighted, who requested us to accompany him with the lethean. We did so, and as we entered the house into which he led us, we heard the most violent outbursts of unrestrained hysteric laughter, which we soon found proceeded from a young lady

who was subject to hysteria; but in this instance, the operation of it was unusually violent and protracted.

She inhaled the ether, at first making some resistance. In a few minutes, however, she was in a deep, calm sleep. Her mother became alarmed, fearing her daughter might not wake. She spoke to her and called her by name; but there was no answer. She took her hand, shook her, and appeared almost frantic, crying out that she was dead. I applied the valve of the oxygen bag to her lips, and almost instantly she began to assume her natural appearance, and started up and looked around. Observing her friends gazing at her and at each other with so much concern, she looked surprised and disappointed, and inquired with great pathos and earnestness of her mother, "why she had called her back." "Called you from where?" said her mother. "Oh! I was in such a delightful place, with beautiful birds and angels, and sweet little children! Why *did* you call me back?"

Gave the ether to Miss B., a highly respectable young lady of Newburyport, and painlessly removed a tooth. In this case we used oxygen gas. She was of a plethoric habit, and there was a delay of returning consciousness. She inhaled oxygen, and at once revived.

A young lady took the ether, and had a tooth removed — thought she had been to church, heard a sermon from the Rev. Mr. Stearns, and was totally unaware of the extraction.

We removed six teeth for Mr. H., of the Boston Theater, under the influence of ether. He most eloquently recited a portion of one of Shakspeare's plays.

A lady repeated, in her *sleep*, a poem she could not repeat when *awake*.

Dr. Cross, of Newburyport, wished me to give the ether to a sailor, for the removal of a finger joint, exostosis of the bone having resulted from a neglected whitlow. He had suffered for months, and was deprived of sleep for nights in succession. He impatiently declared, "This sucking of ether is useless," and said he should not get asleep. Dr. Cross, however, at the same time skilfully cut out the first joint of an index finger, with such dexterity that the incision of the flesh, the separation of the joint, and the removal of the bone appeared to be simultaneous.

During this operation, he thought he was on board the ship, having a fine time with his messmates. Had not felt so well for months. The finger healed rapidly.

Mr. J. Dole, of Rowley, Mass., for two years had been troubled with a tumor on the left breast. Gave him lethean. Dr. Wyman made an incision about five inches in length. The tumorous matter was of an extraordinary character; instead of being consolidated within the radii of six inches, there was a cluster of small tumors occupying a circumference of eighteen inches, all of which he most skilfully and happily removed.

Mr. D. was wholly insensible, except for a moment; while tying an artery, he was slightly conscious of pain, which was instantly dispelled by another inhalation, and he lay in a calm sleep until all tumoric matter was removed, and the wound dressed. On recovering and finding that the tumor was gone, he

expressed the greatest emotions of joy and gratitude, and exclaimed, "*This discovery is from God, not men!*" Said he felt no pain, save a single instant, and, if it had continued, no man could have held him; but by the ether, he lay with his hands and body in the position of peaceful sleep. So well did he feel, that he arose immediately and *said* "that he was well, and was going down to get some dinner." *What is remarkable, he not only felt no pain while cutting or stitching, but none subsequently.*

Dr. D. G. Varney, an assistant of mine, inhaled the ether, and painlessly extracted a front tooth *for himself.*

Sometimes, when there is a difficulty in inhaling the ether, the mind becomes confused, and the effect is observed.

A student at Cambridge thought he was undergoing a rigid examination, and was demonstrating one of Euclid's propositions at the black board, which suddenly turned *white*, and he stood confounded, and utterly unable to see his figures just as he was proving "*quod erat demonstrandum.*"

Gave the lethean to Mrs. L., and, in the presence of the junior editor of the Newburyport Herald, and others, extracted twenty-nine diseased teeth and roots. She says, that during the extraction, and subsequently, she suffered no pain, and her gums have healed and hardened unusually fast.

The above and the following cases have been published.

Removed a tooth for a lady, after many unsuccessful attempts to remove it, by two different dentists.

The muscles of her jaw became rigid; she could not open her mouth, and was fed by a spoon for weeks. She inhaled ether, and for the first time for months, the muscles of her face were relaxed, and we removed the tooth without difficulty.

EXPERIMENTS WITH ETHER,

On Bees, Frogs, Leeches, Fishes, Dogs, Chickens, and an American Eagle.

Experiment 1, *on Bees.* — A full hive contains about eighteen thousand. We etherized one box of about three thousand. We made three divisions of them. On one we sprinkled iced cold water; another we left in the open air; a third we put into a box, through an aperture of which we introduced oxygen gas.

The first, treated hydropathically, revived in twelve minutes; those left to themselves, in twenty minutes; some of those oxygenated, revived and became sensible almost immediately; some of them became so in a few minutes, and *some are insensible yet.*

The ether was given on a sponge. It was of an ordinary kind, and contained alcohol, which acted first as a powerful stimulant, then as a powerful sedative. The oxygen was made of per oxide of manganese. When excited, some of them stung each other; when sensible, they stung us. Bees never sting each other; when attacked by other bees, they war by biting off wings and legs. A queen bee never stings except when in mortal combat with another queen. She may be cut in pieces, but will not sting.

Bees know each other by a peculiar scent of each hive, and none can enter unless by a satisfactory olfactory examination by sentinels, identity being of a nasal character. These etherized bees were repulsed. We then etherized the whole swarm, and all were admitted, for all were alike.

In two days we etherized them again, but purified the ether; that is, removed the alcohol. They were not so excited, but fell as if dead. We had prepared some oxygen of a much purer kind; but before it could be applied they fled.

We subsequently etherized a box of bees with impure ether, and gave them oxygen of a better kind, which we made from chlorate of potassa, and with good effect.

Bees from some other apiary having attacked and began to rob a hive, we made a little swing door, by which they could go *in*, but not *out*. Having thus secured in bees what we lost in honey, we etherized them, and allowed them, through a small aperture, to file out; and as they did so, we spotted many of them with vermilion, by a camel's-hair pencil. During the day they came back, having been expelled from their hives, as we anticipated,

"For the scent of the ether hung round them still."

Through the politeness of Hon. E. Mosely, we received a swarm of bees soon after being similarly indebted to E. Stedman, Esq., for a queenless hive; by the assistance of Mr. T. D. Tompson (a pupil of mine), we etherized both hives, and removed them by hand into another hive without being stung, although thousands were handled. They do well.

Experiment 2, *on Frogs.* — These were particularly interesting, owing to the transparency of their feet; as, by a magnifying glass, thousands of little globules of blood could be seen chasing each other, more or less rapidly, as the ether affected the circulation. In some there was no pulsation; and from this state of apparent death we revived them by powerful shocks of electro-magnetism, after they had been insensible seventy-six minutes. In some cases, after magnetism had failed, we put them in cold water apparently dead, where they lay two hours, and then exhibited vitality. When much etherized with impure ether, they sunk immediately to the bottom; when pure ether was administered, they floated on the surface.

Fishes. — In a large glass globe filled with water, we etherized several small fishes, by a sponge saturated with ether, and then sank to the bottom.* They came to the surface with open mouths, for more air; but compelling them to remain under water, they soon turned on their backs, and lay as if dead; as the ether escaped they revived. The body of an etherized eel was painlessly divided; one part was thrown into pure cold water, and soon betrayed sensibility by motion. The remaining etherized portion lay in a quiescent state, until a stream of pure oxygen gas was forced through a pipe into the water, when muscular activity was exhibited.

* Water not only contains oxygen, but air in its pores. The blood of fishes is thus oxygenated, as the water passes through their gills, which are to them what lungs are to man.

A dog which was subject to violent and convulsive ague fits, was etherized when they commenced, and calmed immediately.

A large *American eagle*, whose outstretched wings measured seven feet, was a subject of our experiments for upwards of six months, a part of which time, from three to twenty times daily, he was etherized, and on one occasion, for thirty consecutive hours, a sponge was pinned over his nostrils, and saturated with ether. A few inhalations made him insensible, and when so, electro-magnetism instantly aroused him.

He would bite at the metallic button of the battery, and holding it in his mouth, was thus etherized. The other button being placed on the flexor muscles, he soon threw it from him. Much ether (if impure) caused convulsions. The battery removed them.

A hen was etherized, on whose breast the eagle lay his head, when as consciousness waned or increased, the feathers on his head bristled, and he made a pass at the hen, but a cork on his beak prevented any injury.

Upon dogs, pigeons, canary birds, and leeches, we have performed various experiments, from which we deduce,

1*st*, Impure is a greater stimulant than pure ether.

2*d*, Impure ether prolongs insensibility.

3*d*, The continued and frequent use of pure ether is comparatively harmless.

4*th*, Ether changes the blood to a darker color.

5*th*, Tactility may be lost while the intellect remains.

THE EFFECTS OF ETHER WHEN INHALED.

"The first mouthful or two is felt to be harsh, and unpleasantly pungent; but, in continuance of inhalation, that feeling gradually disappears, and the sensation becomes rather grateful than otherwise — sometimes intensely so, as in the case of the nitrous oxide gas; the inhaler obstinately and violently refusing to forego his delectation, if attempts be made to take the tube from him. Coughing is not always produced, but more frequently than not; and, in some cases, it proves so distressing as to impose on the practitioner great difficulty in proceeding, even with the best assistance on the part of the patient. In general, however, by letting on the full supply of ether gradually, the coughing proves slight, and speedily ceases. Sometimes a profuse discharge of saliva takes place from the mouth; in almost all cases, the secretion from the lining membrane of the windpipe and lungs seems to be very considerably increased; and from this latter cause, a cough, with expectoration, may come on during the latter stage of a prolonged inhalation, quite independently of any direct irritation from the pungency of the ether. In the course of some time — varying from one to twenty minutes, but usually within two or three minutes, when the inhalation is duly conducted from the first — the patient shows signs of a departure from his ordinary condition. His face grows pale and

leaden, sometimes with a livid congestion about the mouth and nose; his eyes are less brisk in their movements, and their glance is less keen; the eyelids move sluggishly over the eyeballs, and tend to droop; the hands and feet grow very cold, and so do the legs and arms; bent positions of the limbs gradually relax themselves; the patient breathes more slowly and fully; his chest is seen to take in large supplies at each inspiration. The pulse has been all along more and more rapid in its beats; it is now very frequent; and soon it may run away to nothing, almost ceasing to be felt. The eyelids are now motionless; on elevating the upper one, it falls slowly down again, evidently under no control of muscle. The pupil of the eye began to dilate early; and the dilatation has kept pace with the progress of inhalation. The eyeball is now glassy, fixed, often turned upwards, and thoroughly 'void of speculation.' Then is the evidence of full etherization complete, and the operation may be proceeded with.

Such is a sketch of the ordinary effects, as observed; but there is great variety. Sometimes the pupils are but slightly dilated, if at all; and sometimes the pulse, too, is slow to alter. Sometimes the patient withdraws the tube from time to time, to tell his feelings, with great volubility and energy. Sometimes, but rarely, he expresses a strong dislike to it, and is with difficulty induced to resume its use. Sometimes he mutters through the tube, sometimes incoherently, sometimes sanely enough, in reference to circumstances which he observes. Sometimes he laughs im-

moderately, as if under the influence of nitrous oxide gas; and yet without recollection of any ludicrous idea after recovery. Sometimes he twists his limbs about, and sometimes he rolls his head from side to side, with a wild motion of his eye, and with a stupid, yet strong expression of inquiry in his gaze. Sometimes he takes to low moaning and whining through the tube; more especially if he has been much agitated by previous apprehension. Sometimes he comes to breathe more heavily, and with a snorting noise that is not quite agreeable. Sometimes a tendency to convulsions manifests itself, requiring instant disuse of the inhalation.

Supposing the trance complete, the phenomena educed by the operation vary. In general, the patient remains quiet and motionless, as if inanimate; the muscles often quivering slightly, however, at each play of the knife, as if by the mere physiological stimulus which their contractility receives; and knitting of the brows, occasional or fixed, is extremely common; giving an expression by frowning, rather of annoyance than of pain. Sometimes there is slight shrinking of the part from the knife, the patient seeming to make some little effort to move it away. Sometimes the part is violently contorted, requiring more than the usual complement of assistants to restrain it. Sometimes the patient gives sundry abrupt loud exclamations, as if in pain; sometimes he moans and breathes hard; sometimes, though rarely, he roars lustily. And all this may happen without any sensation, or at least, without any subsequent remembrance of pain.

The effects, as indicated by the patient's own recollection, are also various. In general, they are somewhat as follows: — A pleasing sense of soothing succeeds the first irksomeness of the pungent vapor — a soothing of both mind and body. Ringing in the ears takes place, with some confusion of sight and intellectual perception. The limbs are felt cold and powerless; the hands and feet first, then the knees; and the feeling is as if these parts had ceased to be peculiar property, and dropped away. This sensation may gradually creep over the whole frame; the patient becoming, in more senses than one, truly etherealized; reduced to the condition of no body and all soul. The objects around are either lost sight of or strangely perverted; fancied shadows flit before the eyes, and then a dream sets in — sometimes calm and placid, sometimes otherwise. Emerging, consciousness and self-control return, a tendency to excited talking is very manifest, movement is unsteady, and, both in mind and body, very unequivocal signs of intoxication are declared. In plain language, as in plain fact — there is no disguising it — the patient is drunk. The tipsiness, however, is of a light and airy kind; very pure, very pleasant, and very fleeting; and, when gone, leaving very little trace behind. If the ether be good, and properly inhaled, 'there is no headache in a gallon of it.'

When the patient awakes fully to consciousness, it may be supposed that he awakes to much misery, because to much pain. But it is not so. Not unfrequently, every sense is fully restored, except the sense

of pain. The patient sits up, talks rationally and calmly; is aware of every circumstance, knows of his wound, by seeing and hearing of it, and yet feels no pain; the smarting of a raw wound is often averted for some hours in this way; and when it does supervene, at length, there is good reason to believe that in many cases it comes in a mitigated form. Often the patient sobs and cries, immediately or soon after return to consciousness — a state resembling hysteria, or else very like the maudlin grief of a drunken man; but such tears are no sign of suffering; on the contrary, they are not unfrequently the offspring of dreamy joy and gratitude.

This operation of the ether's influence is an important matter. It is brief; and yet it is strange that the ether itself seems to remain long in the system; being plainly and even offensively perceptible in the breath, not merely for hours, but even for days, after protracted inhalation.* The full effect seldom lasts above a few minutes; time enough for the performance of some operations; such as that of tooth-drawing. When protracted procedure is contemplated — as in amputation, stone, rupture, removal of tumors, &c. — the inhalation is proceeded with during the operation, at what is termed 'half-speed.' The ordinary signs having evinced attainment of the full effect, the operation is begun; and then the inhalation may be for a few moments

* The rapidity with which ether pervades the whole system, is also well shown, by amputated parts retaining a strong flavor of ether, even for many days after removal; although perhaps not more than two or three minutes had been spent in inhalation, previous to the making of the incisions.

discontinued, to be afterwards renewed; or, what is better, the mouth-piece is kept continuously applied, the valve, for entrance of atmospheric air, partially or wholly open, so as to dilute the vapor. If, at any time, the patient show signs of prematurely returning consciousness, the valve is shut, and the full power of the ether restored; the patient being made to breathe much or little of the vapor, according to the effects observed.

At first, it may seem that this brief duration of the ether's influence is a disadvantage. The operator soon learns, however, that it is the contrary. Prolonged duration is readily within his power, by continued inhalation; and much of comfort and safety resides in the fact of the effect being transient.

In general, no unpleasant sign showing itself, the inhalation is carried to the point of complete stupefaction; and this, as already stated, is sought to be maintained by a continued, though minor use of the ether. A strange fact, however, is now to be stated; namely, that stupefaction is by no means essential. Experience has fully shown that the brain may be acted on so as to annihilate, for the time, what may be termed the faculty of feeling pain; the organ of general sense may be lulled into profound sleep, while the organ of special sense, and the organ of intellectual function remain wide awake, active, and busily employed. The patient may feel no pain under very cruel cutting, and yet he may see, hear, taste, and smell as well as ever, to all appearance. We have seen a patient follow the operator with her eyes most intelligently and watchfully, as he shifted his place near her, lifted his knife,

and proceeded to use it; wincing not at all during its use; answering questions by gesture, very readily and plainly; and after the operation was over, narrating every event as it occurred — declaring that she knew and saw all; stating that she knew and *felt* that she was being cut, and yet that she felt no pain whatever. Patients have said quietly, 'You are sawing now,' during the use of the saw in amputation; and afterwards, they have declared most solemnly, that though quite conscious of that part of the operation, yet they felt no pain. We have seen a patient enduring amputation of a limb, without any sign of suffering, opening her eyes during the performance, at its most painful part, descrying a country practitioner at some distance — under whose care she had formerly been, and whom she had not seen for some considerable time — addressing him by name, and requesting that he might not leave town without seeing her.

In the Royal Infirmary of Edinburgh, the patient managed all the details of the inhalation himself, loudly insisting that the experiment was quite a failure, and would never do; that the matter must be deferred to another opportunity — and all the while the painful operation was busily proceeded with.

Physiologists are somewhat puzzled as to the exact statement of the effects produced by ethereal inhalation on the nervous system. Of the brain proper, the spinal system and the ganglionic system — as the different parts of the nervous system are termed — which is the part affected? Strychnine is supposed to influence the spinal system mainly; digitalis, the gan-

glionic; — which does the ether affect? It is probable that the brain proper is the part mainly influenced; and sometimes only a portion of it; for, as has already been stated, the intellect may be active, and the special senses, too, may retain all their acuteness, while the patient is wholly unconscious of procedure, which otherwise could not but be accompanied with the severest torture." Tactile sense may be asleep, while intellectual and special sense may be wide awake.

We have recently been informed that a young lady, daughter of a very respectable gentleman in Newburyport, visited a dentist to have a tooth removed. She inhaled "the ether," and was made insensible, and remained so; the dentist was alarmed, and called for assistance. Two physicians came, both of them being scientific men. One of them was one of the ablest and oldest physicians in Essex county. After laboring some time to resuscitate her, it was observed that it was of no use; she was "*as much a corpse as she ever would be.*" In this state of *coma*, or death-like sleep, she remained two hours. *How much ether she inhaled* is not known. This extraordinary case deserves consideration. Her prolonged unconsciousness, and the abortive attempts at resuscitation are remarkable. Either the ether was impure, or it was improperly given, or she took too much. One of these positions must be admitted, unless the subject admits a fourth alternative, namely, an idiosyncrasy of constitution. But we learn there was none;* and if there

* Will exclusion of the air from the lungs by closure of the glottis from spasm of the laryngeal muscle, produce coma?

were, Drs. Warren and Channing, in letters to the author, deny any bodily liability to produce a similar result. Dr. Mott admits a disease of the *heart* or lungs might preclude ethereal vapor, but we understand neither of these complaints existed.

As this case has been much spoken of, and may have deterred some from availing themselves of the benefit of ether, we think it proper to say,

1*st*, We think this state of coma, or prolonged insensibility, might have been avoided.

2*d*, The protracted interval of two hours is the only case on record of similar protracted insensibility.

In our experiments, we have, either by the use of cold water, externally or internally, by means of oxygen gas, or electo-magnetism, or *aqua ammonia*, always produced restoration.

Convulsions may occur, slight or violent, transient or protracted. Of course, the first appearance of them is the signal for the discontinuance of the ether, which is to be resumed, if the operation be not completed, so soon as the system has again become quiet. Fainting may take place, the pulse become very rapid, and, at last, imperceptible; and the faintness may prove of such intensity and duration, as to cause serious alarm. But this is not likely to occur, except in the case of diseased heart. Signs of congestion in the brain may manifest themselves; the patient threatening to pass into what is technically termed the condition of *coma*, as indicated by complete insensibility, dilated pupils, relaxed muscles, snoring, and labored breathing. Lastly, the experiment may fail; the patient becom-

ing excited and confused, but not dead to pain. This result, however, we feel convinced, will seldom, if ever occur, *when good ether is well administered with suitable apparatus.*

It is possible, also, that the irritation of the air passages may leave some permanent traces behind, threatening to pass on into bronchitis or pneumonia. Happily, however, direct proof of such casualties, is still wanting.

A feeling of hurry, growing out of the fear that the effects of the ether will pass off before the operation is completed, should not exist. Let every step of every operation, says Dr. Channing be proceeded in with the utmost composure, and the abiding conviction, *that the state which ether has produced may be surely and with safety continued as long as the circumstances of cases may demand.*

The effect of ether is usually very different when taken as a mere experiment, and as an amusement, from that experienced in the business use of it, as a prelude and accompaniment to surgical operation. In the former case, excitement is very apt to ensue, with restlessness and talking; in the latter, the sedative effect is much more speedily and smoothly attained. In fact, there is what is termed a *tolerance* of ether, when ether is really required; just as in particular diseases, whose cure demands certain remedies, there is engendered a tolerance of those remedies in the system. A grain of tartar emetic, for example, in the healthy, produces great sickness and vomiting; and during inflammation of the lungs, the same dose,

or one much larger, may be taken every second hour without producing either. In health, a few ounces of blood taken from the arm may produce fainting; in serious inflammation, an approach to faintness will seldom be perceived until many ounces have been abstracted. Thirty drops of the tincture of Indian hemp produces, in health, a full narcotic effect, often very unpleasant; in tetanus, the same dose has been given every half hour to a girl of eleven years of age. In health, a grain of opium will produce heavy sleep; in delirium tremens, that dose may be repeated every hour, until ten times the amount is given, and still the patient may be wakeful as at first. A tolerance of bleeding is engendered by inflammation; of tartar emetic, by inflammation of a certain organ; of Indian hemp, by tetanus; of opium, by nervous excitement from drink. It would seem that a like tolerance of ether is engendered by the occurrence of surgical pain; or perhaps rather by the conviction of its certain approach, and the preparation of body and mind suitable for its advent.

In public practice, etherization has been found very useful in detecting feigned diseases. The patient having been, *nolens volens*, thrown into helpless unconsciousness, stiff joints have become supple, crooked backs have grown straight, and various other decrepitudes have thawed into normal shape and form.

One field of inquiry, vast and important, seems just opening to the profession; namely, the inhalation of other remedial agents, in the form of vapor, with or without ether — as practised by Dr. Pearson and others,

in the end of the last century. And who knows, but, by the resuscitation of "pneumatic medicine," many diseases may be brought more thoroughly under control; the remedies, in small quantity, being directly mixed with the circulating blood — borne along thereby, rapidly pervading the whole system, and both speedily and effectually exercising their remedial agency? *

In order to remove some honest doubts about etherization that may yet exist, we present to the reader the following communications on this subject, by several distinguished surgeons of this country, viz.: Dr. Walter Channing, Dean of the Medical College attached to Harvard University, for upwards of twenty years; Dr. J. C. Warren, of Boston, the late distinguished surgeon of the Massachusetts General Hospital; Dr. Valentine Mott, known not only in this country but also in Europe, as one of the greatest of living surgeons. Having addressed letters to these gentlemen, requesting their opinions on the use of ether in certain cases, and the result of their observations as to its effects in others, we give the following extracts from their letters in reply: —

* According to Wagner, vaporizable substances thus applied to the bronchial cells, "seem to make their way into the blood through the unbroken vascular membrane, with the same certainty and ease as when they are injected directly into the veins."

"BOSTON, OCT. 26, 1847.

DEAR SIR:

Yours of the 22d inst. is received. In reply, I would say to your

1*st* question, "of the agency of ether in retarding the curative process in surgery," I can learn of no case in which ether has retarded the curative process in surgical operations. A surgeon of much power of observation and ample opportunities, to this question, answered — *No*, without qualification.

2*d*, I know of no case in which ether has caused *uterine hæmorrhage*, *abortion*, *delirium*, or *asphyxia*.

3*d*, I have never known *coagulation* of the blood *more perfect* than after use of ether in labor.

Questions 4th and 5th, relating to classes of persons to whom ether should not be administered. I know of no such class. I have known ether used in phthisis with great comfort to the patient; in headache, in cough, in spasmodic diseases; in one patient who had suffered from symptoms of diseased heart. * * This patient was etherized for nine hours, viz. from eight A.M. to five P.M.

Yours truly,

W. CHANNING.

To Dr. MAYO G. SMITH,
Newburyport."

"BOSTON, OCT. 23d, 1847.

DEAR SIR:

The questions in your letter, which I received this day, would require, to be satisfactorily answered, re-

plies rather more extended than my time will at present permit me to devote to them.

In the mean time, I will state, for your satisfaction, that the objections to the use of ether, as proposed in your note, are without foundation. [See questions referred to, in preceding letter.]

Respectfully yours,

J. C. WARREN.

To Dr. MAYO G. SMITH,
Newburyport."

"NEW YORK, OCT. 27th, 1847.

SIR:

To the questions you ask in yours of the 22d inst., I can make some reply, at least to some of them.

The use of ether inhalation does not in the least retard the curative process.

It does not cause the edges of the wound to be everted or retard the healing.

Blood *does* coagulate during operations performed under the influence of ether.

It must be a mere assertion that tubercles of the lungs are produced by the ether. * *

Yours very respectfully,

VALENTINE MOTT.

To Dr. MAYO G. SMITH,
Newburyport."

Dr. Crosby, the distinguished Professor of Surgery and Obstetrics at Hanover Medical College, has performed many capital operations while patients were

under the influence of ether; and he recently informed the author that he never knew of an unhappy result. He has administered it to all classes and constitutions, and in obstetrics, with remarkable success.

1*st*, In all cases for difficult operation prior to inhaling ether, he administers from twenty to sixty drops of laudanum.

2*d*, He places the subject u nder an intelligent nurse and allows no conversation.

William T. G. Morton, who has been called by the London Lancet, "the unknown dentist in the Athens of America," was born in Charlton, Worcester county, Massachusetts, in 1821.

At an early age he was thrown upon his own resources. He subsequently made the science of *dentistry* his study, and unwilling to confine himself to the mechanical department, he wished to gain all necessary medical and surgical information on the subject. He became the pupil of Dr. Charles T. Jackson, and attended lectures at the Massachusetts Medical College, "where," says Dr. Jackson, "he dissected, with diligence and zeal, those parts of the head and throat particularly important to the surgeon dentist."

During his connection with the college, he was compelled to witness much pain in surgical operations, and his humane mind shrunk from the suffering necessarily inflicted. He was therefore much impressed with the importance of obtaining some agent to remove pain, both from its advantage to the operator, and its comfort to the patient, as suggested by the

senior surgeon, Dr. Warren, and his associates, in their lectures before the medical students.

Having closed his studies with Dr. Jackson, and his attendance on the college lectures, he resumed his labors with great assiduity.

The great, ever-present idea of the obliteration of human pain, followed him; and having many teeth to extract for the insertion of numerous sets of artificial teeth, he instituted a series of experiments to enable him to do so painlessly.

He applied, as it was very natural he should do, to his former teacher, Dr. Jackson, for advice; who, in the course of conversation, observed that he had better be careful, or he would be considered more of a humbug than Wells, with his nitrous oxide gas. "When I inquired the effect of ether gas," says Dr. M., "Dr. J. stated that it might be used, and spoke of its effects upon college students, and suggested the use of sulphuric ether as an anodyne."

Dr. Morton, after various experiments, believed he had found the desideratum, — an object of unwearied search by physicians and surgeons of the old and new world.

He applied to Dr. Warren for an opportunity to demonstrate to the world the practicability of his theory; which was promised him on the succeeding day.

For the more perfect administration, a suitable inhaling vessel was thought necessary. In conversation with his friend, Dr. Gould, the valvular instrument was spoken of, when the idea was instantly seized by Dr. M., who cried *eureka*, and rushed, like Archim-

edes from the bath, through the streets of Boston, at the still hour of midnight, to the residence of Mr. Drake, a well-known philosophical instrument maker, and nervously ringing his door-bell aroused him from his slumbers, and besought him, as if the destinies of the world hung upon the issue, to make the inhaler.

Mr. Drake hurried to his shop, and daylight, stealing through its windows, found them bending over their unfinished task. Hour after hour passed away, but he was not quite ready. In another part of the city lay a poor man, awaiting an operation; his heart tremulously alternated between hope and fear, as he prayed for the arrival of Dr. Morton.

The hour of trial arrived, but not Dr. M., at the hospital. Dr. Warren, after waiting for half an hour, was about commencing the operation, when the door opened, and Dr. M. entered hurriedly, apologized for the delay, applied his inhaler, etherized his subject, pronounced him insensible, and handed him over to Dr. Warren.

A company of distinguished surgeons surrounded him. Around the amphitheatre arose tier upon tier of students, forming a galaxy of animated faces, influenced as by one mind, and gazing with fixed intensity upon the scene. A company of surgeons were around the body of the subject, on their knees, to witness every movement of the knife, and the effect of its keen edge on the living nerve. A tumor was to be removed from the neck. An incision three inches in length was made; and, says Dr. Warren, "*to my great surprise, without any starting or crying out, or other indication*

of pain." All was silent even as the surrounding walls, in which had reverberated unnumbered groans, and shouts, and cries of agony.

The operation was over, and the sleeper awoke, as from a dream, inexpressibly grateful that he had felt no pain. Then and there, on the 17th of October, 1846, in the Massachusetts Hospital, in Boston, was witnessed the first painless surgical operation in the world's history through the influence of ether.

October 19th, Dr. Hayward removed a limb for an etherized patient. This was the first capital operation ever performed under the influence of ether.

In both instances the ether was administered by Dr. Morton, who now had Dr. Warren to stand godfather to his discovery; and Dr. Hayward acted as sponsor to an agent calculated to rob earth of a portion of that sentence pronounced against man, and "his seed after him," when God arraigned Adam in Eden for trial.

What must have been the feeling of Warren, now in the evening of a life made brilliant and venerable by professional excellence! At this decisive and eventful moment, it is said, a tear trembled on his cheek, and for a moment he was lost in meditation.

For centuries surgeons had sought a means to alleviate human suffering, and they were about to realize the full fruition of their hopes. This wonderful news spread rapidly, and thousands of poor dilapidated specimens of humanity, in hospitals and infirmaries throughout the world, with straining eyes and outstretched arms looked to this land of the pilgrims for

this heaven-sent boon to the human race. Who cannot rejoice that in the good providence of God, when so many contingencies occur, in a world of casualties like ours, there exists a means of sufficient potency to enable us effectually and harmlessly to remove human pain? Who more rejoice than woman, for the remission of any portion of a sentence she has long borne, and which was primarily passed on the morning of creation upon the mother of us all?

Who does not rejoice that its discoverer should be an American? "It is," says the London Lancet, "a high honor to our transatlantic brethren, next to the discovery of Franklin; it is the second and greatest contribution of the new world to science, and it is the first great addition to the medical art."

For the discovery of vaccination, the world honored Jenner. In 1775 Jenner was a medical student in England.

A peasant girl came into the office of his preceptor, and laughingly told him she would never take the small-pox, because she had observed that those who milked the cows and received from them the kine-pox, never took the small-pox. The same fact had been observed in other dairy counties. This conversation impressed the mind of Jenner, who startled England in 1796, by announcing his prevention for this loathsome disease. Yet Jenner was opposed.

A distinguished physician stated that it would make men roar like bulls, and convert those who were vaccinated into a kind of mongrel, half animal and half man. A clergyman denounced it from the pulpit, and

averred this vaccination was the same kind with which God permitted Satan to inoculate his servant Job. A Philadelphia medical publication denounced it as indelicate.

Poor Jenner came to the United States, and landed at Boston, where enraged men sought him for days, with ropes in their hands, threatening to hang him upon the first tree.

Dr. Waterhouse, a Professor of Yale College, permitted his family to be vaccinated, and soon Jenner was almost worshipped by the same phrenzied populace that sought his life; and in two or three years after, every man, woman, and child was inoculated in a single week.

Thus we see Jenner *applied*, but did not *discover;* his application, however, constituted discovery. Opposition to a principle never proves it to be incorrect. If Jenner was rewarded for the mere application of a remedy, ought not Dr. Morton to be rewarded for applying, if not originating, his lethean?

GLOSSARY

OF TECHNICAL AND SCIENTIFIC TERMS.

Albumen, a viscous fluid without taste or smell.

Allopathy (Greek, ἄλλος, other, and πάθος, condition), a method of curing disease by producing a condition of the system, inconsistent with the existence of the disease.

Alumen, an earth, or earthy substance.

Alveolar, containing sockets like the jaw, in which are placed the teeth.

Amaurosis, a loss or decay of the sight, without any visible defect in the eye.

Anastomosis, the communication of vessels with one another.

Animalcule, a small animal invisible to the naked eye.

Anodyne, a medicine which allays pain and causes sleep.

Anti-septic, opposing or counteracting putrefaction.

Anterior, before.

Articulation, the joining or juncture of bones or teeth.

Assay, the trial of the purity, weight, value, &c. of metallic substances.

Atrophy, a gradual wasting away without any visible cause.

Bicuspides (Latin, *bis*, two, and *cuspis*, a point), the teeth immediately posterior to the cuspid or canine teeth.

Calcined, made friable by heat.

Calcareous, of the nature of lime.

Calculus, gritty, hard, like stone.

Canine, sharp-pointed teeth, like dogs' teeth, from which the name *caninus* is derived.

Capillary, fine long tubes resembling a hair.

Carbon, pure charcoal.

Carotid arteries, two arteries which convey the blood from the aorta to the brain.

Cartilage, gristle, a smooth, solid, elastic substance, softer than bone.

Cataplasm, a poultice.

Cathartic, a purgative medicine.

Caustic, having the quality of burning, corroding, or destroying animal flesh.

Cellular membrane, in animal bodies, is composed of an infinite number of minute cells, which communicate with each other.

Cephalic, pertaining to the head.

Chyme, that particular modification of food which it assumes after it has undergone the action of the stomach.

Cicatrix, a scar, a little seam or elevation of the flesh, remaining after a wound or ulcer is healed.

Cicuta, a poisonous plant, often called water hemlock.

Condyle (Latin, *condylus*) a protuberance on the end of a bone, a knot or joint, knuckle.

Condyloid process, the posterior protuberance at the extremities of the under jaw.

Corrosive, having the power of eating or wearing gradually.

Cuspidati (from Latin, *cuspis*, pointed), the teeth situated immediately after the incisors.

Cutaneous, belonging to the skin.

Cuticle, outer coat of the skin.

Deciduous, the first teeth.

Decoction, a liquid obtained from a substance boiled in water.

Dens, a tooth.

Depletion, the removal of the blood in the vessels by venesection ; blood-letting.

Dexter jaw, the right jaw.

Diagnostic, distinguishing characteristic, indicating the nature of a disease.

Diagnosis, the distinctive knowledge of a disease.

Diathesis, particular disposition or habit of body.

Digastric, having a double belly, a name given to a muscle of the lower jaw.

Digitalis, a plant, usually called foxglov

Duct, a channel for the fluids of the body.

Dysopsy, dimness of sight.

Ecchymosis (εκχυμωσις), in medicine, an appearance of livid spots on the skin, occasioned by extravasated blood.

Edentate (Latin, *edentatus*), destitute or deprived of teeth.

Ellipsis, an oval figure.

Emphysema, in surgery, a puffy tumor, easily yielding to pressure.

Epilepsy, a disease accompanied with spasms, or convulsions, and loss of sense.

Equilateral, having all the sides equal.

Erosion (Latin, *erosio*), the state of being eaten away ; corrosion, canker.

Excision, the cutting out or off of a tooth, or any part of the body.

Exostosis, unnatural protuberance of a tooth or bone.

Expectorant, any medicine which promotes discharges from the lungs.

Fauces, (the plural of Latin, *faux*), the top of the throat.

Filament, fine threads, of which flesh, nerves, and skin are composed.

Fossa, a kind of cavity in a bone, with a large aperture.

Fossil, petrified, organic substance, dug from the earth.

Friable, easily crumbled or pulver ized.

Gangrene, to become mortified.

Gastric, a fluid separated by the capillary vessels of the stomach ; the principal solvent of the food. It has a saltish taste ; is inodorous.

Gomphosis, the connection of a tooth with its socket.

Gland, a distinct soft body which secretes some fluid from the blood.

Graminivorous, subsisting on grass.

Granulated, formed into grains.

Gypsum, plaster of Paris, sulphate of lime.

Hæmorrhage, flow of blood from ruptured blood vessels.

Hemicrany, a pain that affects only one side of the head.

Homœopathy, the theory of curing diseases by producing affections similar to the disease.

Hygenia, health, that department of medicine which treats of the preservation of health.

Hyoides, bones of the tongue.

Imponderable, not having sensible weight.

Imputrescible, not subject to putrefaction.

Incarnative, a medicine that promotes the growth of new flesh, and assists nature in the healing of wounds.

Incisor (from Latin *incido*, to cut), a fore-tooth which cuts, bites, or separates.

Inferior, lower.

Inosculation, the union of two vessels of an animal body at their extremities, by which a communication is maintained.

Inspiration, the act of drawing air into the lungs.

Integument, that which invests or covers another thing.

Labiodental (Latin, *labium* and *dens*), formed by the co-operation of the lips and teeth, as in the pronunciation of *f* and *v*.

Lachrymal, pertaining to tears, conveying tears.

Lamina, a thin plate or scale.

Lateral, pertaining to the side.

Levator (from Latin *levare*, to lift), a muscle, whose office it is to raise or elevate certain parts.

Ligament, a strong, compact substance binding one bone to another.

Ligature, a cord or string for tying the blood-vessels to prevent hæmorrhage.

Linguadental (Lat. *lingua* and *dens*), formed and uttered by the joint use of the tongue and teeth, as in the pronunciation of *d* and *t*.

Lithodeon, a Greek word, meaning "stony batter."

Luxation, the act of lifting a tooth, or moving or forcing a bone from its proper place.

Macerate, to remove flesh by soaking or steeping.

Malformation, bad formation.

Maxillary sinus, the cavity between the exterior aud interior plates of the jaw bone.

Meatus, a passage.

Membrane, an extensive fibrous substance which envelopes different parts of the mouth and the body.

Molar (*molaris*, to grind), the grinding or double teeth.

Mollient, softening, assuaging.

Morphine, a poisonous vegetable, extracted from opium.

Mucus, a moistening viscid fluid, secreted by the mucous membrane.

Necrosis (νεκρωσις), the dry gangrene, a species of mortification, a disease which affects the bones and teeth.

Nitrogen, the element of nitre ; that part of the air sometimes called *azote*.

Occiput, the back part of the skull.

Œsophagus, the gullet, or canal, through which food passes to the stomach.

Opaque, not transparent.

Osseous, bony, or resembling bone.

Ossify, to change to bone.

Parotid, certain glands below and before the ears, or near the articulation of the lower jaw.

Parietes, walls, or those parts which form an enclosure.

Pathology, explanation of the nature, causes, and symptoms of diseases.

Pepastic, a medicine to help digestion.

Periosteum, a nervous, vascular membrane, endued with quick sensibility, immediately investing the bones or teeth.

Peripneumony, an inflammation of the lungs, or some part of the thorax.

Pharynx, the upper part of the gullet, below the larynx.

Phlogistic, a natural degree of vital energy and strength of action in the heart and arteries, inflammatory.

Phrenitis, an inflammation of the brain, attended with fever and delirium.

Platina, a metal nearly of the color of silver, the heaviest and one of the most valuable of the metals.

Plexus, any union of vessels, nerves or fibres, in the form of net work.

Posterior, behind.

Posterior tooth, a tooth back of another.

Process, any protuberance, eminence, or projecting part of the bone or jaw.

Pterygoid process (from *peterux*, a wing), and *eidos*, likeness), is so called from its likeness to a wing.

Rachitis, inflammation of the spine.

Ramus, a branch of the jaw.

Resolution, the disappearing of any tumor without suppuration; the dispersing of inflammation.

Salivate, to excite an unusual secretion and discharge of saliva; it is usually done by means of mercury.

Scarify, to make small incisions in the skin or gums.

Scirrhus, a hard tumor usually proceeding from the induration of a gland, often terminating in a cancer.

Scorbutic, affected with scurvy.

Sensorial, pertaining to the brain and nerves.

Septic, that which promotes the putrefaction of bodies.

Sinister, left, the opposite of dexter.

Sinus, a cavity in a bone or jaw, or other part, wider at the bottom than at the entrance.

Slough, the part that separates from a foul sore, as the dead part in mortification.

Splanchnology (Greek, *σπλαγχνα* and *λογος*), description of the internal parts of the body.

Staphyloraphy, a remedy for palatine deformity.

Sthenic (Greek, *σθνος*), in medicine, that which increases the vital energy and action in the heart and arteries; phlogistic.

Strumous, having swellings in the glands.

Styptics, articles of a binding quality, to stop hæmorrhage.

Sublimated, brought into a state of vapor by heat.

Sudorific, a medicine that produces perspiration.

Soporific, producing sleep.

Superior, upper.

Suppuration, the formation of the purulent matter in a wound or abscess.

Suture, the union of bones with dentiform margins.

Therapeutics, that part of dentistry or medicine which relates to the discovery and application of remedies.

Thorax, that part of the human skeleton, which consists of the bones of the chest; also the cavity itself.

Thyroid (Greek, θυρεος and ειδος), a term applied to one of the cartilages of the larynx.

Trachea, a cartilaginous canal, thro' which the air passes to the lungs.

Tumefied, swelled, enlarged.

Turgid, unnatural distension, by the operation of some internal agent.

Tympan (Latin, *tympanum*), the hollow part of the ear, behind the membrane of the tympanum.

Uvula, a soft, round, spongy body, suspended from the palate near the foramina of the nostrils, over the glottis.

Vascular, full of vessels, or consisting of vessels, such as veins, arteries, &c.

Vesicle, a little bladder, or a portion of the cuticle separated from the skin, and filled with humor.

Virus, foul or contagious matter of an ulcer; poison.

Viscera, the contents of the abdomen and thorax.

Viscid, glutinous, sticky, not readily separated.

Vitreous, pertaining to, consisting of, or resembling glass.

Vitrify, to convert into glass by fusion, or by the action of heat.

Vomic nut, or *nux vomica*, the seed of the *Strychnos nux vomica* — a tree in India. It is *not* emetic.

Xerodes, a tumor attended with dryness.

Xiphoid, or *ensiform cartilage*, is that which is situated at the base of the breast bone.

Zygomatic (Greek, ζευγμα), pertaining to a bone of the head; called, also, *os jugale*, or cheek bone; or to the bony arch under which the temporal muscle passes.

Zygomatic muscles, the muscles which rise from the zygomatic bone, and are inserted into the corner of the mouth; the zygomatic suture is that which joins the zygomatic processes of the temporal and cheek bones.