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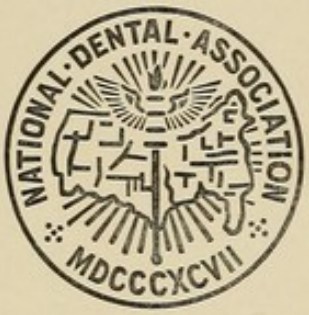
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THE NATIONAL DENTAL ASSOCIATION
OF THE UNITED STATES OF AMERICA

A

HISTORY OF DENTISTRY

FROM THE MOST ANCIENT TIMES UNTIL THE END OF THE EIGHTEENTH CENTURY

BY

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With 104 Engravings and 20 Plates



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PREFACE.

THE idea of writing a History of Dentistry first suggested itself to me ten years ago, when I was charged by the Organizing Committee of the Eleventh International Congress of Medicine with the reproduction and description of all the appliances of ancient dental prosthesis existing in the museums of Italy.

The highly interesting researches in which I then became engaged in order to carry out worthily the important mission intrusted to me, awoke in me the desire to gain still further acquaintance with all that relates to dental art in the time of the ancients. I was thus urged on to ever fresh efforts, not only in the discovery of prosthetic appliances and other objects of ancient dentistry, but in the study, as well, of dental literature and of all the written matter that might throw light on dentistry in past ages.

This subject has already occupied many before me, and each one has brought to it his contribution of greater or less value, some in the form of short pamphlets, others in that of larger works.

The end I proposed to myself was to write a History of Dentistry which should be much more complete, more circumstantial, and more exact than those published hitherto, and which, instead of being, as are many of these works, simply a compilation, should represent, at least in part, the fruits of personal research and scrupulous examination of a vast number of works of various kinds containing elements utilizable for the purpose.

The first part of my work, which I now offer to the public, comprises the remote origin of Dentistry and its development throughout the ages as far as the end of the eighteenth century. In a short time I hope to publish the second part of it, viz., the History of Dentistry during the last hundred years.

I have carefully collected the greatest possible number of historical data, keeping in view the consideration that some facts, although of little value in themselves, may possess a certain importance for the student desirous of procuring historical information relating to some particular point of dental science.

If this book should, as I hope it may, contribute to the diffusion of exact historical knowledge as to the origin and gradual development of dentistry, my labor will not have been lost, for it will have realized the object, a highly practical one, which has guided me in writing it.

VINCENZO GUERINI.

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INTRODUCTION.

EVERY dentist who has ever given any thought to the development of his profession must have realized the growing necessity for an accessible and authoritative history of the dental art. The early efforts in this direction by Duval, Fitch, Carabelli, Snell, Linderer, Harris, and others, followed in this country by the more recent essays of Perine, Dexter, and Cigrand, are out of print and difficult to obtain. The *Geschichte der Zahnheilkunde*, by Geist-Jacobi, and *Notice sur l'Histoire de l'Art Dentaire*, by Lemerle, have given to the practitioners of Germany and France valuable information which the English-speaking dentist has often sadly lacked.

Realizing this situation, at the first meeting of the National Dental Association, the late Dr. R. Finley Hunt offered the resolution: "That a Committee of Three be appointed by the President to report at the next annual meeting a measure looking to the preparation of a *full history* of the Dental Profession." After a careful consideration of the subject, this committee reluctantly concluded that, "whereas a complete history of dentistry may some day be the result of the effort now being made, this Association must confine its first attempts to the history of dentistry in America." In a letter to the committee the late Dr. W. D. Miller said: "Of course, a universal history of dentistry would be very interesting and valuable, but its compilation would naturally cost an immense amount of labor." Aside from this, it did not seem possible that the data for a proper history of the early development of the dental art in Africa and Europe could be collected by an association working in America.

After several years of what may have seemed a policy of masterly inactivity the unexpected happened, and the committee was able to report at the Buffalo meeting of the Association that Dr. Vincenzo Guerini, of Naples, Italy, had written a history of dentistry from the earliest times to the beginning of the nineteenth century, and that this work, translated into English and fully revised, had been generously placed in the hands of the committee for publication under the auspices of the National Dental Association, in token of the distinguished author's appreciation of American dental development.

The Association, deeply sensible of this high compliment, and fully realizing this opportunity for accomplishing a purpose which had hitherto

seemed impossible, gladly arranged for the publication of the book. After the delay incidental to the production of a work of this character, and the necessary subscribers being obtained, this exhaustive history of early dentistry, by the greatest authority on that subject in the world, is presented for the serious consideration of the thoughtful and studious members of the profession.

Dr. Guerini has spent many years of his professional life and large amounts of money in collecting the material for this work. Our historical records are scattered through a vast literature, and much of it is of great antiquity, and it has never before been gathered together and arranged in such a consecutive, logical order.

The importance and value of dental art and science as a humane service are well recognized, but we are so accustomed to view the question from the modern standpoint that we, generally speaking, overlook the immense work done by our predecessors reaching far back in unbroken line to the mists of antiquity. It was they who laid the foundations upon which modern dentistry has been built, and no man can peruse the record of their efforts as set forth in Dr. Guerini's book without developing a higher appreciation of their work and a keener realization of the worth and dignity of the calling which they in common with ourselves followed.

It has been deemed wise to make a few amendments and commentaries, and when that has been done the amendment has in each case been inserted as a foot-note and designated by the initials of the commentator.

The supervision of the work while passing through the press and the correction of proofs have been entrusted to Dr. Edward C. Kirk, of the Committee; the index has been prepared by the chairman.

CHARLES MCMANUS, D.D.S.,
Chairman of Committee on History of Dentistry,
National Dental Association, U. S. A.

A HISTORY OF DENTISTRY.

PART I.

FIRST PERIOD—ANTIQUITY.

INTRODUCTION.

The first beginnings of dental art were undoubtedly the same as those of general medicine, for it is evident that in primitive times, when the healing art was still in its rudimentary stage, no divisions could have existed in it.

Scientific medicine, whose most ancient representative is Hippocrates, was preceded for the course of many centuries by sacerdotal medicine and by popular medicine.

Necessity, instinct, and even mere chance must have taught primitive man some simple curative practices, in the same manner that they taught him gradually to prepare his food and to satisfy the other wants of life. It was in this way that popular medicine, which is found without exception among all races and is perhaps as ancient as man himself, had its earliest beginning.

As regards sacerdotal medicine, it was principally derived from the false ideas prevalent among primitive peoples about the causes of maladies. When, for example, an individual in full health was seized with sudden illness, no one could imagine, in those times of profound ignorance, that this happened in a natural manner; the fact was therefore attributed to a supernatural cause, that is, to his having been stricken by the wrath of some divinity. In this state of things it was believed to be absolutely necessary to propitiate the inimical or vengeful divinity, so that the patient might be restored to health. It was, therefore, very natural that the intervention of sacerdotal aid should be sought, that is, of the supposed intermediaries between human beings and the gods. The priests, on their side, were ready to occupy themselves with such cases, for their services were always well recompensed, and, added to this, if the

patient recovered, the respect and veneration of the people for the sacerdotal caste was considerably increased, whilst if he did not, this simply meant that he or his family was not worthy of receiving the desired pardon, or that, anyhow, the Divinity, for good reasons of his own, would not grant it.

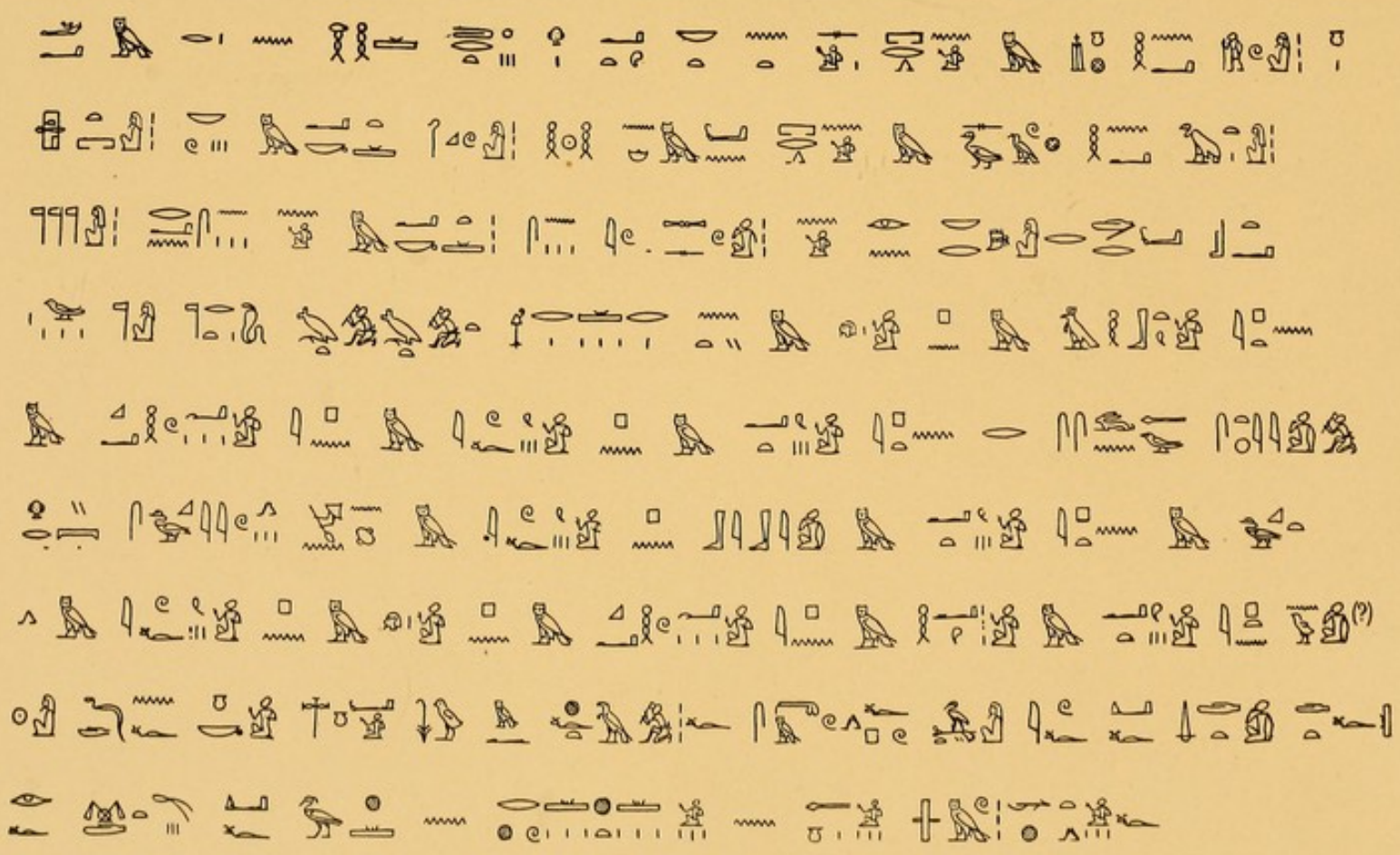
However, it being to the interest of the priests to obtain the greatest possible number of cures, they did not limit themselves merely to offering up prayers and sacrifices and to imposing on the patients the purification of themselves and other religious exercises; they also put into practice —always to the accompaniment of ritualistic words and ceremonies— the means of cure which their own experience and that of others suggested to them. The art of healing the sick was transmitted from generation to generation in the sacerdotal caste, acquiring an ever greater development and complexity in proportion to the making of new observations and fresh experiences. It is to be understood that in this manner the priests became more and more skilful in the treatment of disease; they were really the doctors of those times, albeit their curative practices were mixed up with an ample dose of imposture. This, at least in many cases, must have had, besides, the advantage of acting favorably on the patients by means of suggestion.

We learn from Herodotus that the Babylonians used to carry the sick into the public squares; the passers-by were expected to make inquiries as to their illnesses, and if it so happened that they or any of their acquaintances had been similarly afflicted, to come to the aid of the patient by offering their advice and making known the means of treatment that had effected recovery, exhorting him, at the same time, to have recourse to them.

This usage had without doubt its advantages, as it must have led, little by little, to the recognition of such remedies as were most efficacious, among all those recommended, against the various maladies.

Another custom that served to furnish useful elements for the development of the art of medicine was that of the votive tables, hung in the temples by patients after their recovery, in sign of gratitude for having received the invoked blessings. These tables contained a brief description of the malady and of the treatment that had proved useful in dispelling it. If we reflect that dental affections are often of long duration and very tormenting, the thought naturally suggests itself that among the votive tables not a few must have referred to maladies of the teeth.

The numberless cases recorded by votive tables afforded precious clinical material, which without doubt was utilized in a great measure by the priests in compiling the earliest medical writings, and, as we shall see later, Hippocrates himself stored up all the medical records existing in the celebrated temple of Cos.



Introduction of Ebers' Papyrus, transcribed in Egyptian hieroglyphic characters.

CHAPTER I.

DENTAL ART AMONG THE EGYPTIANS.

Among the people of ancient times, the Egyptian nation was, without doubt, the one in which civilization first took its rise and had its earliest development. From the time of Menes, first King of Egypt (3892 B.C.), the inhabitants of the valley of the Nile were well advanced on the path of civilization, and under the fourth dynasty, dating from 3427 years before the Christian era, they had already attained a high degree of progress.

Medical art and science in every country have always progressed in proportion to the general civilization, for the treatment of disease is one of the first and most important manifestations of civilized life. It is therefore natural that the healing art should have flourished earlier in Egypt than elsewhere, that is, in the midst of the oldest civilized people.

There, as in other countries, medicine was practised for some time only by the sacerdotal caste; but not all the members of this caste were doctors and priests at one and the same time; there was a special class among them, called "pastophori," whose mission it was to cure the sick.

Our knowledge of medicine as practised among the Egyptians of old is now no longer limited to the scanty notices handed down to us by Greek and Roman writers. The researches made by students of Egyptian lore have placed original medical writings in our hands, now already partly interpreted, that permit us to form a sufficiently exact idea of the science of Medicine in ancient Egypt.

These valuable documents, denominated papyri, from the material on which they are written, now exist in great numbers in the Berlin Museum, in the British Museum, and in those of Leyden, Turin, Paris, and other cities; but the most important of the papyri treating of medical subjects is certainly the papyrus of Ebers, in the library of the Leipzig University.[1] This very valuable papyrus—the most ancient of all known works on Medicine—is the best written of all the Egyptian medical papyri, and is also the best preserved and most voluminous. In size it is 30 centimeters high, 20 meters long, and the whole text is divided into 108 sections or pages, each one of about 20 to 22 lines. The celebrated Egyptian scholar, Prof. George Ebers, procured it, toward the

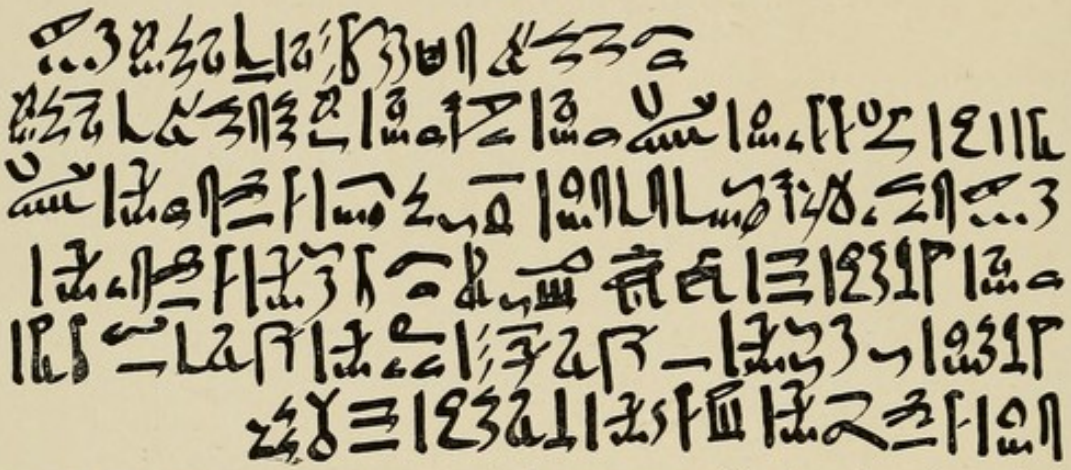
[1] See Introduction to the German translation of the Ebers papyrus, by Heinrich Joachim, Berlin, 1890.

beginning of the year 1873, from an inhabitant of Luxor, in Upper Egypt. He published a beautiful edition of it two years later in Leipzig; and in 1890 Dr. Heinrich Joachim published a German translation of the whole papyrus, with an introduction and explanatory notes.

The Ebers papyrus is written in hieratic characters. We here reproduce some passages of it, so as to give our readers an idea of the style of writing.[1]

Lepsius and with him the greater part of Egyptologists are of opinion that the Ebers papyrus is not an original work at all, but simply a copy of medical writings of still earlier date, belonging to different epochs, and which were collected and reunited to form a kind of manual on medicine.

FIG. 1



Part of Ebers' papyrus in Egyptian hieratic characters containing three dental prescriptions.

From some indications existing in the papyrus itself, Ebers has been able to argue, with quasi certainty, that the papyrus was written toward the year 1550 B.C. But some parts of it have their origin in a far more remote epoch; they go back, that is, to thirty-seven centuries or more before the Christian era. In fact, at page ciii of the Ebers papyrus[2] one reads:

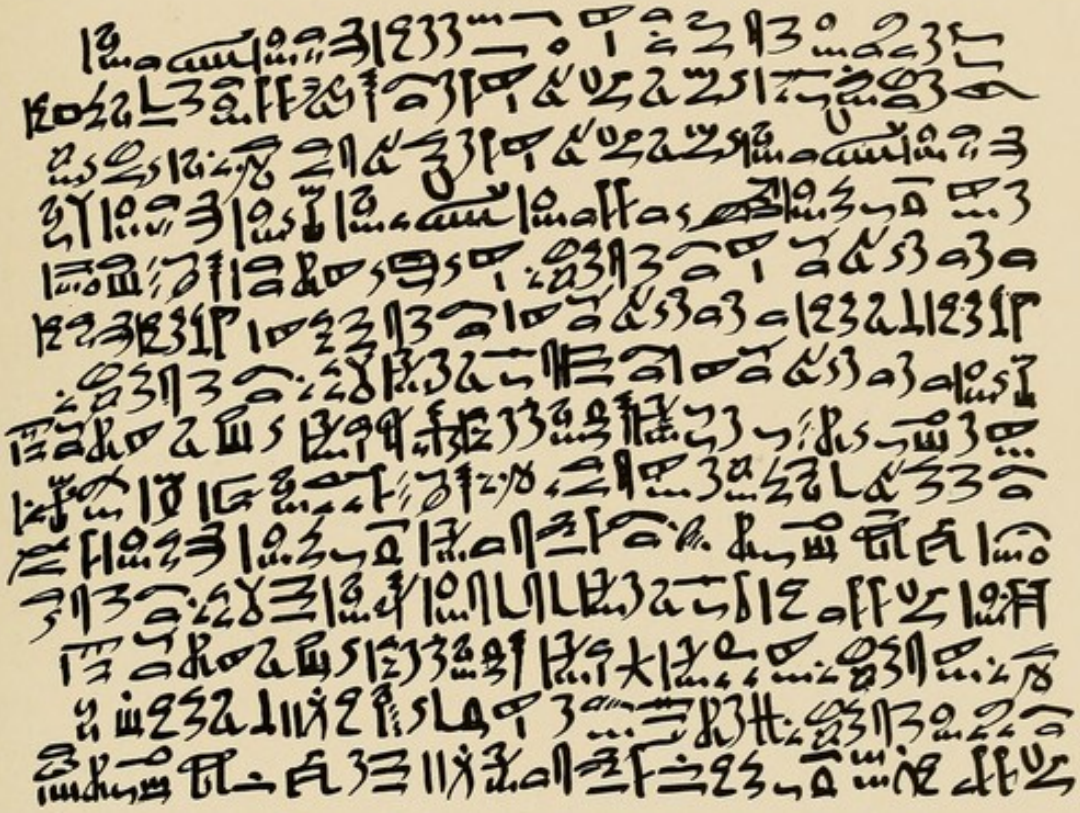
"Beginning of the book about the treatment of the *uxedu* in all the members of a person, such as was found in a writing under the feet of the God Anubis, in the city of Letopolis; it was brought to His Majesty Usaphais, King of Upper and Lower Egypt." Now, as Joachim remarks, the Usaphais herein named was the fifth king of the first Egyptian

[1] The Egyptians had three different kinds of writing: the hieroglyphic, the hieratic, and the demotic. The hieroglyphic style, which is the most ancient and is chiefly to be found on monuments and in religious texts, consists of figures representing every kind of object; the hieratic or sacerdotal style is an abbreviation of the hieroglyphic writing; the demotic or popular style, the least ancient, resulted from further abbreviations of the hieratic.

[2] See page 185 of the German translation of Dr. Joachim.

dynasty, and he reigned toward 3700 before the Christian era. Hence, it may be argued that some, at least, of the writings from which the Ebers papyrus was taken were composed in the very remote epoch to which we have just alluded, or perhaps still farther, for it is impossible to know whether the book, deposited by unknown hands at the foot of the statue of the God Anubis, had been written but a short time previous or at a much earlier epoch.

FIG. 2



Part of Ebers' papyrus in Egyptian hieratic characters containing eleven dental prescriptions.

Dental and gingival maladies are in no way neglected in the Ebers papyrus. At page 72, a remedy is prescribed "against the throbbing of the *bennut* blister in the teeth," then two other remedies "to cure the *bennut* blisters in the teeth and to strengthen the flesh (gum)."

It is somewhat difficult to say what is meant by *bennut* blisters; but perhaps it means small, gingival abscesses of dental origin. The first of the above remedies—probably meant to calm the pricking or throbbing pain that, in such cases, often accompanies the dental malady —consisted of:

"Seps-grains . . . . . Part 1
Dough . . . . . " 1
Honey . . . . . " 1
Oil . . . . . " 1
To be applied on the part as a plaster."

The other two remedies, very likely intended for the cure of dental fistulæ, were to be used as masticatories. The first consists of:

"Fennel seeds . . . . . Part 1
Dough . . . . . " 1
Anest-plant . . . . . " 1
Honey . . . . . " 1
Incense . . . . . " 1
Water . . . . . " 1"

The other was still more complicated and thus compounded:

"Dâm-plant . . . . . Part 1
Anest-plant . . . . . " 1
Incense . . . . . " 1
Amaa-plant . . . . . " 1
Man-plant . . . . . " 1
Saffron . . . . . " 1
Aloe wood . . . . . " 1
Annek-plant . . . . . " 1
Cyperus . . . . . " 1
Onion . . . . . " 1
Water . . . . . " 1"

At page 89 of the papyrus[1] we find two other remedies, having the same object, that is, "to cure the bennut blisters in the teeth and to strengthen the flesh."

The first is compounded in this way:

"Cow's milk . . . . . Part 1
Fresh dates . . . . . " 1
Uah corn . . . . . " 1
To be left stand and then to be masticated nine times."

This is the second receipt:

"Anest-plant . . . . . Part 1
Dough . . . . . " 1
Green lead . . . . . " 1
Sebests[2] . . . . . " 1
Cake . . . . . " 1
Dâm-plant . . . . . " 1
Fennel seeds . . . . . " 1
Olive oil . . . . . " 1
Water . . . . . " 1
To be used like the preceding one."

[1] See the German translation by Joachim, page 162.
[2] A fruit resembling cherries.

In this same page 89 many other remedies corresponding to various indications are prescribed.

"To strengthen the teeth:

Powder of the fruit of the dum-palm	Part 1
Green lead	" 1
Honey	" 1

To be mixed and the teeth rubbed with it."

The following is another remedy for the same purpose:

"Powder of flint stones	Part 1
Green lead	" 1
Honey	" 1

To be rubbed on the teeth."

Next comes a remedy "to cure the growth of *uxedu* in the teeth," that is:

"Dough	Part 1
Beans	" 1
Honey	" 1
Verdigris	" 1
Green lead	" 1

To be powdered, mixed, and applied on the teeth."

The word *uxedu* recurs more than thirty-five times in the Ebers papyrus, in relation to affections of the most different parts of the body. By confronting all the passages of the papyrus in which one finds the word *uxedu*, Joachim deduces that it does not indicate any special disease, but has the general signification of "a painful swelling." According to Geist-Jacobi, by "growth of the uxedu in the teeth" may be understood an alveolar abscess and the consequent swelling of the surrounding parts.

Another remedy is intended for "the cure of the tooth that gnaws unto the upper part of the flesh."

The translator of the papyrus remarks that by the "upper part of the flesh" is to be understood the gum. The remedy would, therefore, correspond to the indication of curing a tooth "that gnaws or gives pain unto the gum." But as one sees, even putting it in these words, the meaning is anything but clear. Perhaps the destructive action of the carious process, reaching as far as the gum, is what is here meant to be alluded to. Meanwhile here is the receipt:

"Cumin	Part 1
Incense	" 1
Onion	" 1

To be reduced to a paste, and applied on the tooth."

Besides the remedies already given, the two following are prescribed for strengthening the teeth:

"Incense . . . . . Part 1
Verdigris . . . . . " 1
Green lead . . . . . " 1
Mix and apply on the tooth."

The other is compounded of :

"Water . . . . . Part 1
Absinth . . . . . " 1
To be used as above."

We next find a formula, preceded by this very vague indication: "Chewing remedy for curing the teeth."

"Amaa-plant . . . . . Part 1
Sweet beer . . . . . " 1
Sut-plant . . . . . " 1
To be masticated and then spit on the ground."

Another masticatory is intended to "strengthen and cure the teeth," and is compounded thus:

"Saffron . . . . . Part 1
Duat-plant . . . . . " 1
Sweet beer . . . . . " 1
To be masticated and then spit on the ground."

Finally, we have a medicament "for curing the gnawing of the blood in the tooth." It is complicated enough, being compounded with:

"The fruit of the gebu . . . . . Part $\frac{1}{32}$
Onion . . . . . " $\frac{1}{64}$
Cake . . . . . " $\frac{1}{16}$
Dough . . . . . " $\frac{1}{8}$
Anest-plant . . . . . " $\frac{1}{32}$
Water . . . . . " $\frac{1}{2}$
One leaves it to stand and then chews for four days."

But what meaning is to be attributed to the "gnawing of the blood in the tooth?"

It is almost certain that this figurative expression referred to the pain deriving from caries and pulpitis. It may have had its origin in the observation of two phenomena, that is, first of all, the pulsating character

which the pain alluded to often assumes, and the eventual issuing of blood from the cavity of a tooth affected by caries and pulpitis, when the pulp is exposed. At any rate, the Egyptian doctors of remotest antiquity undoubtedly did not ignore the presence of blood in the interior of the tooth.

From what we have related, it clearly appears that at that remote epoch many remedies were already in use for combating dental affections. These must consequently have been frequent enough, which demonstrates the erroneousness of the opinion held by some, who affirm, as does Mummery,[1] that in ancient times diseases of the teeth were extremely rare.

Besides this, it is fully evident, from the Ebers papyrus, that at the time in which this was written, dental pathology and therapy were still in a very primitive condition, and formed a part of general medicine, from which they showed as yet no tendency to separate; so true is this, that the remedies intended for the treatment of the teeth do not constitute a special section of the work, but are to be found among medicaments of an altogether different nature. Thus, at page lxxii of the papyrus[2] we find, first, three remedies against the itch; then five remedies for the cure of pustules in various parts of the body; next an ointment and a potion for the *bennut blisters* in whatever part of the body they may occur; after this, three medicaments against the *bennut blisters* of the teeth; and lastly, a plaster for curing crusts and itching in whatsoever part of the body.

One finds no mention of dental surgery in the Ebers papyrus. No conclusions could be drawn from this fact if the work only spoke of medical treatment, for then it might reasonably be supposed that the compiler had purposely occupied himself with this subject only; but, on the contrary, the Ebers papyrus frequently makes mention of operative interventions, and among these, of the use of the knife and of the red-hot iron for the treatment of abscesses and of certain tumors. Therefore, there being no mention made in the papyrus of any dental operation, not even of extraction, gives us reason to suspect that at that remote epoch no surgical operation was carried out on the teeth, and that, as yet, no instruments existed for practising extraction.

In the time of the celebrated historian Herodotus, of Halicarnassus, who lived in the fifth century previous to the Christian era (about from 500 to 424 B.C.), that is, more than a thousand years after the time in which the Ebers papyrus was written, the dental art in Egypt had made remarkable progress, and was exercised by specialists. In fact, in the

[1] On the Relations of the Human Teeth to those of the Lower Animals, by John R. Mummery. Trans. Odontological Society of Great Britain, May, 1860.

[2] See German translation by Joachim, p. 120.

second book of Herodotus we find the following passage: "The exercise of medicine is regulated and divided amongst the Egyptians in such a manner that special doctors are deputed to the curing of every kind of infirmity; and no doctor would ever lend himself to the treatment of different maladies. Thus, Egypt is quite full of doctors: those for the eyes; those for the head; some for the teeth; others for the belly; or for occult maladies."[1]

Having here had occasion to refer to the *History* of Herodotus, we will quote two passages of this famous work, which have a certain interest for our subject;

"Whilst the tyrant Hippias, after having been driven out of Athens (510 B.C.), was marching against Greece at the head of the Persian army and had already arrived at Marathon, he happened one day to sneeze and to cough in a more vehement manner than usual; and he being already an old man, and his teeth all shaking, a violent fit of coughing suddenly drove one of them out of his mouth, and it having fallen into the dust, Hippias set to work, with great diligence, to search for it; but the tooth not coming to light, he drew a long sigh, and then said, turning to those who were standing by: 'This land is not ours, neither shall we ever be able to have it in our power; what clings to my tooth is all of it that will ever belong to me.'"[2]

In another part of the *History*, that is, in the ninth book, Herodotus recounts as follows:

"When the corpses buried after the battle of Platea were already despoiled of their flesh, a curious fact was seen; for the people of Platea having collected the bones of those who had perished, there was found amongst them a skull altogether devoid of commissures, and composed of one single bone. A jaw was also found, the teeth of which, comprising the molars, appeared to be made all of one piece, as though composed of a single bone."

Relative to this last passage of Herodotus, we may remark, as does Stark, that the total synostosis of the skull bones is certainly very rare, but that, nevertheless, one has authentic examples of the same, not only in ancient but also in relatively modern times, witness the famous skull of Albrecht von Brandenburg, surnamed the German Achilles, who died in 1486, and was buried in the monastery of Heilbronn. As to teeth united together and forming a single piece, no example exists save in very ancient authors, for instance, in Valerius Maximus, who recounts a similar marvellous fact of Prusia, King of Bithynia, and in Plutarch, who attests to a similar fact in the person of Pyrrhus, King of Epirus.

[1] Herodoti Halicarnassei historia, 1570 fol. Euterpe, page 53.

[2] Herodoti Halicarnassei historia, lib. vi.

It is very difficult to establish within what limits the activity of the dentists alluded to by Herodotus was displayed. It has been affirmed by some that dental art in ancient Egypt was very far advanced, and that not only the application of artificial teeth, and even of pivot teeth, but also stoppings, were practised by the Egyptian dentists of those days. Here are some data on this subject:

Joseph Linderer[1] tells us that, according to Belzoni[2] and others, artificial teeth made of wood and very roughly fashioned have been found in Egyptian sarcophagi.

George H. Perine, a dentist of New York, in an article on the history of dentistry,[3] says: "Both filled and artificial teeth have been found in the mouths of mummies, the cavities in the former stopped with gold and in some cases with gilded wood. Whether these fillings were inserted during life for the purpose of preserving the teeth, or after death for ornamentation, it is, of course, impossible to say. That the Egyptians were exceedingly fond of embellishing their persons with gold ornaments and bright colored materials is a fact which has been clearly established, and the discovery of mummies—of exalted personages no doubt—some organs of which were gilded and embellished with showy colors proves that their fondness for display accompanied them even to the grave." To this may be added, that after an embalmment of the highest class[4] it was usual to gild the eyebrows, the point of the nose, the lips, and the teeth of the corpse, and place a gold coin between the teeth, or cover over the tongue with a thin gold plate.

Dr. J. G. Van Marter, a dentist in Rome, in an article on prehistoric dentistry,[5] writes, among other things, that *the renowned archeologist, Mr. Forbes, had seen mummies' teeth stopped with gold.*

The great defect of all the assertions referred to is that of not being accompanied by any element of proof, wherewith to demonstrate their truth. When, for example, we are told that Mr. Purland possesses, in

[1] Die Zahnheilkunde, Erlangen, 1851, p. 348.

[2] G. B. Belzoni (1778 to 1823), a celebrated Italian traveller and archeologist, visited Egypt and Nubia, and wrote, in English, a report on his discoveries, which was published in 1821. We have not been able to procure this book; we have, however, read the Italian version, published in Naples in 1831, without coming across any mention of artificial teeth found in Egyptian sarcophagi. Therefore, unless the work has undergone some mutilation in the Italian translation, we do not know whence Joseph Linderer can have taken the above notice.

[3] New England Journal of Dentistry, 1883, vol. ii, p. 162.

[4] According to Herodotus and Diodorus, there were three different modes of embalming in use among the Egyptians; the most expensive of these cost one talent (about 5600 francs), the second in order 20 minae (about 1900 francs), while for the less wealthy there was a third class, at a much more economical rate.

[5] See Giornale di Corrispondenza pei Dentisti, October, 1885, p. 227.

his collection of antiquities, a tooth pivoted on to the root of a mummy's tooth, the question suggests itself naturally: If this tooth is, as it appears, separated from the jaw of the mummy to which it is said to have belonged, how can we be certain that the tooth itself is really that of a mummy? Until sufficient proof of this be furnished, we cannot but consider the above assertion as absolutely without value.[1]

The same may be said as to the assertions of Wilkinson and Forbes with regard to mummies' teeth stopped with gold. Where and by whom were these mummies found? And where are they preserved? Was the stopping, too, verified at the time of the finding of the mummy, in such a manner as to exclude all possibility of fraud, or was it discovered afterward, in circumstances such as to suggest the possibility of a mistification? It has, in fact, been reported[2] that the pretended Egyptian stopping in a mummy existing in an English museum was nothing else than a practical joke, carried out, besides, in a very awkward manner.

In opposition to the above assertions, we have the most absolute contradictory statements on the part of the most competent authorities.

The celebrated Egyptologist, Prof. George Ebers, has only been able, in spite of the most accurate research, to arrive at completely negative results in all that has reference to the dental art of the ancient Egyptians.[3]

[1] [The oft-quoted statements of Mr. Purland with reference to Egyptian dental art are recorded in the transactions of the first monthly meeting of the College of Dentists, an extinct English dental association, and published in the Quarterly Journal of Dental Science, 1857, vol. i, p. 49, where the following note by the secretary appears: "Mr. Purland repudiated the idea of the Chinese having been the first to manufacture teeth, and referred to numerous specimens in the British Museum, manufactured between four thousand and five thousand years ago by the Egyptians, who he considered were the original makers. On the subject of flint, Mr. Purland said he had discovered pieces of wood in the centre, and remarked upon the artificial teeth he had found in mummies."

Again, at page 63 of the same journal, in an article entitled "Dental Memoranda," by T. Purland, Dentist, Ph.D., the author says:

"Belzoni and others discovered rudely manufactured teeth in the sarcophagi of the Egyptians. As regards the use of gold leaf, Sir Gardner Wilkinson observes, as a singular fact, that the Egyptians stopped teeth with gold.

"It is true that rudely manufactured teeth have been found in the heads of Egyptian mummies, but it is equally true that teeth of a very superior make and adaptation have also been found, some carved in ivory, others in sycamore wood, and some have been found fixed upon gold plates. Of these varieties, some are deposited in the valuable and extensive museum belonging to Joseph Mayer, Esq., F.S.A., of Liverpool; others are in the museums of Berlin and Paris, and I am in possession of a tooth found pivoted to a stump in the head of a mummy in the collection of a lamented friend.

"Of stopping with gold, several instances have come to my notice, particularly in a mummy in the Salt collection, sold by Sotheby, in 1836, in which three teeth had been stopped. I have endeavored to trace the mummy, but in vain."—E. C. K.]

[2] Giornale di Corrispondenza pei Dentisti, October, 1885, p. 229.

[3] Geist-Jacobi, Geschichte der Zahnheilkunde, p. 9.

The distinguished craniologist Prof. Emil Schmidt, of Leipzig, who owns a collection of several hundred mummies' skulls, writes thus on the question now before us: "In no jaw have I ever found anything that could be attributed to the work of dentists: no fillings, no filing or trepanning of teeth, no prosthesis."[1] Virchow, who also examined a great many Egyptian skulls, among which were several belonging to royal mummies, did not find any indications of dentists' work;[2] and Mummery, as well, although he made the most conscientious researches on this subject, could not arrive at any positive results whatever.[3]

Between the affirmations of some and the negations of others, it is very difficult to say on which side the truth lies. For my own part, I fail to find that there is the least proof of the ancient Egyptians having known how to insert gold fillings and still less to apply pivot teeth. But at the same time I think it cannot be doubted that the Egyptian dentists knew how to apply artificial teeth. And even though it may not be possible to demonstrate this by direct proof, one is equally prone to admit it when one considers, on the one hand, the remarkable ability of the ancient Egyptians in all plastic arts, and, on the other hand, the great importance they attributed to the beautifying of the human body; so much so, that even in so ancient a document as the Ebers papyrus, one finds formulæ for medicaments against baldness, for lotions for the hair, and other kinds of cosmetics. Is it likely, therefore, that so refined and ingenious a people should not have found the means of remedying the deformity resulting from the loss of one or more front teeth?

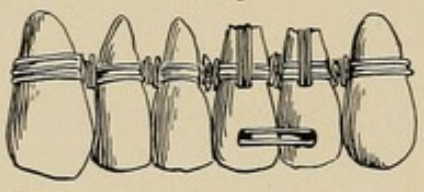
Fortunately, however, we are not bound to content ourselves with simple suppositions, for a well-authenticated archeological discovery made in the month of May, 1862, has put us in possession of an irrefutable proof.

The discovery to which we allude is registered in Renan's *Mission de Phénicie*, and was the result of researches made in the necropolis of Saida (the ancient Sidon) by Dr. Gaillardot, Renan's colleague in his important scientific mission. In a grave in one of the most ancient parts of the necropolis, Dr. Gaillardot found, in the midst of the sand that filled the grave, a quantity of small objects, among which were two copper coins, an iron ring, a vase of most graceful outline, a scarab, twelve very small statuettes of majolica representing Egyptian divinities, which probably formed a necklace, to judge by the holes bored in them. But among the objects found (which, together with that we are about to mention, are now in the Louvre at Paris), the most important of all is "a part of the upper jaw of a woman, with the two canines and the

[1] Geist-Jacobi, Geschichte der Zahnheilkunde, p. 9. [2] Ibid.
[3] Ibid.

four incisors united together with gold wire;[1] two of the incisors would appear to have belonged to another individual, and to have been applied

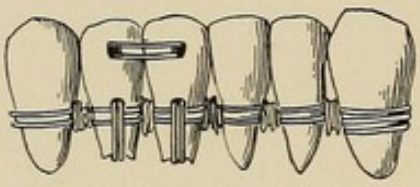
FIG. 3



Phœnician appliance found at Sidon, as represented in a cut of Renan's Mission de Phénicie.

[1] The incisors represented in the cut of Renan's work do not at all give the anatomical form of upper incisors, but of lower ones. Therefore, either the figure itself has been badly drawn, or the piece found by Dr. Gaillardot was part of the inferior and not of the superior jaw. In the latter case, the figure in Renan's book ought to be reversed, in the manner here shown:

FIG. 4



The same figure reversed, as it ought to be if the piece found at Sidon belonged to a lower jaw.

Neither do we understand on what ground Dr. Gaillardot has based his affirmation of the piece discovered having belonged to a female skeleton, as it is well known that there is no characteristic difference between a male and a female jaw.

[Interesting examples of the survival of this primitive type of dental prosthesis are found among the Hindus at the present time. The two illustrations (Figs. 5 and 6) are from photographs of specimens of work done by native Hindu dentists. Fig. 5 is a roughly carved artificial tooth of ivory attached by a gold wire ligature to the adjacent natural

FIG. 5

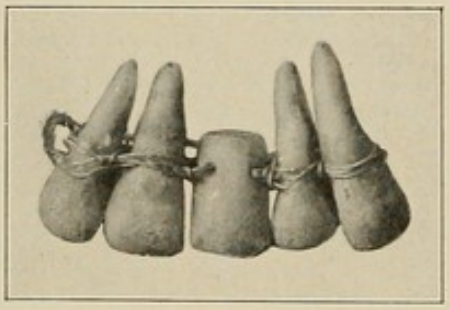
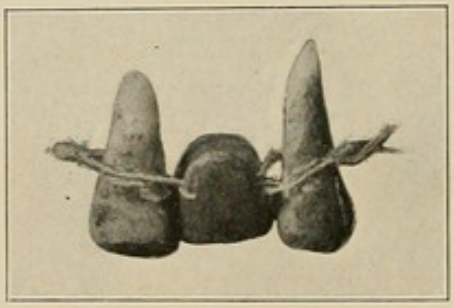


FIG. 6



Examples of dental prosthesis as practised by the Hindus at the present time.

teeth, all of which, with the artificial tooth attached, were subsequently lost by alveolar disease. Fig. 6 is a similar carved artificial tooth of ivory attached to the adjoining teeth by a thread ligature, the supporting teeth with the attached ivory tooth also having been lost by alveolar disease. These specimens were removed and sent to the writer by Dr. H. B. Osborn, of Burma, during the present year (1909).—E. C. K.]

as substitutes for lost teeth. This piece, discovered in one of the most ancient tombs of the necropolis, proves that dental art in Sidon was sufficiently advanced."[1]

To these words, literally translated from Renan's work, we will only add the following considerations:

Egypt was, in its time, a great centre of civilization, whose influence was strongly predominant in all the neighboring region, and especially in ancient Phœnicia and in its large and industrious cities Tyre and Sidon. The remains discovered in many of the Phœnician tombs would of themselves alone be sufficient to demonstrate luminously the enormous influence exercised by the Egyptian civilization on the life and customs of that people. Now, if there were dentists in Sidon capable of applying false teeth, it may reasonably be admitted that the dentists of the great Egyptian metropoli Thebes and Memphis were able to do as much and more, the level of civilization being without doubt higher there than in Tyre or in Sidon, or in other non-Egyptian cities.

[1] Renan, Mission de Phénicie, p. 472.

CHAPTER II.

THE HEBREWS.

In the Hebrew literature, as principally represented by the Bible and by the Talmud, there does not exist any book on medicine. Notwithstanding the vicinity and the close relations of the Hebrews with Egypt, medical science never reached the degree of development among this people that it did in the land of the Pharaohs.

In the Bible we do not find the least trace of dental medicine or dental surgery. Indeed, although the books of Moses contain a great number of exceedingly wise hygienic precepts, there are not any that refer directly to the teeth or to the mouth. We may therefore conclude, with a certain degree of probability, that the Hebrews had in general good teeth and that dental affections were very rare among them.

The word *tooth* or *teeth* occurs in the Bible more than fifty times,[1] but very few of the passages in which it is to be met with present any interest so far as our subject is concerned.

That the Hebrews attached great importance to the integrity of the dental apparatus is plainly seen from the following verses of the book of Exodus (xxi: 23 to 27):

23. . . . thou shalt give life for life,

24. Eye for eye, tooth for tooth, hand for hand, foot for foot,

25. Burning for burning, wound for wound, stripe for stripe.

26. And if a man smite the eye of his servant, or the eye of his maid, that it perish; he shall let him go free for his eye's sake.

27. And if he smite out his manservant's tooth or his maidservant's tooth; he shall let him go free for his tooth's sake.

These legislative measures show clearly enough that among the Hebrews the loss of a tooth was considered a lesion of great gravity, as they thought it of sufficient importance to be named in the same category as the loss of an eye, of a hand, or of a foot. If anyone caused the loss of an eye or of a tooth to his servant, the punishment was the same in both cases; that is, he was obliged to give him his liberty, thus undergoing the loss of his purchase money.

Beauty and whiteness of the teeth were also in great repute. Thus we read in the Song of Solomon (iv: 2):

[1] The number varies according to the different translations. So, instead of the Latin dentes elephantis, we find in English and in other languages the word *ivory*.

"Thy teeth are like a flock of sheep that are even shorn, which came up from the washing; whereof every one bear twins, and none is barren among them."

In another part of the Song (vi: 6) he repeats these same words, thus giving it to be understood how great was his admiration for the beautiful teeth of his beloved.

From various passages of the Bible, one perceives that integrity and soundness of the teeth was considered a prime element of force and vigor. In Psalm iii: 7 David says: "Arise, O Lord; save me, O my God: for thou hast smitten all mine enemies upon the cheek bone; thou hast broken the teeth of the ungodly." (That is, reduced them to impotence.) And in Psalm viii: 6 we read: "Break their teeth, O God, in their mouth."

On the other hand, in one of the Proverbs of Solomon (xxv: 19), broken or decayed teeth are taken to symbolize weakness: "Confidence in an unfaithful man in time of trouble is like a broken tooth, and a foot out of joint." (In the Latin translation, instead of "broken tooth" stands "dens putridus." Perhaps the corresponding expression in the Hebrew language, signifies in a general sense a decayed or injured tooth.)

The uncomfortable sensation produced on the teeth by acid substances (teeth on edge) is to be found several times alluded to in the Bible. In the Book of Proverbs (x: 26), one reads: "As vinegar to the teeth, and as smoke to the eyes, so is the sluggard to them that send him." And Jeremiah says (xxxi: 29, 30): "In those days they shall say no more, The fathers have eaten a sour grape, and the children's teeth are set on edge. But every one shall die for his own iniquity; every man that eateth the sour grape, his teeth shall be set on edge."

As is apparent, there is nothing in the passages quoted that can be in any way connected with the treatment of dental affections; neither is it to be wondered at, when one reflects that even in the Talmud—which is much less ancient—medicine in general is hardly at all spoken of. This famous code as to practical life is almost silent with regard to therapeutic medicine, and only recommends hygienic practices. An axiom of the Rabbi Banaah is worthy of note, and may be quoted here as bearing on the subject, and also because many Christians might be found to conform willingly thereto:

"Wine is the best of all remedies; and it is in places where wine is wanting that one is in need of pharmaceutic remedies."[1]

[1] J. Bouillet, Précis d'histoire de la Médecine, Paris, 1883, p. 24.

CHAPTER III.

DENTISTRY AMONG THE CHINESE.

For above 4000 years science and religion among the Chinese, as well as their customs, have remained quite unchanged. The inhabitants of the Celestial Empire can vaunt a most ancient civilization; which is, however, altogether stationary; neither has their medicine made any progress, and its actual state represents with sufficient exactness what it was in primitive ages.

In Europe, various works have been written about the medicine of the Chinese, one of the best being that of Dabry,[1] taken from the most celebrated medical books of China,[2] and which may be considered as a compendium of the medical science of this people.

In this work we find two chapters relating to our specialty: the first of these (p. 286) speaks of toothache, the second (p. 292) treats of all the other dental and gingival diseases.

The Chinese call the toothache *ya-tong*, and distinguish a great many varieties of the malady, that is:

1. *Fong-je-tong*. This kind of toothache is caused by sudden cold, and has the following characteristic symptoms: Red and swollen gums, which after a little time discharge purulent and fetid mucus; abundant salivation; acute pain; swelling of the cheek. It is to be cured with draughts, mouth washes, and various kinds of frictions.

We consider it useless to give the particulars of the various receipts, because Dabry hardly ever translates the names of the drugs of which they are compounded. These formulæ are therefore incomprehensible by most people.

2. *Fong-lan-tong*. This kind of toothache is also caused by cold. The pain is very great, but the gums are neither red nor swollen.

3. *Ye-tong*. Is also produced by chill. The gums are red and swollen; there is no discharge of mucus; great pain, which is aggravated by cold liquids. If the malady lasts for some time, the gums end by becoming black, and the teeth are loosened; the pain becomes more intense in spitting. In this stage of the malady the sufferer no longer fears cold drinks, but rather desires them, to soothe the pain. The cure varies

[1] La médecine chez les Chinois, par le Capitaine P. P. Dabry, Consul de France en Chine, Membre de la Société Asiatique de Paris, 1863.

[2] One of these books, Nuei-King, is said to have been written twenty-seven centuries before the Christian era, by the Emperor Houang-ty, the founder of Chinese medicine.

according to whether the malady be of recent or of old date; it consists in the use of internal remedies (pills, potions), or of frictions on the part where the pain is situated.

4. *Han-tong*. This is also owing to the action of the cold. Pains in the cheek and forehead proceeding from the teeth; no diseased condition either of the gums or of the alveoli.

5. *Tou-tan-tong*. Violent cough and toothache at the same time; difficulty in masticating.

6. *Yn-hiue-tong*. The gums are pale, or violet-red, hard and lumpy, sometimes bleeding; the toothache is continuous. Among the numerous remedies recommended against this malady (mouth washes, frictions, draughts, pills), one particularly deserves mention: it is the urine of a child used as a mouth wash.

7. *Tchong-che-tong*. Pain in the teeth after mastication; there is also sometimes excoriation of the gums; flow of purulent mucus mixed with blood; bad-smelling breath; the tooth falls; it is decayed, and one can perfectly well distinguish a small hole; the root is unsound; in extracting the tooth one sometimes brings away together with it a little white worm, with a black spot on the head, which can be distinguished by the aid of a magnifying glass. A remedy must immediately be administered to destroy these worms, otherwise the patient runs the risk of having his other teeth attacked in the same manner, and of their falling out. The remedies against this affection are most numerous, and belong for the most part to the oftentimes cited categories. One of them presents a certain interest, its basis being arsenic.

In Dabry's book it is described in the following manner: "Arsenic (gr. 1.80), *houang-tan* (gr. 3.60); pulverize, mix with water, and with a part of the mass form a small pill, which put close to the aching tooth or into the ear, if afraid of the arsenic; then sleep. Cure certain."

8. Toothache, the effect of general weakness, following principally on abuse of coition. It is to be cured by the use of internal medicine, or by local remedies to be rubbed on the painful spot. Some of the medicaments registered in this paragraph have reference to the special case, in which the teeth are loosened through excess of coition. Among others there is a prescription for a dentifrice powder for strengthening the teeth, to be used every morning.

9. Toothache following on a blow. It is to be cured by using a certain dentifrice powder, composed of six ingredients. Another medicament consists in heating about an ounce and one-half of silver in some recipient, and then pouring wine upon it, and rinsing the mouth with it.

Besides these nine kinds of toothache, the Chinese doctors recognized a peculiar morbid condition of the teeth and their surrounding parts, which is thus described in Dabry's book:

"It sometimes occurs, after recovery from illness, that convalescents, in order to acquire strength, drink too great a quantity of wine; and that this after a certain time produces a beginning of inflammation of the stomach. In such cases the teeth often fall out, the breath becomes fetid, and if the patient eats hot food, the empty alveoli as well as the cheeks are painful."

Various internal medicaments and dentifrice powders are prescribed for combating this morbid condition. One of these latter includes a great number of ingredients in its composition; among others, the bones of mice.

Mention is also made of certain remedies, to which recourse may be had at times, for allaying violent dental pains, of whatsoever kind, or whatever be the cause that occasions them.

One of these remedies is composed of different substances (among them, garlic and saltpetre), to be pulverized and made into pills. If the pain be on the left side, one introduces one of the pills into the right ear, and *vice versa*.

The formula is also given for a very complicated medicated powder, to be snuffed up in the left nostril if the person suffering from tooth-ache be a man; in the right if a woman.

Another powder is to be smelt with the right nostril or with the left, corresponding to the side on which the pain is located.

Abscesses and fistulæ of the gums are spoken of as follows:

"It sometimes occurs that an abscess forms in some one point of the gum; this communicates great pain to the tooth near it; the abscess is white, with discharge of purulent matter." The treatment consists in the use of different medicated powders, to be rubbed on the affected part. Two of the powders contain musk, besides several other ingredients. A lotion is also prescribed.

In the next chapter the following affections are described:

1. *Ya-heou.* Gums are red, soft, and swollen, and a fetid and purulent matter exudes from them; the teeth are not painful; if the gums are lanced, blood of a pale red color flows from them in abundance. This malady is to be treated with various internal medicines and sometimes with scarification.

2. *Ja-suen.* Gums swollen; little by little they are corroded and destroyed by ulceration, which leaves the roots of the teeth bared; the patient has an aversion for hot food; continued pain in the teeth; discharge of purulent and fetid mucus; by the slightest exposure to cold the pain becomes very violent. This affection is to be combated with internal remedies and local treatment (frictions with medicated powders; application of an ointment of very complicated preparation).

3. *Tchuen-ya-kan.* The gums are painful for a few days; apparition of the root of the tooth; absence of ulceration. Children of five

or six years of age are frequently exposed to this malady. The best means of cure consists in the extraction of the tooth. There are, besides, various internal and external remedies prescribed. One of these latter contains verdigris and three other ingredients. Among those to be used internally there is a decoction prepared with twelve different drugs, two of which are mint and rhubarb. The quantity of rhubarb is about seven and one-half grams; therefore, this prescription is certainly intended to act as a purgative.

4. *Ya-ting*. The right or left gum suddenly swells; a tumor forms of about the size of a grain of sorgo; in the beginning it is red, afterward black; severe pain in the cheek and neck; itching in the cheek; the tumor afterward bursts, giving exit to blood, and becomes black; it ought to be pricked directly (before it opens of itself) with a silver needle; blood of a violet color will flow from it, which should be left free course until it regains its ordinary color. The sufferer has at the same time pains in the stomach, great thirst, abdominal pains, and sometimes even delirium.

5. *Ya-jong*. Gums swollen and painful, abscess, fever, swollen cheeks; great thirst, and vomiting of a liquid kind; dejections dry. The treatment consists in the methodical use of certain medicines to be used internally, among which is rhubarb. If one neglects to make use of this treatment, an ulceration sets in with discharge of a purulent and sanguine mucus; it is then necessary to rub the part with a medicinal substance called by the Chinese, *ping-pang-san*. Should the tooth be somewhat loose, it ought to be extracted and the gum rubbed again with the substance just now named.

6. *Tso-ma-ya-kan*. An illness common to children after the smallpox; ulceration of the gums, which turn black; fetid breath. In certain cases the gums are hard and the mucous membrane of the cheek is also attacked; all the teeth shake; there is flow of blood from the gums, upon which certain spots begin to form that are clearly distinguishable as small holes. These holes must be filled with a particular medicinal substance (named *lay-ma-ting-kouei-sse*), and, besides, one ought to make use of various other internal and external remedies.

This is a very serious illness. In the case of recovery, the patient ought to abstain from taking any heating aliment for one hundred days.

7. *Tsee-kin-tong* or *tsee-ly-tong*. Gums swollen; slight but continuous pain, aggravated by the effort of the wind; the gums become ulcerated little by little, with discharge of purulent and sanguine mucus; and the root of the tooth is afterward seen to be uncovered. This malady is to be treated by means of draughts, pills, mouth washes, and frictions of various kinds.

After the treatise on the maladies referred to above, we find in Dabry's

book a long series of "general remedies for every kind of toothache." There are about forty of these, and decoctions and powders predominate among them, the latter to be rubbed on the painful spot. Decoctions are the form of medicament most in use among the Chinese. In this list of about forty anti-odontalgic remedies we find as many as eighteen decoctions, seven for internal use, and the others to be employed as mouth washes. Some of the latter are compounded with vinegar instead of with water.

Four remedies of the above list are to be made into a paste and formed into pills, to be applied upon the aching tooth.

Another medicament is also to be formed into pills and applied inside the ear.

The following remedy is particularly worthy of note:

"One roasts a bit of garlic, crushes it between the teeth, and afterward mixes it with chopped horseradish seeds, reducing the whole to a paste with human milk; one then forms it into pills; these are to be introduced into the nose on the side opposed to that where the pain is situated."

Two other remedies, in powder, are to be snuffed up through the nose.

A powder to prevent the progress of caries is prescribed, with which the tooth should be rubbed every day, or it may be applied on the decayed spot.

Finally, two powders are also prescribed for whitening the teeth. One of these is compounded of seven ingredients, among which is musk; the other has only three substances in its composition: salt (gram 25), musk (gram 1.8), *tsang-eul-tsee* (gram 36).

A therapeutic method much in vogue among the Chinese is acupuncture, which is used in the treatment of the greatest variety of affections, including those of the dental system. The doctors of the Celestial Empire have the greatest faith in this operation, which they hold capable of removing obstacles to the free circulation of humors and vital spirits, thus reëstablishing that equilibrium of the organic forces which constitutes health, and the absence of which causes disease.

The Chinese doctors prefer to use gold or silver needles for puncturing; but they also frequently use needles of the best steel. These instruments vary very much in length, in thickness, and in form, and there are not less than nine distinct kinds of puncturing needles.

Every doctor who intends dedicating himself to the practice of this operation has to begin by the most accurate study of the elective points for puncturing according to the various affections; he should also know to what depth precisely to drive the needles in each case, in order to reach the site of the morbific principle and procure convenient exit

for it; he ought to know equally well how long to leave the needle in the affected part, so as to obtain the best possible therapeutic results in each case.

The points of election for carrying out puncturing in various maladies are spread over the whole superficies of the body, and amount in number to 388. Each of these is known by a special name. Each site of election stands in determinate relations, as to distance, to the known anatomical points, and may, therefore, be easily and precisely found by appropriate measurement. The unity of length for these measurements is called *tsun*, and is divided into ten *fen;* its value varies, however, according to whether the said measurements be taken on the head, the trunk, or the extremities. For the head, the length of the *tsun* is calculated as equal to the distance existing between the inner and the outer angle of the eye; for the trunk, it is equivalent to the eighth part of the horizontal line between the two breast nipples; and for the extremities, it is equal to the length of the second phalanx of the middle finger, measured with the joints bent.

There are twenty-six points of election upon which to carry out puncturing used as a remedy against toothache. There are also six other points of election for pains in the gums.

One would naturally be disposed to believe that these points of election would be situated in proximity to the teeth. Instead, many of them are situated in distant parts of the body—for example, in the elbow, in the hands, the feet, the vertebral region, the coccyx, and so on. However, about half of them are to be found in the labial, maxillary, and peri-auricular regions.

The puncturing of every point of election is almost always indicated for the cure of not only one but several, and, indeed, very often many, maladies; for example, the puncture carried out on the point of election, *kin-tche*, situated at the outer extremity of the bend of the elbow, may be utilized in more than twenty-five morbid conditions; among which are pains in the arm, paralysis of the arm, edema of the whole body, excessive perspiring, vomiting, hematemesis, toothache, boils, gastralgia, hemiplegia, and even cholera!

This mode of cure depends on the special relation of each point of election to the so-called canals of transmission and communication (named in Chinese *king*) through which the blood and the vital spirits circulate, and which serve at the same time to transmit the "innate heat" and "the radical moisture" to all parts of the body.

And here we must be allowed a brief digression in explanation of what we have just said.

The anatomical notions of the Chinese are very erroneous;[1] their

[1] See Bouillet, work quoted at p. 31.

ideas on the functions of the human body and of human life in general, differ considerably from ours. They recognize two natural principles of vitality, one they call *yang* (vital, primordial, or "innate heat"), the other *yn* (radical moisture). The spirits (that is the air) and the blood serve as vehicles to these two essential principles of life; that is, vital heat and radical moisture. The constant equilibrium, the accord, the perfect union of these two essential principles of life constitute a state of health. From their alteration, corruption, or disunion originate all diseases.

There are twelve principal sources of vitality in the human organism; that is, twelve organs from which the two aforesaid vital principles are distributed throughout the body: The heart, the liver, the two kidneys, the lungs, and the spleen are the seat and origin of radical moisture; the large and the small intestine, the two ureters, the gall-bladder, and the stomach are the seat and origin of vital heat. These twelve sources of life are in intimate relation with one another by means of the canals of communication, through which the blood and the vital spirits (air) circulate, carrying with them into every part of the body vital heat and radical moisture.[1]

The points of election upon which to carry out puncturing are situated along the course of the large lines of communication and transmission; and that explains, according to the Chinese medical theories, why a puncture carried out on a given point of the body can prove useful in relieving a variety of maladies even in distant parts of the organism.

Puncturing is almost always associated with cauterization, for after having drawn out the needle, it is usual to cauterize the site of the puncture with the so-called "*moxa*," that is, with a kind of vegetable wool obtained from the leaves and dried tips of the artemisia. One compresses this substance very tightly between the fingers into the shape of a small cone. One next applies a small coin with a hole in the centre upon the site of election; the cone of moxa is placed on the hole in the coin and lighted at its top. As the cone is very compact, it burns slowly enough, without developing excessive heat, so that, according to Ten Rhyne,[2] who was an enthusiast for this mode of cure, "the epidermis is drawn without violence and rises gently into a small blister. The moxa, whilst burning, draws out the *peccant humors* visibly, absorbing them in such a manner that they are totally consumed without destroying the skin itself."

The application of the moxa is not as painful as might be thought,

[1] Dabry, op. cit., p. x (introduction), pp. 1, 2, 4, 10, 11.

[2] This author wrote toward the end of the seventeenth century; one of his works is entitled De Acupunctura.

and even children support it without much crying. The number of times for repeating the operation varies according to the malady and the site of application, etc. Thus, in the point *kin-tche*, which we have mentioned once before, the cauterization is generally repeated seven times, but in certain cases the number may be brought up to 200.

There are certain points of election for which puncturing alone is prescribed without subsequent cauterization; in other instances, the puncturing is held to be unnecessary or even dangerous; one, therefore, only applies the moxa in these cases.[1]

In Japan, the moxa was still more in use than in China. According to Ten Rhyne, from the remotest times the moxa has been the best and almost the sole mode of treatment for illness in Japan, and was regarded not only as an excellent remedy, but also as an excellent preservative; so much so that even convicts condemned to perpetual imprisonment had permission to go out every six months to undergo this cure.

Dental affections also were especially treated with the moxa, and, judging by what Ten Rhyne says on the subject, it would seem that this caustic, when used against toothache, was usually applied in the region of the mental foramen.[2]

[1] Dabry, op. cit., p. 424.

[2] See Histoire de la Chirurgie depuis son origine, par MM. Dujardin et Peyrihle, Paris, 1774 to 1780.

Mŏxa 艾 (Japanese)

艾

Ngai 艾 moxa

CHAPTER IV.

CUSTOMS RELATING TO THE TEETH AMONG DIFFERENT PRIMITIVE PEOPLES.

JOSEPH MURPHY, in his book, *A Natural History of the Human Teeth*,[1] says that the natives of Hindostan, especially the Brahmins or priests of Brahma, take extreme care of their teeth. Every morning they rub them for about an hour with a small twig of the fig tree, at the same time that, turned toward the rising sun, they recite their prayers and invoke Heaven's blessing on themselves and their families. As this custom is prescribed in the most ancient codes and religious writings of India, it reverts, without doubt, to the remotest ages, and, therefore, demonstrates the great importance that this people, and particularly the Brahmin caste, has ever attributed to beauty and cleanliness of the teeth. Murphy affirms that the Brahmins, in general, have magnificent teeth; and that this depends, certainly in great part, on the assiduous and scrupulous care that they take of them.

From the writings of their ancient poets one also deduces in what high esteem the people of India held beautiful teeth, considering them one of the principal ornaments of the face. The lover, says Murphy, never neglected, in enumerating the beauties of his lady-love, to praise the whiteness and regularity of her teeth.

Among some of the people of India, when the second dentition is completed, it is customary to separate the teeth one from the other with a file; we do not know, however, whether this is done as an embellishment or with some other object—perhaps, as suggested by Joseph Linderer,[2] to prevent caries.

Anyhow, this and other customs in vogue in various parts of India and in many islands of Oceanica demonstrate that these peoples attribute great importance to the teeth.

The substituting of gold teeth for those missing has been in use in Java from exceedingly remote times.[3]

Dyeing the teeth black is considered a great embellishment among many races of Asia and Oceanica; this operation is sometimes preceded

[1] London, 1811.

[2] Die Zahnheilkunde, etc., 1851, p. 347.

[3] J. Bontii, De medicina Indorum, 1642, lib. iv.

by another, viz., the filling up of the interdental spaces very cleverly with gold leaf.[1]

In Sumatra and the neighboring islands many women file their teeth down to the gums; others file them into points; or partially remove the enamel so as to render it easier to apply the black dye; this being held to be the height of elegance. Men of high rank and condition dye their upper teeth black and cover the lower ones with fine gold plates, which in a full light produces what they consider a fine contrast. The natives of other islands gild the upper central incisors and dye the others black.[2]

In Japan, the married women may easily be distinguished from the others by their black and shining teeth. The coloring preparation they use to blacken the teeth is composed of urine, raspings of iron, and a substance called *saki*. This mixture has a most unpleasant odor, and if applied on the skin acts as a caustic. Its action on the teeth is so powerful that they do not regain their whiteness even after a lapse of years. In applying this substance, and also for some time after, the women take care to preserve their gums and lips from its effects, as it would otherwise cause them to assume a dark blue tint.[3] The inhabitants of the Pelew Islands make use of the wild thistle and shell chalk to blacken the teeth. It is also the custom to blacken the teeth among the inhabitants of Tonkin and Siam, the women of the Maria Islands, and the single ladies of Java.

Some of the peoples of Eastern India plane their teeth down to an even level; and from the habit of masticating areca nuts mixed with chalk and other substances, their lips and teeth are dyed red. At Macassar the natives have their teeth dyed red; they also substitute missing teeth by artificial ones made of gold, silver, or tombac.[4]

Negroes, especially those of Abyssinia, very often file their incisors into points to resemble the form of the canines; this is in order to give themselves an air of greater ferocity.

Murphy relates that the inhabitants of one of the islands of the Sound make an incision in the upper lip in a parallel line with the mouth, and large enough to allow the tongue to pass. After the margins have healed they have a great resemblance to the lips. This kind of artificial mouth is made to support a shell, carved in such a manner as to produce the effect of a row of teeth.

The natives of the Sandwich Islands sacrifice their front teeth to conciliate the favor of their god Eatoa.[5]

[1] Carabelli, Handbuch der Zahnheilkunde, 1844, i, 8.

[2] Linderer, op. cit.

[3] [The newer civilization of Japan has caused this custom to largely fall into disuse. —E. C. K.]

[4] Carabelli, loc. cit.

[5] Linderer, loc. cit.

Among the natives of New South Wales, it is the custom when a youth reaches virility to knock out his front teeth with a stone; this operation being carried out by the *kuradshis* or wizards.

The savages of Peru are also in the habit of making the front teeth fall out; the reason of the custom is that the space thus made is regarded by them as an embellishment.[1]

[1] Carabelli, op. cit., p. 17.

CHAPTER V.

THE GREEKS.

An ancient Greek physician—Asklepios, afterward called Æsculapius[1]—by the ability he displayed in the art of healing, so impressed the minds of the simple and uncultured at that primitive epoch as to be held in repute rather as a god than as a man. Not only was he held to be the author of wonderful cures, but it was also affirmed that he had resuscitated the dead; no doubt from his having in some case or other of apparent death restored the individual to consciousness by the assistance he rendered him. Exaggeration, so natural to ignorant minds, afterward did the rest, and magnified the healing and restoring powers of Æsculapius to such an extent that it is not to be wondered at that he should have been looked upon as a divine being. With the lapse of time, various traditions formed around his name, among which there was, however, finally such discrepancy that the popular voice spoke no more of one, but of many Æsculapii,[2] and to one of these was attributed, among other merits, that of having invented the probe and the art of bandaging wounds, while another was held to be the inventor of purgatives and of the extraction of teeth.

According, therefore, to these traditions, dental surgery had its origin with Æsculapius, the god of Medicine. But what was the precise epoch in which this benefactor of humanity lived?

We learn from Homer that two sons of Æsculapius, Machaon and Podalirius,[3] took special part, as doctors, in the siege of Troy. This celebrated siege, which lasted ten years, took place in the twelfth century before the Christian era (that is, 1193 to 1184 B.C.); admitting, therefore, the account of the parentage to be authentic, one may argue therefrom that Æsculapius must have lived between the twelfth and thirteenth centuries B.C. Many temples were built and dedicated to Æsculapius; these were called *asklepeia*, after the Greek form of his name. The priests were called *Asklepiadi*, and alleged their direct descent from Æsculapius himself.

[1] The Greek name Asklepios became in the Latin, Æsculapius; the two names are therefore equivalents.

[2] See Cicero, De Natura deorum, lib. iii, chap. xxii.

[3] [Homer speaks of them as "two excellent physicians," and refers to Machaon as "a blameless physician," and admits that "a medical man is equivalent to *many* others." Their renown was continued in a poem of Arctinus, wherein one was represented as without a rival in surgery, the other as sagacious in detecting morbid symptoms.—C. M.]

The temples of Æsculapius became so numerous in time that they were to be found in almost every Greek city. The most celebrated were those of Epidaurus, Cos, Cnydus, and Rhodes, as well as that of the great city of Agrigentum, in Sicily. The Asklepiadi not only performed the temple rites, but were doctors at the same time, for as interpreters of the wisdom of the god, they also occupied themselves in curing the sick. From this it resulted that these temples became in time, through observation and experience, schools of medical science.

But besides this sacerdotal medicine, there was also a lay medicine in Greece. Many great philosophers, especially Pythagoras, Alcmeon of Croton, Empedocles, Anaxagoras, and Democritus, occupied themselves with physiology, with hygiene, and with medicine; also the gymnasiarchs, or directors of gymnasiums, or schools of gymnastics, an art having for its end to increase physical strength and maintain health, cultivated medicine, particularly that part of it which concerns hygiene, dietetics, and surgery as applied to the treatment of violent lesions, such as fractures, luxations, etc.

The Asklepiadi often themselves imparted the principles of medicine to students outside their caste. Lay medicine thus gradually came to supplant sacerdotal medicine, especially after Hippocrates, who through his works, exercised a preponderant influence in the secularization of the science. However, the Asklepiadi, on their side, continued to practise medicine up to the time when the pagan temples fell into complete ruin, through the advance of Christianity.

On the columns of the asklepeia and on the votive tables were written the names of those cured by the god, together with indications regarding their various maladies and the treatment by virtue of which the sick had been restored to health.

Surgical instruments of proved utility were deposited in the temples. Celius Aurelianus makes mention of a leaden instrument used for the extraction of teeth (*plumbeum odontagogon*), which was exhibited in the temple of Apollo, at Delphi.

As a matter of fact, it would seem more natural that this instrument should have been shown in the temple of Æsculapius, he being the god of Medicine, and believed, besides, to be the inventor of dental extraction. One is rather inclined by this to think that the *odontagogon* may have been deposited in the temple of Apollo before the building of Æsculapian temples. Indeed, who can tell if Æsculapius himself, not yet deified, may not have deposited there a model of the instrument he had invented!

From the fact of the *odontagogon* in the temple of Apollo being made of lead, Erasistratus, Celius Aurelianus, and other ancient writers have drawn the deduction that it was only permissible to extract teeth when they were loose enough to be taken out with a leaden instrument. But

Serre[1] observes, not without reason, that if a tooth be so unsteady as to be able to be extracted with leaden pincers, this may just as well be done, and perhaps even better, by pinching the tooth between the fingers, no other aid being required than a handkerchief to prevent them from slipping. Avulsive pincers of lead would be, therefore, a nearly useless invention; so it is much more probable, as Serre remarks, that the original pincers were of iron, and that the inventor, reserving these for his own use, made a simple model of the same in lead (this being easier to do) and deposited it in the temple of Apollo, in order to make known the form of the instrument to contemporaries and to posterity, naturally supposing that whoever wished to copy it would understand of himself, or learn from the priests, that it was to be made of iron and not of lead.

FIG. 7



Portrayal of a dental operation on a vase of Phœnician origin, found in Crimea (see Cigrand, Rise, Fall, and Revival of Dental Prosthesis, pp. 60–63 and 287).

HIPPOCRATES. The sacerdotal and philosophical schools of medicine, as well as the gymnasiums, were the three great sources whence Hippocrates derived his first knowledge of medicine.

Hippocrates was born in the island of Cos, toward the year 460 B.C. He belonged to the sacerdotal caste of the Asklepiadi, and was, according to some of his earliest biographers, the nineteenth descendant of Æsculapius on his father's side, and the twentieth descendant of Hercules on his mother's side. The time of his death is even still more uncertain

[1] Praktische Darstellung aller Operationen der Zahnarznei-kunst, von Johann Jakob Joseph Serre, Berlin, pp. 7 to 13.

than that of his birth, for, according to some, he died at eighty-three, according to others, at eighty-five, at ninety, at one hundred and four, and even at one hundred and nine years of age.

Hippocrates was initiated in the study of medicine by his own father, Heraclides; but in the medical art he also had as a teacher the gymnasiarch Herodicus of Selymbria; besides, he studied eloquence under the sophist Gorgia and philosophy under the celebrated Democritus. He treasured up all the records of medical practice that were preserved in the temple of Cos; but according to some ancient authors he is said to have set fire afterward to this temple, and to have left his native country in order to flee from the resentment he had aroused. Probably it was the priests themselves who attributed the burning of the temple (which certainly took place at that time) to Hippocrates, out of jealousy for his growing fame; though it may also be possible that this great man, having first collected together all that was useful among the medical records that were to be found there, afterward courageously destroyed this centre of superstition, so that medicine, ceasing to be confused with imposture and being despoiled of the supernatural character attributed to it, which paralyzed its progress, should become a liberal and human art, based purely on the observation of clinical facts and the study of natural laws.

For a long time, Hippocrates travelled in various parts of Europe, Asia, and Africa, everywhere making valuable observations. He finally returned to his native country, where through the practice of medicine and by his immortal writings he acquired such esteem and veneration that his compatriots almost tributed him with divine honors after death.

Not all, however, of the works that make up the so-called collection of Hippocrates were really written by the father of medicine. Two of his sons—Thessalus and Draco—and his son-in-law Polybius also distinguished themselves by the practice of medicine and by their admirable writings, which together with those of other doctors of that period were erroneously included in the collection of Hippocrates' works. At any rate, the collection of Hippocrates faithfully represents the state of medicine and surgery at the epoch in which he and his disciples flourished, that is, toward the end of the fifth and during the fourth century before the Christian era.[1]

Neither Hippocrates nor others before him had ever dissected corpses; it is, therefore, not to be wondered at that the anatomical notions contained in the Hippocratic works should be scarce and very often inexact. The physiological notions also are highly deficient and imperfect, which is, indeed, very natural, for an exact knowledge of the functions of the human body presupposes an exact knowledge of the relative organs.

[1] Guardia, Histoire de la Médecine, p. 250.

The philosophical ideas of the time had considerable influence on the medical theories of Hippocrates and his successors. The universe was considered as constituted by four elements: earth, air, fire, water. To each of these elements a special quality was attributed, and, thus, one recognized four fundamental qualities, viz., cold, dryness, heat, and moisture. Man—the most perfect being—was regarded as a "microcosmos," or small world in himself, that is, a sort of compendium of the whole universe, and his organism, in correlation to the four primordial elements of the universe, was believed to be constituted of four fundamental humors—the blood, the pituita or mucus, the yellow bile, and the black bile or atrabile.

Health, says Hippocrates,[1] depends on the just relation one to another of these principles, as to composition, force, and quantity, and on their perfect mixture; instead, when one of the four principles is wanting or in excess, or separates itself from the other components of the organism, one has a diseased condition. In fact, he adds, if some one humor flow from the body in a measure superior to its superabundance, such a loss will occasion illness. If, then, the humor separated from the others collect in the interior of the body, not only the part that remains deprived of its presence will suffer, but also that into which the flow takes place and where the engorgement is produced.

We have here briefly stated these generalities in order to make ourselves clearly understood in speaking hereafter on different subjects, whether with regard to Hippocrates or to other authors of the time.

In the works of Hippocrates there is not one chapter that treats separately of the affections of the teeth, just as there is no book in which he speaks separately of diseases of the vascular or nervous systems, and so on. There are, nevertheless, a great number of passages scattered throughout the Hippocratic collection from which we can deduce very clearly the great importance that the Father of Medicine ascribed to the teeth and to their maladies.

In the book *De carnibus*, the formation of the teeth is spoken of among other things. It might have been supposed that Hippocrates would have been ignorant of the fact that the formation of the teeth commences in the intra-uterine life. This, however, is not the case; in fact, he says: "The first teeth are formed by the nourishment of the fetus in the womb, and after birth by the mother's milk. Those that come forth after these are shed are formed by food and drink. The shedding of the first teeth generally takes place at about seven years of age, those that come forth after this grow old with the man, unless some illness destroys them."[2]

[1] Hippocratis opera, Genevæ, 1657 to 1662, De natura hominis, p. 225.

[2] Page 251.

And a little farther on one reads: "From seven to fourteen the larger teeth come forth and all the others that substitute those derived from the nourishment of the fetus in the womb. In the fourth septennial period of life there appear in most people two teeth that are called wisdom teeth."[1]

There is a passage in this same book *De carnibus*, in which the great importance of the teeth for clear pronunciation of words is alluded to: "The body," says Hippocrates,[2] "attracts the air into itself; the air expelled through the void produces a sound, because the head resounds. The tongue articulates, and by its movements, coming into contact with the palate and the teeth, renders the sounds distinct."

The book *De dentitione* is written in the form of brief sentences or aphorisms, and speaks of the accidents that often accompany the eruption of the deciduous teeth. The most important passages in this short treatise are the following:

"Children who during dentition have their bowels frequently moved are less subject to convulsions than those who are constipated."

"Those who during dentition have a severe attack of fever rarely have convulsions."

"Those who during dentition do not get thinner and who are very drowsy run the risk of becoming subject to convulsions."

"On conditions of equality, those children who cut their teeth in the winter get over the teething period the best."

"Not all the children seized with convulsions during dentition succumb to these; many are saved."

"In the case of children who suffer with cough the period of dentition is prolonged, and they get thinner than the others when the teeth come forth."

In the third book of Aphorisms, where Hippocrates speaks of the illnesses that prevail in the various seasons of the year and in the various ages of life, mention is also made of the accidents of dentition. The twenty-fifth aphorism says: "At the time of dentition, children are subject to irritation of the gums, fevers, convulsions, diarrhea; this occurs principally at the time when the canines begin to come forth, and in children who are very fat or constipated."

The works of Hippocrates are nearly silent on the hygiene of the teeth; but in the second book, on the diseases of women,[3] some prescriptions are to be found against bad-smelling breath. We translate the passage integrally:

"When a woman's mouth smells and her gums are black and unhealthy, one burns, separately, the head of a hare, and three mice, after

[1] Page 252. [2] Page 253. [3] De morbis mulierum, lib. ii, p. 666

having taken out the intestines of two of them (not, however, the liver or the kidneys); one pounds in a stone mortar some marble or whitestone,[1] and passes it through a sieve; one then mixes equal parts of these ingredients and with this mixture one rubs the teeth and the interior of the mouth; afterward one rubs them again with greasy wool[2] and one washes the mouth with water. One soaks the dirty wool in honey and with it one rubs the teeth and the gums, inside and outside. One pounds dill and anise-seeds, two oboles of myrrh;[3] one immerses these substances in half a cotyle[4] of pure white wine; one then rinses the mouth with it, holding it in the mouth for some time; this is to be done frequently, and the mouth to be rinsed with the said preparation fasting and after each meal. It is an excellent thing to take small quantities of food of a very sustaining nature. The medicament described above cleans the teeth and gives them a sweet smell. It is known under the name of Indian medicament."

In the book *De affectionibus* there is a passage where it is said that inflammation of the gums is produced by accumulations of pituita, and that, in like cases, masticatories are of use, as these remedies favor the secretion of saliva, and thus tend to dissipate the engorgement caused by pituita.

Still more important, however, is the following passage of the same book:[5]

"In cases of toothache, if the tooth is decayed and loose it must be extracted. If it is neither decayed nor loose, but still painful, it is necessary to desiccate it by cauterizing. Masticatories also do good, as the pain derives from pituita insinuating itself under the roots of the teeth. Teeth are eroded and become decayed partly by pituita, and partly by food, when they are by nature weak and badly fixed in the gums."

Hippocrates, therefore, considers affections of the teeth to depend in part on natural dispositions, that is, on congenital weakness of the dental system, in part on accumulations of pituita, and the corroding action of the same. If a painful tooth were not loose, it was not to be extracted; but one was to have recourse to cauterization and to masticatories, intended the one and the other to dissipate the accumulation of pituita, believed by him to be the cause of toothache.

It is easily to be understood that as only loose teeth were to be extracted, Hippocrates considered the extraction of teeth a very easy opera-

[1] The use of carbonate of lime or chalk as a dentifrice evidently goes back to antiquity.

[2] Unwashed wool—that is, wool not cleansed of the fat secreted by the skins of the animals from whom it is taken—was much in use by the doctors of antiquity. One now obtains *lanolin* from it.

[3] The obole was about three-quarters of a gram.

[4] The cotyle was a little more than a quarter of a liter.

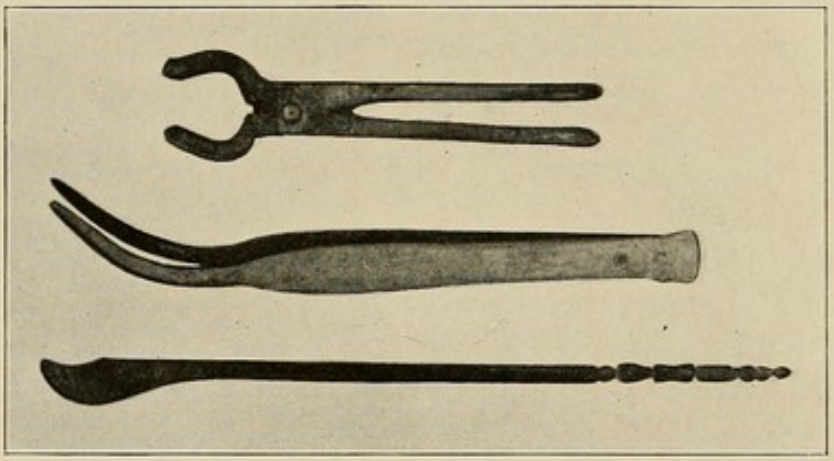
[5] Page 507.

tion, notwithstanding that the instruments then in use cannot have been other than very imperfect; and this is clearly to be seen from a passage in the book entitled *De medico*, where, after having spoken of the articles and instruments that ought to be kept in a doctor's office (*officina medici*), he adds:

"These are the instruments necessary to the doctor's operating room and in the handling of which the disciple should be exercised; as to the pincers for pulling out teeth, anyone can handle them, because evidently the manner in which they are to be used is simple."[1]

Having made mention of the *officina medici*, we think it opportune to explain here with some precision what is to be understood by this term.[2] Medicine and surgery were practised in ancient times in open shops; this was so in Greece, and later also in Rome. When the practice of

FIG. 8



Very ancient dental forceps and two other dental (?) instruments existing in the Archæological Museum of Athens.

medicine became secularized through its abandoning the Æsculapian temples, doctors' shops began to arise in the most important centres of population, to which those in need of assistance resorted or were carried. In time these stations for the practice of medicine, and particularly of surgery, became more and more numerous.

The Hippocratic collection contains a special treatise (*De officina medici*), which speaks of the conditions these places were expected to fulfil, the articles therein to be contained, the instruments, the general rules relative to operations, the bandages, etc.

About six hundred years later, Galen wrote three books of commentaries on this treatise of Hippocrates. He says, among other things,

[1] Page 21.

[2] See Daremberg, Dictionnaire des Antiquités Greques et Romaines, article "Chirurgie."

that the doctor's shop ought to be spacious and furnished with wide openings, to let in abundance of light. These medical stations to which the sick and infirm repaired in great numbers to ask advice, to undergo operations, or receive medical dressings, must have been of great importance, as is to be presumed from the cited books of Hippocrates and Galen.

The greatest doctors of antiquity practised the medical art in these places. It is also said that the great philosopher and naturalist, Aristotle, who came of a race of doctors, had inherited a doctor's shop of great value, but that notwithstanding this he refused to dedicate himself to the medical profession.

The doctors' shops were at the same time real pharmacies, where doctors prepared medicines, and where all the remedies then in use, either simple or compounded, were kept and sold to the public. Besides, there were to be found instruments of every kind and articles for medicating; and, therefore, bandages, compresses, lint, sponges, cupping glasses, cauteries, knives, bistouries, lancets, sounds, needles, hooks, pincers, files, saws, scrapers, splints, appliances for replacement of luxated bones, speculums, trepans, apparatus for fumigation, trusses, and a thousand things besides.

Naturally, dentistry was also practised in these shops, either by doctors who occupied themselves with dental maladies as with those of any other part of the body, or, later on, by individuals who dedicated themselves exclusively to this specialty.

Medicine and surgery were exercised, however, not only in doctors' shops, but also at the patients' houses, and it was Hippocrates who especially inaugurated clinical medicine—that is, the practice of visiting patients in their beds.

But we must not digress from our argument.

Many observations relative to the teeth are to be found in the seven books of Hippocrates on *Epidemics*. Unfortunately, the observations are not always given in clear and precise terms, which principally depends on the fact that these books consist for the most part of simple and most concise notes, written by Hippocrates on cases observed by him, and not intended for publication under such form, but rather constituting the material for further work.

Here is a passage from the fourth book on *Epidemics*, which reveals Hippocrates' extraordinary power of observation, for even teeth that had fallen out were minutely examined by him, to the end of acquiring precise ideas on the anatomical conformation of these organs, held by him to be of the highest importance.

"In the youth suffering from a phagedenic affection in the mouth, the lower teeth fell out, as well as the front upper ones, which left a cavity in the bone. The loss of a bone in the roof of the mouth causes

depression in the middle of the nose; the falling out of the upper front teeth sometimes causes a flattening of the point of the nose. The fifth teeth counting from the front ones had four roots (two of which were almost united to the two contiguous teeth), the points of which were all turned inward. Suppurations arising from the third tooth are more frequent than from any of the others; and the dense discharge from the nose and pains in the temples are specially owing to it. This tooth is more apt to decay than the others; but the fifth does so, as well. This tooth had a tubercle in the middle and two in the front; a small tubercle in the internal part, on the side of the other two, had first begun to decay.[1] The seventh tooth had only one large, sharp-pointed root. In the Athenian boy, there was pain in a lower tooth on the left, and in an upper one on the right. When the pain ceased, there was suppuration of the right ear."

This last fact—of the suppuration of the ear—is mentioned by Hippocrates not as a simple coincidence, but as a fact intimately connected with the cessation of the toothache. This may be argued from the general ideas of Hippocrates in regard to the beginning and the resolution of diseases. He considers a malady to be produced by a humor, which becomes localized in a given point of the body. The *crisis* gives exit to the peccant humor,[2] and the mode in which this is evacuated constitutes the *critical phenomenon;* the same may be represented either by a profuse perspiration, by abundant urine, by diarrhea, by vomiting, by expectoration, by bleeding or discharge of other humors from the nose, by the issuing of pus from the ear, and even by deposits on the teeth.[3] If by effect of *organic sympathies* the morbid humor, instead of being thrown outward, be transported into another region of the body, this constitutes the so-called *metastasis*.

The hints just given will serve to render some of the passages which we quote from the works of Hippocrates more intelligible.

In the fourth book on *Epidemics* we find among other clinical cases the following:

"Egesistratus had a suppuration near the eye. An abscess manifested itself near the last tooth; the eye directly got quite well; there was a dense discharge of pus from the nostrils; and small, rounded pieces of flesh were detached from the gums. It seemed as though a suppuration at the third tooth were going to take place, but it went back; and suddenly the jaw and the eye swelled up."[4]

And farther on one reads:

[1] The various editions here offer numerous variations, but the sense is everywhere obscure.

[2] See Bouillet, Précis d'Histoire de la Médecine, p. 94.

[3] On Epidemics, lib. ii, section i, p. 1002.

[4] De morbis vulgaribus, lib. iv, p. 1131.

"In Egesistratus the two last teeth were decayed in the parts where they touched one another. The last had two tuberosities above the gum, one on the decayed side, the other on the opposite side. In the part in which the two teeth were in contact with one another there were two roots in each, large and similar, and corresponding to those of the contiguous tooth; on the other side there was only a half root[1] and rounded."

Toward the end of the fourth book on *Epidemics*, we find repeated an observation which we have already noted:

"The third upper tooth is found to be decayed more frequently than all the others. Sometimes a suppuration is produced all around it."[2]

In the following passage mention is made of a mouth wash against toothache, the basis of which is castoreum and pepper:

"In consequence of a violent toothache the wife of Aspasius had her cheeks swollen up; but on making use of a mouth wash of castoreum and pepper she found great relief."[3]

A little after we find the practice of bleeding mentioned; and contemporarily an allusion to the use of alum—with regard to a painful swelling of the gums, that is to say, a gingivitis:

"Melisandrus suffered severe pain and swelling of the gums; he was bled in the arm. Egyptian alum, if used in this malady, arrests its development."[4]

Toward the commencement of the sixth book the following observation is registered:

"Among those individuals whose heads are long-shaped, some have thick necks, strong members and bones; others have strongly arched palates, their teeth are disposed irregularly, crowding one on the other, and they are molested by headache and otorrhea."[5]

While we should be tempted to attribute the knowledge of the relations between malformation of the skull, ogival palate, and bad arrangement of the teeth to quite modern studies, we are obliged to admit, and to our great surprise, that these relations were already noted, twenty-four centuries back, by the great physician of Cos.

In the seventh book on *Epidemics*, a case of scorbutus is described, where incense and a decoction of lentils proved useful against the lesions of the buccal cavity:

" . . . Large tubercles, of the size of grapes, had formed on the gums close to the teeth, black and livid, but not painful, except when the patient took food. For the mouth, incense powder mixed with some other ingredients proved useful. The internal use of the decoction of lentils also did good to the ulcers of the mouth."[6]

[1] That is a very short root.
[2] Page 1138.
[3] De morbis vulgaribus, lib. v, p. 1157.
[4] Page 1157.
[5] De morbis vulgaribus, lib. vi, section i, p. 1164.
[6] Ibid., vii, p. 1223.

In the same book there is a passage in which Hippocrates warns against the use of origanum, as harmful to the teeth and eyes:

"Origanum in drinks is harmful to affections of the eyes, and also to the teeth."[1]

Farther on a case of necrosis of the jaw is mentioned:

"Cardias, the son of Metrodorus, by reason of pains in the teeth was subject to mortification of the jaw. Excrescences of a fleshy kind formed on the gums, that grew most rapidly; the suppuration was moderate; the molars fell out and afterward the jaw itself."[2]

Some passages in the *Epidemics*,[3] and in other books of Hippocrates, even when not referring directly to pathological conditions of the teeth, are of value as demonstrating what importance the author attaches to the dental organs, and to the phenomena of which they may possibly become the site.

In establishing the diagnosis of a malady, he recommends searching for its point of departure; for example, if it has begun with a headache, an earache, a pain in the side, and adds, that in some cases the nature of the malady is revealed by the teeth, in some others by swelling of the glands.[4] The truth and importance of this observation are not to be doubted.

In fevers, Hippocrates considers it an unfavorable sign if there be a deposit of viscous matter on the teeth, especially when the patient keeps his mouth half open, that is, when he lies in a state of stupor.[5]

Other prognostics drawn from the teeth or the gums are the following:

"Grinding of the teeth in those who have not this habit when in full health, gives reason to fear a furious delirium and death; but if the patient, already delirious, presents this sign, it is an absolutely fatal one.[6] It is also a most unfavorable sign when the teeth get very dry."

"Necrosis of a tooth heals the abscess formed at the gum.[7] This is very easily explained by the fall of the tooth. But Hippocrates knew very well that the affection does not always take such a favorable course; he therefore adds, immediately after:

"In the case of necrosis of a tooth the supervening of a strong fever with delirium gives reason to fear a fatal exit. If, notwithstanding this,

[1] Page 1229.

[2] De morbis vulgaribus, lib. vii, p. 1238.

[3] The title of these seven books of Hippocrates might cause a false idea to be conceived. They do not precisely treat of epidemics in the sense given to the word in the present day; instead, they describe the maladies which predominated during four years, in successive periods of time, according with the variations of the atmospheric conditions. (See Litré, Introduction to the books on Epidemics.)

[4] De morbis vulgaribus, lib. iii, p. 1009; lib. vi, section iii, p. 1176.

[5] De morbis vulgaribus lib. iv, p. 1138; Aphorisms, lib. iv, No. 53, p. 1251.

[6] Coacæ prænotiones, No. 235, p. 157; Prædictorum, lib. i, No. 48, p. 71.

[7] Coacæ prænotiones, No. 236; p. 157.

the patient be saved, there will be suppuration and exfoliation of the bone."[1]

According to Hippocrates, "violent pains in the lower jaw give reason to fear a necrosis of the bone."[2]

"Gingival hemorrhage in cases of persistent diarrhea is an unfavorable symptom."[3] In fact, the easy and frequent occurring of hemorrhage of the gums may, in many cases, be an indication of profound alteration of the blood, a condition serious in itself, but still more so when associated with obstinate diarrhea.

In different parts of the books of Hippocrates, the influence of atmospheric conditions on the production of dental and gingival maladies is alluded to.

"Much inconvenience was caused to various persons at that period of time by swelling of the fauces, by inflammation of the tongue, by abscesses of the gums."[4]

"After the snow, there were west winds and light rains; colds in the head, with or without fever, were very frequent; in one of the patients, pains were produced in the teeth on the right side, and in the eye and eyebrow."[5]

In more than one of his books Hippocrates speaks of special dental or gingival symptoms, having their origin in different maladies, especially those of the spleen:

"In many who have enlargement of the spleen the gums become affected and the mouth has a bad smell."[6]

In another place we read:

"Among those persons who have an enlargement of the spleen, the bilious ones have a bad color, are subject to ulcerations of a bad nature, their breath is fetid, and they themselves are thin."[7] Finally, in the *Book on Internal Diseases*, Hippocrates describes different species of splenic maladies, to one of which he assigns the following symptoms:

"The belly becomes swollen, the spleen enlarged and hard, the patient suffers acute pain in it. The complexion of the individual is altered. A bad smell emanates from the ears. The gums are detached from the teeth and smell bad; the limbs wither, etc."[8]

The cases of splenic swellings spoken of by Hippocrates in the above passages must have been owing, without doubt, to grave cachectic conditions (among which, probably, scurvy); and we know that gingivitis, with all its possible consequences (among which expulsive periodontitis),

[1] Loc. cit., No. 237.
[2] Loc. cit., No. 239.
[3] Loc. cit., No. 241, p. 157; No. 648, p. 222.
[4] De morbis vulgaribus, lib. iii, p. 1083.
[5] Ibid., lib. iv, p. 1121.
[6] Prædictorum, lib. ii, p. 111.
[7] De affectionibus, p. 521.
[8] De internis affectionibus, p. 549.

is not only a constant symptom in scurvy, but is also frequent in all diseases attended by profound disorders of nutrition.[1]

Setting on edge of the teeth is counted by Hippocrates among the many symptoms to which a protracted leucorrhea may give rise:

"One should ask women who have been troubled for some time with a white flux whether they suffer from headache, pains in the kidneys and in the lower part of the belly, as well as setting on edge of the teeth, dimming of the sight, singing in the ears."[2]

Hippocrates had also observed that the phenomenon of setting the teeth on edge (*stupor dentium*) may be produced as well by acids in general, also by acid vomiting;[3] and that it may also be produced in many individuals by a strident sound.[4]

In the second book of *Epidemics* we find a proposition of the following tenor:

"Long-lived individuals have a greater number of teeth;"[5] which is as much as to say that "the having a greater number of teeth is a sign of longevity." This prejudice is to be found repeated by many authors subsequent to the epoch of Hippocrates, and among these by Aristotle and Pliny. Not even the greatest men are infallible; there is, therefore, no reason to be scandalized if Hippocrates should really have fallen into such an error. Anyhow, it should be observed that only the first and the third book on *Epidemics* are held to be really authentic, while the other five were probably compiled by other doctors of the school of Hippocrates who did not limit themselves merely to gathering together the many isolated notes and observations left in writing or derived from the oral teachings of their master, but took it upon themselves to introduce into the compilation something of their own besides. It is, therefore, anything but certain that the above-mentioned error is really to be attributed to Hippocrates.

The probable origin of this prejudice, which certainly originated among the people and was afterward accepted by the doctors, is easily to be guessed at. Individuals blessed with dental arches of remarkable beauty and perfection may sometimes convey the impression of having a greater number of teeth than others, for those two rows of regular white teeth, close to one another, strike the optic sense much more vividly than teeth of the ordinary kind. This impression is somewhat analogous, at least as regards color—to the optical illusion which causes a white circle to appear larger than a black one of equal diameter. Now, without doubt, individuals with a perfect denture are mostly healthy and well

[1] Paul Dubois, Aide-mémoire du chirurgien-dentiste, Paris, 1894, 2me partie, pp. 415, 416.

[2] Prædictorum, lib. ii, p. 108.

[3] De internis affectionibus, p. 534.

[4] De humoribus, p. 49.

[5] De morbis vulgaribus, lib. ii, section vi, p. 1050.

constituted, and, therefore, live longer, in general, than others. It is also to be noted that these people usually keep all their teeth to a more or less advanced age; and there is no doubt that among adults of the same age, those who have a less number of teeth, by reason of having lost several of them, are, in general, individuals whose organic constitutions are less good, whose health is less satisfactory, and who are, therefore, destined in all probability to live a shorter time than the others. It is, therefore, perfectly true, *but only in a certain and very limited sense* that "long-lived individuals have a greater number of teeth."

Geist-Jacobi, perhaps in order to dissipate the erroneous signification of the Hippocratic proposition cited above and to place in evidence that part of it which may be true, has thought well to translate it thus: "He who lives long keeps many teeth." But this translation does not render faithfully the idea expressed in the original Greek, *οἱ μακρόβιοι πλείους ὀδόντας ἔχουσιν* (literally, the long-lived have more teeth); a proposition that the most celebrated commentators of Hippocrates interpret in the sense given by us, and which Litré translates excellently well in these words: "*Avoir des dents en plus grand nombre est un signe de longévité.*"

Notwithstanding this prejudice, which survived vigorously for many centuries, the regular number of teeth was not unknown at the time of Hippocrates. This is to be perceived from a brief treatise of the Hippocratic collection, entitled *De hominis structura*, wherein is written:

"The teeth, together with the molars, are thirty-two."

Among the many and many counsels of practical value registered in the works of Hippocrates, the following deserves special mention:

"When a person has an ulcer of long duration on the margin of the tongue, one should examine the teeth on that side, to see if some one of them does not, by chance, present a sharp point."[1]

In fact, it not infrequently occurs that a lingual ulcer deriving from irritation produced by a broken or sharp tooth assumes a malignant aspect that causes it to be mistaken for a cancerous ulcer, and medical men may even be so far misled as to advise the extreme remedy of amputation of the tongue. If, however, the consulting surgeon has some experience, he will not neglect in the first place to examine accurately the state of the patient's teeth; it then mostly happens that after the removal of the offending tooth a complete cure is obtained in a brief space of time. How much anxiety would not such poor sufferers be spared if physicians in general were acquainted with the counsel given by Hippocrates twenty-four centuries ago!

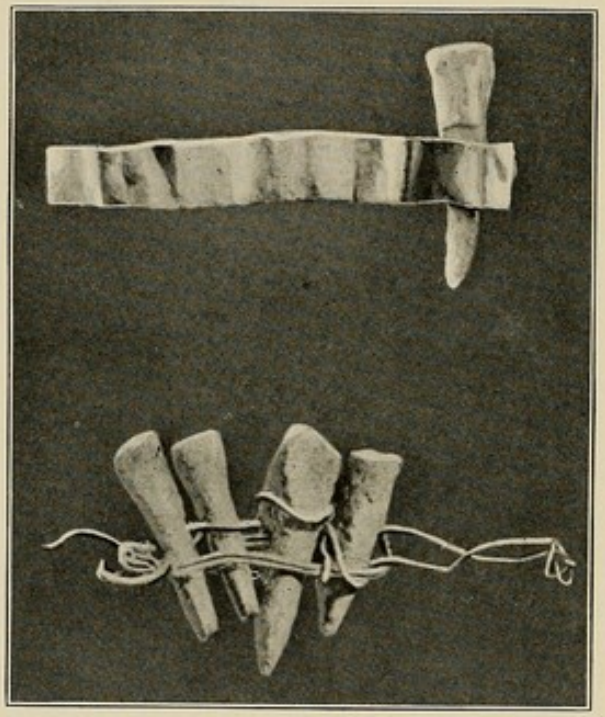
In speaking of fracture of the lower jaw, Hippocrates recommends binding the teeth next to the lesion together. He distinguishes between

[1] Prædictorum, lib. ii, p. 96.

the complete and the incomplete fracture; he then speaks separately of the fracture of the symphysis. Treating of the incomplete fracture, he says:

"If the teeth in proximity of the lesion be shaken, one ought, after having reduced the fracture, to bind them one to the other, until the consolidation of the bone, using preferably gold wire for the purpose; but if this be wanting, linen thread can be used instead, and not only ought the two teeth next to the site of the fracture to be bound, but several of the others besides."[1]

FIG. 9



Two Greek appliances existing in the Archæological Museum of Athens.

Farther on, when speaking of complete fractures, he renews this advice in these words:

"After having carried out the coaptation, the teeth ought, as we have said already, to be bound one to the other; this greatly contributes to obtaining the immobility of the fragments, particularly if properly carried out."[2]

Also, in cases of fracture of the symphysis, Hippocrates recommends "binding the teeth together on the right and left of the lesion." And after having spoken of the best adapted means of constraint in such kinds of fractures, he adds: "If the reduction has been well performed, and the part kept in proper repose, the consolidation takes place in a short time and the teeth do not undergo any damage; in the contrary case, the

[1] De articulis, p. 799.

[2] Loc. cit.

cure is retarded, the fragments reunite in a bad position, and the teeth are injured and become useless."[1]

From what we have referred, it is easy to perceive how much importance Hippocrates attached to the dental system, what knowledge he possessed as to the pathological conditions of the teeth, the gums, and the jaws, and what means of treatment he used. But in what relates to therapy it will perhaps not be useless to make some further observations.

One of Hippocrates' aphorisms says:

"Cold is the enemy of the bones, the teeth, the nerves, the brain, and the spinal marrow."[2]

From this it is easy to conclude that Hippocrates was no friend to hydrotherapic treatment, and that he considered the use of cold drinks bad for the teeth, and cold applications harmful in dental diseases.

The idea expressed in the aphorism just quoted is to be found repeated in the book entitled *On the Use of Liquids;*[3] and in this same treatise we find *vinegar* recommended shortly after in cases of *burning of the teeth* (an expression probably meant to indicate those pathological conditions of the teeth and gums which are accompanied by a sense of burning).

Some of the Hippocratic maxims, full of wisdom and good sense, will forever conserve their importance, whatever be the degree of perfection to which medical science may come.

"Diseases, says he, should be combated in their origin;"[4] which is as much as to say, that it is not enough to apply symptomatic or palliative means of cure, but that it is necessary, rather to seek and to combat the true causes of disease. And in another place we find written:

"One should take care of two things in illnesses—to do good and not to do harm. The art of curing includes three terms: the malady, the patient, and the doctor. The latter is the minister of the art; the patient has to combat the malady together with him."[5]

It is only too true, that not all the representatives of the healing art keep sufficiently in view the precept *to do good and not to do harm;* nor do all patients comport themselves in such a manner as to contribute, in accordance with Hippocrates' wise counsel, to the work of their own cure.

ARISTOTLE, the greatest philosopher of antiquity, was born at Stagira, in Macedonia, and lived from 384 to 322 B.C. He wrote most excellent works on all branches of human knowledge, and was the founder of Natural History and Comparative Anatomy. His acquaintance with anatomy as illustrated principally in his treatise *On the Different Parts of Animals*, is absolutely extraordinary for the time in which he lived.

[1] De articulis, p. 800.
[2] Aphorism, lib. v, No. 18, p. 1253.
[3] De liquidorum usu, p. 426.
[4] De locis in homine, p. 419.
[5] De morbis vulgaribus, lib. i, p. 948.

One chapter of this work[1] is altogether dedicated to the study of the teeth; but he also speaks of these organs in many other of his works, particularly in his *History of Animals*, which is a real and proper treatise on zoölogy, wherein the author records a great number of notes about the peculiarities presented by the dental system, in the different classes of animals.

In spite of the great errors into which he has fallen, his ideas about the teeth are, taken as a whole, quite worthy of attention, especially when one considers the remote epoch in which this great philosopher wrote. We will here give a brief notice of the most important of his observations relating to the dental organs.

The form, the disposition, the number of the teeth, varies in animals, according to the quality of their food and according to whether the teeth serve merely to divide and to chew the alimentary substances, or as instruments of offence and defence as well. In man, the teeth serve principally for mastication, but the front ones have, besides, another most important office, namely, that of assisting in the articulation of words, in the pronunciation of certain letters.

In those animals in which the teeth also serve as weapons, it is to be observed either that some of them protrude like those of the boar, or that they are sharp and saw-like in their disposition, as in the lion, the panther, the dog, etc. No animal possesses at the same time protruding and saw-like teeth.

The teeth are not always equal in number in both jaws; the animals provided with horns have no teeth in the front of the upper jaw; this, however, is also to be observed in animals without horns, as for example, in the camel. Among the animals provided with horns there are none which have protruding or saw-like teeth.

In general, the front teeth are pointed and the back ones broad. Nevertheless, all the teeth of the seal are pointed, with a saw-like disposition, perhaps because this animal marks the transition from the quadruped to the fish, all of which, with few exceptions, have their teeth formed in that way. Animals with saw-like teeth have generally very large mouths.

No animal has ever more than one row of teeth in each jaw; however, says Aristotle, if Ctesias[2] is to be believed, there is an animal in India, named marticora, which has a triple row of teeth.

The molar teeth are never changed either in man or in any known animal; the pig never changes its teeth.

One can judge the age of many animals by their teeth. As the animal

[1] De partibus animalium, lib. iii, cap. i.

[2] Ctesias, of Cnydus, wrote various works, somewhat earlier than Aristotle; one of which, the History of India, is very interesting, but also contains not a few fables.

grows older, the teeth become darker in color, except in the case of the horse, whose teeth grow whiter with age.

The last molars are cut by men and women about the twentieth year; but in some cases, and especially with women, they have been known to come forth—not without pain—very much later, even so late as at eighty years of age.

The man has more teeth than the woman; this peculiarity is also to be found in the female of some animals (such as sheep, goats, and pigs).

Individuals provided with many teeth generally live the longest, those instead who have fewer teeth (or simply far apart) are generally shorter lived.

The teeth are generated by the nourishment distributed in the jaw-bone; they are, in consequence, of the same nature as bones. Their surface, however, is very much harder than that of the bones. The teeth, contrarily to all other bones, grow throughout life, so as to provide for their wearing away through mastication; and for this reason they lengthen when the antagonizing teeth are wanting.[1]

The teeth differ from all the other bones, therein that they are generated after the body has been already constituted; they are, therefore, secondary formations; and precisely for this reason are able to be shed and to be renewed.

Some of the veins of the head, says Aristotle, terminate with very slender branches inside the teeth.[2]

The dental system of the monkey is altogether similar to that of man.

The molar teeth exist in viviparous quadrupeds as well as in man; in the oviparous quadrupeds and in fish they are wanting. They serve to grind food, a function in which the lateral movements of the inferior jaw have, in many animals, a large share. For this reason, in animals who have no molars, these lateral movements do not exist.

In birds, the beak takes the place of the lips and teeth; the substance of which it is formed is similar to that of the horn or the nails.

In those animals which, instead of having all the teeth sharp, are furnished with incisors, canines, and molars, these three species of teeth are disposed in the same order as in man.

The setting on edge of the teeth may be produced not only by eating acid things, but also simply by seeing them eaten. This sensation may be made to cease by the use of purslane and salt.

[1] This, as well as other errors of Aristotle, we shall find repeated throughout the lapse of centuries by many authors, Galen not excluded, who, in fact, by the authority of his name, gave them valid confirmation.

[2] The distinction between arteries and veins was, at that time, not yet well known, though we already find, in this passage of Aristotle, allusion made to the relations between the teeth and the bloodvessels.

In the book entitled *Problems*, many of which have reference to medical matters, one is to be found to the following effect:

"Why do figs, when they are soft and sweet, produce damage to the teeth?" Perhaps, answers Aristotle, because the viscous softness of the fig causes small particles of its pulp to adhere to the gums and insinuate themselves into the dental interstices, where they very easily become the cause of putrefactive processes. But, he adds, it may also be that harm is produced to the teeth by masticating the small hard grains of this fruit.

In Aristotle's *Mechanics*, the following question relative to the extraction of the teeth is discussed:

"Why do doctors extract teeth more easily by adding the weight of the odontagra (dental forceps) than by using the hand only? Can it be said that this occurs because the tooth escapes from the hand more easily than from the forceps? Ought not the irons to slip off the tooth more easily than the fingers, whose tips being soft can be applied around about the tooth much better? The dental forceps," adds Aristotle, "is formed by two levers, acting in contrary sense and having a single fulcrum represented by the commissure of the instrument. By means of this double lever it is much easier to move the tooth, but after having moved it, it is easier to extract it with the hand than with the instrument."

From this passage of Aristotle one may draw various conclusions. First of all, it appears that, at that time, the extraction of teeth was a common enough operation carried out by doctors in general, or, at least, by specialists not indicated by any particular denomination but called doctors (in Greek, *ιατροι*) just the same as those who dealt with the maladies of every other part of the body. If, therefore (which, however, is very doubtful), there existed in Greece, as there certainly did in Egypt, individuals who occupied themselves *exclusively* with the treatment of the teeth, they cannot have formed a distinct class of professionals, but merely a section of the medical class. Herodotus, too, as we have already seen, does not say, speaking of Egypt, that there was a proper class of dentists, but gives us to understand that the Egyptian doctors did not occupy themselves indiscriminately with the treatment of all maladies, for some dedicated themselves to curing the eyes, others to the treatment of maladies of the head, others to those of the teeth, and so on.

From the Aristotelian passage on the extraction of teeth, just quoted, it may be concluded that in those times the Hippocratic precept, that only loose teeth were to be extracted, was not observed, for otherwise, Aristotle could not have said that dental forceps are useful to loosen the teeth, but that after this has been done the extraction of the tooth may be more easily effected by means of the fingers than with the instrument.

This last assertion appears very strange. It demonstrates that either

the instruments then in use were very imperfect, or that Aristotle, although the son of a doctor and himself possessed of vast medical knowledge, had absolutely no experience as to the extraction of teeth; and, therefore, speaking theoretically, and without any practical basis, he ran into error, as even the greatest men are apt to do when drawing conclusions from purely theoretical reasonings.

From Aristotle to Galen, that is, for the space of five centuries, the anatomy of the dental system, so far as may be deduced from the writings preserved to us, made no sensible progress. But in respect to this, one must take into consideration some historical facts of capital importance. The school of medicine of Alexandria, which arose about three centuries before Christ, numbered among its most brilliant luminaries the celebrated doctors Herophilus and Erasistratus, who were the initiators of the dissection of human corpses,[1] thus giving a great impulse to anatomical research. It is, therefore, hardly admissible that these two great anatomists, who studied with profound attention even the most complicated internal organs, should have neglected the anatomy of the teeth. Unfortunately, however, not all the results of their researches have come down to us; nor is this to be wondered at, especially if we reflect on the large number of precious works entirely lost by the destruction of the celebrated library of Alexandria, A.D. 642.

When we come to speak of Archigenes, we shall see how he, in certain cases, advised trepanning the teeth. This would lead to the belief that in his times, viz., toward the end of the first century after Christ, the existence of the central cavity of the tooth was not ignored, and that, therefore, the structure of these organs had already been the object of study.

As to diseases of the teeth and their treatment, there is no doubt that Herophilus and Erasistratus must have occupied themselves with these subjects; and the same may be asserted of Heraclides of Tarentum, a celebrated doctor who lived in the third century before the Christian era. Indeed, we read in Cœlius Aurelianus,[2] that the record had come down through the works of Herophilus and Heraclides of Tarentum, of persons having died by the extraction of a tooth.[3] The same writer also alludes to a passage of Erasistratus, relating to the *odontagogon* already mentioned, which was exhibited in the temple of Apollo, and to the practical signifi-

[1] According to the testimony of Celsus, a very serious author and in every way worthy of belief, Herophilus and Erasistratus dissected not only corpses, but also living men, namely, malefactors consigned to them by the kings of Egypt, in order that they might make researches into the normal conditions of the organs during life, and their mode of functioning. See Cornel. Cels., De re medica, lib. i, Preface.

[2] Cœlii Aureliani de morbis acutis et chronicis, lib. viii, Amstelædami, 1755, Pars ii, lib. ii, cap. iv, De dolore dentium.

[3] Herophilus et Heraclides Tarentinus mori quosdam detractione dentis memoraverunt.

cation to be attributed to the fact of this instrument being of lead and not of hard metal. Now, if Herophilus, Heraclides of Tarentum, and Erasistratus all spoke of the serious peril to which the extraction of a tooth may give rise, and therefore recommended not having recourse to it too lightly, it is evident that they had given serious attention to this operation and consequently also to the morbid conditions that may render it necessary.

CHAPTER VI.

DENTAL ART AMONG THE ETRUSCANS.

Much earlier than the foundation of Rome (B.C. 753) there flourished in that part of Middle Italy today called Tuscany the highly civilized people known by the name of Etruscans or Toschi. Their political organization had the form of a confederation of twelve principal cities,[1] the federal capital being Tarquinii. The Etruscan people were industrious, intelligent, and artistic in the highest degree, possessing special skill in the decorative arts, splendid monuments, some of which still remain to us; they were fond of luxury in all its manifestations, and took great care of their persons; at the same time, however, they were a laborious and courageous race, not only most active and enterprising in agriculture, in art and commerce, but also brave warriors and hardy navigators.

In their long sea voyages the Etruscans frequently visited Egypt and Phœnicia, trading especially in the more flourishing cities, which were at that time Memphis in Egypt, and Tyre and Sidon in Phœnicia. On the other hand, the Phœnicians, who were also active merchants and navigators, not only visited Etruria and other regions of Italy very frequently, but also established numerous colonies in many islands of the Mediterranean, and especially in those nearer to Italy.

This continual intercourse between Etruscans, on the one side, and Egyptians and Phœnicians, on the other, accounts for the great influence exercised by the Egyptian and Phœnician civilization upon the later developed Etruscan culture—an influence manifesting itself very distinctly in the works of art of the latter, which often have an altogether Oriental character, and not seldom represent scenes drawn from the domestic life of the Egyptians and Phœnicians.[2]

As to what concerns dental art, everything leads up to the belief that it was practised by the Egyptians and Phœnicians earlier than by the Etruscans, whose civilization, as already hinted, is certainly less ancient. Nevertheless, in comparing the dental appliances found in the Etruscan tombs with the sole authentic dental appliance of Phœnician work-

[1] Arretium, Cære, Clusium, Cortona, Fæsulæ, Falerii, Pisæ, Russellæ, Tarquinii, Vetulonia, Volaterræ, Volsinii.

[2] Deneffe, La prothèse dentaire dans l'antiquité, p. 51.

manship known at the present day,[1] we cannot but be struck with the great superiority of the Etruscan appliances. It is therefore probable

FIG. 10

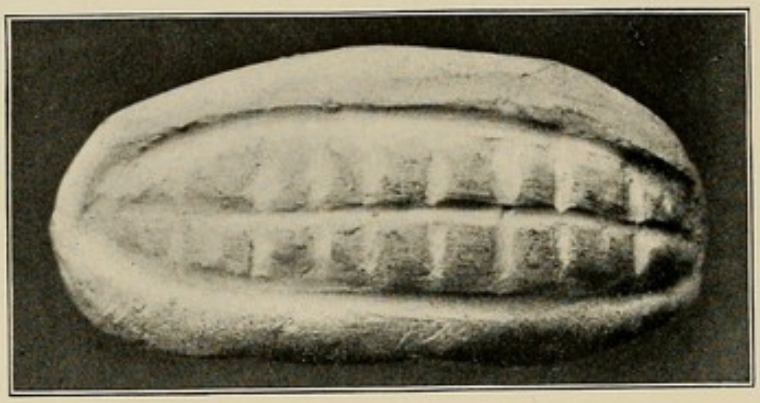


FIG. 11

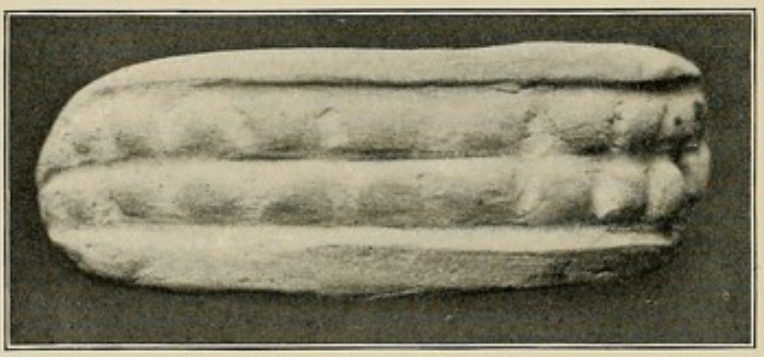
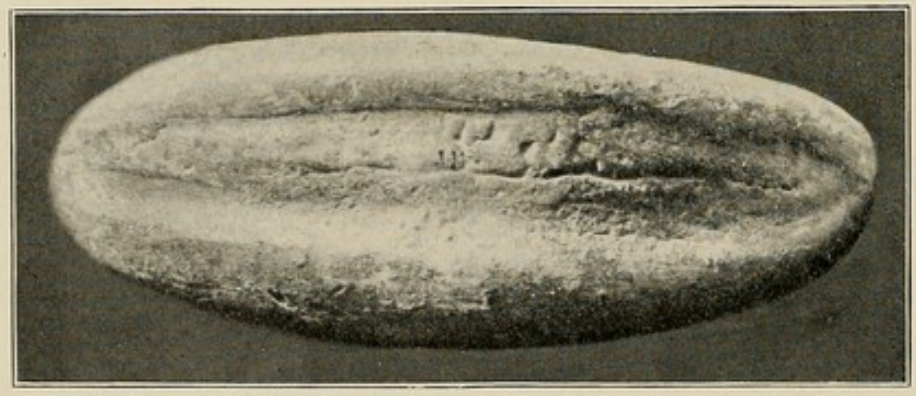


FIG. 12



Dentures in terra-cotta, such as the Etruscans used to present to their divinities as votive offerings in order to be cured, or after having been cured of dental maladies.

[1] Dr. Cigrand in his book The Rise, Fall, and Revival of Dental Prosthesis, after having spoken of the Phœnician dental appliance described in Renan's work, adds: "There are scores of specimens of Phœnician dental art in home collections and also at the Columbian World's Fair." However, until these specimens of Phœnician dental art are described and their origin is exactly known, their authenticity will always remain a matter of doubt. [Cigrand is in error. The specimens he speaks of were mainly imagined.—W. H. TRUEMAN.]

that the Etruscans, although they had learned the dental art from the Egyptians and Phœnicians, had subsequently carried it to a much higher degree of perfection than it had arrived at in Egypt or in Phœnicia. An analogous fact has come to pass in our own times. Dental art in America, which emanated from the French and English schools, soon took on so vigorous a development as indisputably to acquire first rank.

Before describing in detail the dental appliances found up to now in Etruscan tombs, we will consider a question touching very closely upon the argument which we are treating and which has already been discussed in Professor Deneffe's book, already cited.

How is it that the dental appliances of the Phœnicians, Greeks, Etruscans, and Romans should have come down to us, notwithstanding cremation?

In the first place, if one reflects that the teeth offer an altogether special resistance to the action of fire, and if one also remembers that gold was the substance employed for the construction of the appliances in question, and that this metal does not melt save at a very high temperature, it no longer appears marvellous if, in many cases at least, the dental appliances should have been able to resist the cremating process.

In the second place, the cremation may possibly sometimes have been incomplete—that is to say, the skeleton may not have been altogether reduced to ashes; therefore, among the residuum of this incomplete combustion, a piece of a jaw may easily have remained, and incidentally also its prosthetic appliance.

But besides all this, it must be considered that the custom of burning corpses was not at all general among ancient people. Indeed, cremation was not in use either among the Egyptians, the Phœnicians, the Hebrews, or the Chinese; the Greeks only resorted to it in exceptional cases. The most ancient tombs of the Etruscans show that at the epoch of their settling in Italy, cremation was in general use among them. But little by little, as they entered into commercial relations with the Egyptian, the Phœnician, and the Greek peoples, who did not burn their dead, the custom of burial substituted that of cremation. Toward the end of the sixth century before Christ there were to be found in southern Etruria, one beside the other, tombs for the burial of corpses and others for cremation.

One sometimes finds in one and the same tomb a cinerarium (urn for conserving ashes) and skeletons enclosed in sarcophagi or resting on mortuary couches.

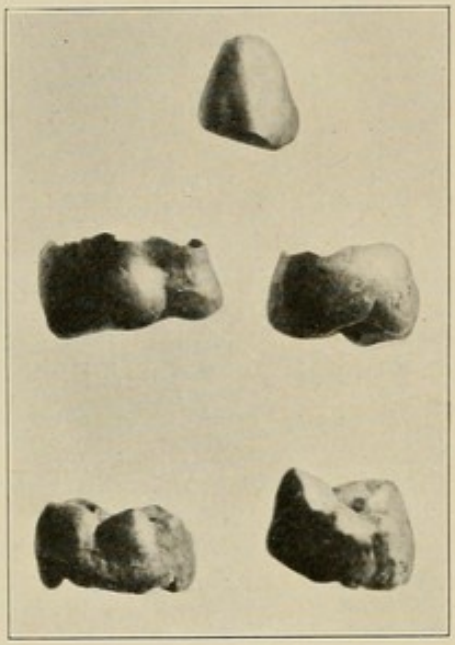
At Tarquinii and Orvieto burial generally prevails.

In the fifth century B.C., the epoch in which the Law of the Twelve Tables was promulgated, burial and cremation were equally in use among the Romans. In the second century of the Christian era burial

was already prevalent, and through the influence of Christianity became general during the third and fourth centuries.[1]

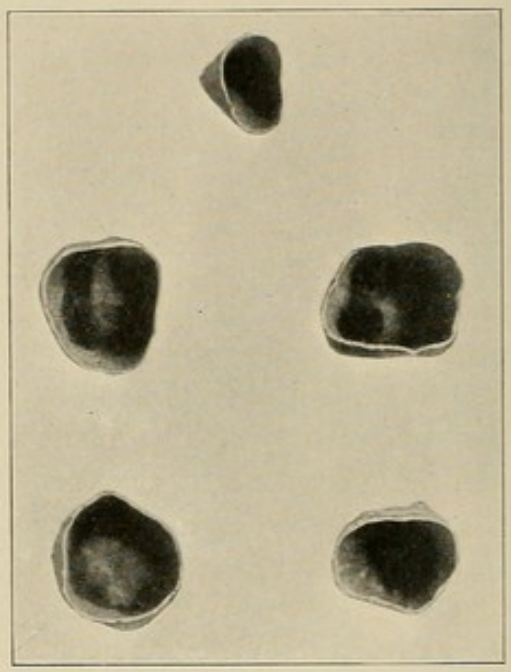
Notwithstanding cremation, which certainly must have destroyed a great number of the dental appliances of that time, and in spite of the many different destructive agents which successively did their work on those human remains during so many centuries, not a few prosthetic

FIG. 13



Tooth crowns found in an Etruscan tomb of the ancient Vitulonia (Archæological Museum of Florence). The enamel-capsules of these teeth (four molars and one canine) are perfectly well preserved, whilst the ivory has entirely disappeared.

FIG. 14



The same tooth-crowns of the preceding figure, seen from the side of the concavity of the enamel capsules.

pieces of Etruscan workmanship have come down to us; from which we may argue that dental prosthesis was not an exceptional fact among this people, as some may perhaps suppose, but, on the contrary, must have been a very usual practice.

The dental appliances discovered up to now among Etruscan remains are preserved in different Italian museums, with the exception of some few existing in private collections or of others that have passed out of Italy into other countries.

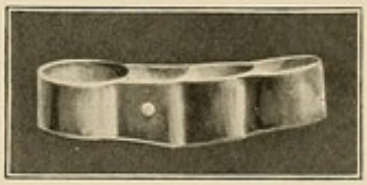
In the museum of Pope Julius in Rome there is a dental appliance found at Valsiarosa in one of the many Etruscan tombs excavated in that locality near Civita Castellana, the ancient Falerii (Fig. 15). This

[1] Deneffe, op. cit., pp. 60, 61.

appliance is formed by a series of four gold rings meant to encircle four teeth (canine, bicuspids, and first molar). The third ring is traversed by a pivot riveted at the two extremities, which was meant to hold fast an artificial tooth (the second bicuspid); this is wanting, however. One naturally puts the question, How is the disappearance of this tooth to be accounted for, it having been traversed by the pivot, which is still found in its place? The suppositions are two: Either the artificial tooth was made of some not very durable material, which, in the course of time, became reduced to powder or fell to pieces, or may have been destroyed in some other way; or else the artificial tooth, instead of being simply perforated to allow the pivot to pass through, was cleft longitudinally at its base and, being introduced into the ring sat, so to speak, astride the pivot. In the second case, which, however, seems to me the less probable of the two, the tooth may merely have come off the pivot and gotten lost.

In the Civic Museum of Corneto, the ancient Tarquinii, there are two dental appliances, one of which (Figs. 16 and 17) is of the greatest interest. It was found in one of the most ancient tombs in the necropolis of Tarquinii. This specimen of prosthesis is formed of three teeth; the two upper central incisors and the second bicuspid on the left, which is no longer in existence.

FIG. 15



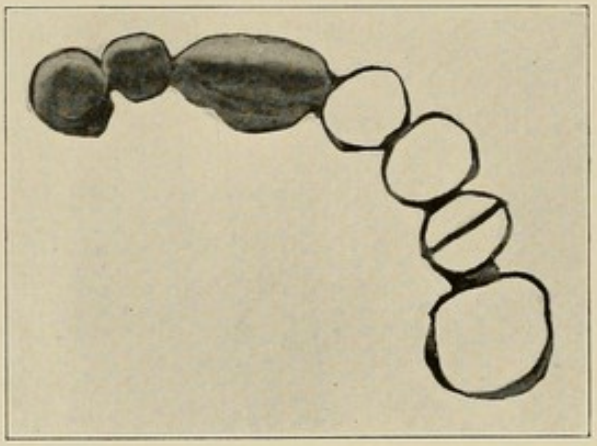
Etruscan appliance found at Valsiarosa, destined to support an artificial bicuspid, now disappeared.

To afford support and maintain the three artificial teeth in position, the Etruscan dentist of about three thousand years ago, ingeniously made use of the canine and the lateral incisor on the right, the canine, the first bicuspid, and the first molar on the left, connecting them by a continuous series of pure gold rings soldered together. The dentist had not employed human teeth to replace the incisors which the individual had lost; according to the religious laws of the time, the dead were held sacred, and it would probably have been considered sacrilege to use their teeth; or it may also be that the patient had declared his aversion to the idea of substituting his own teeth by those of a dead man. However this may be, the Etruscan dentist thought well to repace the missing incisors with a somewhat large ox tooth; upon this he had made a groove, so as to give it the appearance of two teeth. In reality this ox tooth occupies the place not only of the two middle incisors, but also of the lateral incisor on the left. Perhaps by a natural anomaly the individual

may never have had this tooth; or, more probably still, some length of time may have elapsed between the loss of one of the three and the other two, so that when he made up his mind to have recourse to a prosthetic appliance, the space normally occupied by the three incisors was already notably diminished, and the void could therefore be filled by an ox tooth so adjusted as to represent only two teeth.

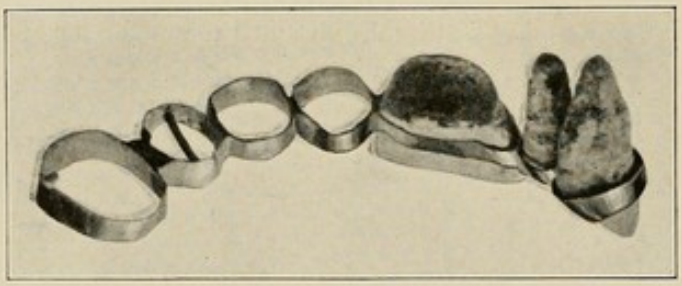
When I was intrusted with the reproduction of all the ancient prosthetic pieces existing in the Italian museums, I met with special difficulty in the reproduction of the above-mentioned piece; and this because I

FIG. 16



Etruscan appliance for supporting three artificial teeth, two of which were made of one ox tooth. (Civic Museum of Corneto).

FIG. 17



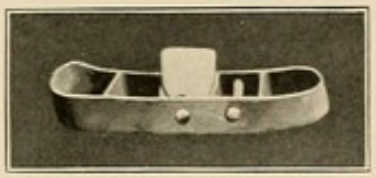
The same appliance reversed.

could not succeed in procuring an ox tooth that was not worn away by the effects of mastication. The idea then occurred to me of sectioning the upper jaw of a calf at about the age of the second dentition, and taking out the teeth, which were already strong and well formed, but not yet deteriorated by mastication. I fancy my Etruscan colleague must have done the same three thousand years ago, when he carried out the prosthesis in question, for the large tooth employed by him does not show any signs of being worn by mastication.

This large tooth is solidly fixed by means of two pivots to the gold band

that encircles it. Another pivot served to fix the second bicuspid, also artificial. This tooth, as already stated, has now disappeared, but the pivot that fixed it to its ring is still in its place. In carrying out this prosthesis the dentist has contrived the series of rings that support the teeth in such a manner that they remained above the gum, and thus the harmful effects of contact and of the pressure of an extraneous body was avoided. At the same time, this arrangement, by distancing the rings from the dental neck that narrows off conically, added to the firmness of the prosthesis.

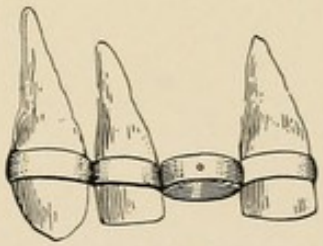
FIG. 18



Etruscan appliance for supporting two inserted human teeth, one of which is now wanting. (Civic Museum of Corneto.)

Another dental appliance (Fig. 18) which is in the custody of the Civic Museum of Corneto, was also found in a very old Etruscan tomb. It is formed by two bands of rolled gold; one of these is labial, the other lingual, and they are soldered together at their extremities, forming by the help of four partitions, also of gold, five square spaces. Three of these served for the reception of the natural teeth supporting the prosthesis; the other two maintained, by means of pivots, two inserted human teeth; one of these is lost; the other is still in its place, solidly fixed by its pivot. These inserted human teeth, by the religious laws we

FIG. 19



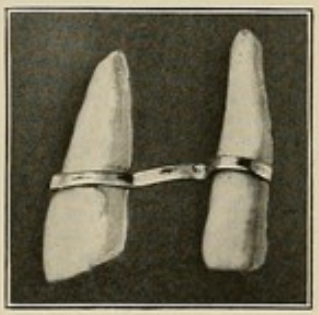
Etruscan appliance supporting one inserted tooth (upper middle incisor on the right) which is now disappeared. (Museum of the Conte Bruschi at Corneto.)

have before mentioned, could not have been taken from corpses; probably they belonged to the person himself, and having fallen out through alveolitis, had been reapplied in the manner described above.

Two Etruscan dental appliances are to be found in the Museum of the Conte Bruschi at Corneto: one is similar to those already described, and the other, instead, is of a special kind. The first (Fig. 19) is formed

by a series of four rings, embracing the upper canine on the right and the three neighboring incisors. It was destined to support a single inserted tooth, the middle incisor on the right; this has disappeared, while the pivot by which it was fixed to the ring is still there, as well as the three natural teeth that afforded support to the appliance.

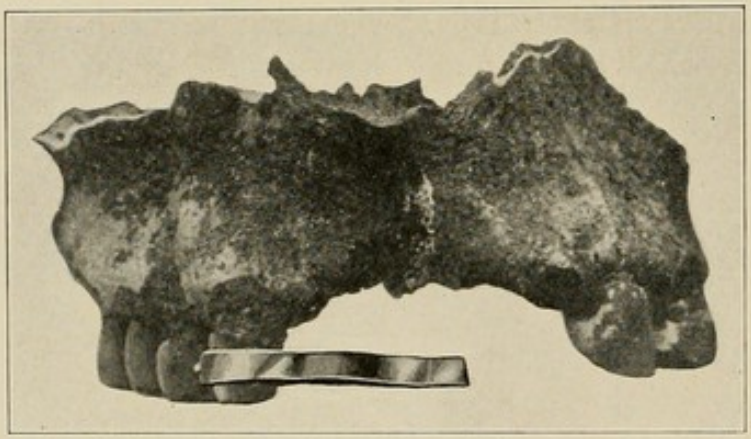
FIG. 20



Etruscan appliance intended to avoid the bad effects of convergence, or, perhaps, to support a purely ornamental artificial substitute. (Museum of Conte Bruschi at Corneto.)

The other appliance (Fig. 20) is formed by two rings; the one surrounds the left upper canine, the other the left middle incisor. Between these two rings there is not the usual ring crossed by a pivot, but simply a small horizontal bar of gold soldered to the two rings. I suppose that the person not liking to wear false teeth (one meets with this repugnance

FIG. 21



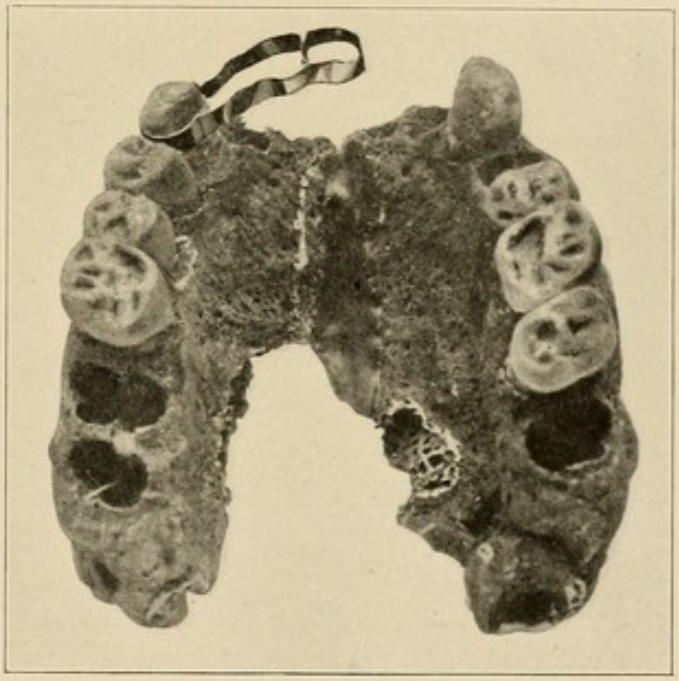
Dental appliance still adhering to the jaw, discovered in an Etruscan necropolis near Orvieto, and now in the possession of the Ghent University.

also at the present day), the dentist has limited himself to putting a horizontal bar of gold between the two teeth on either side of the missing one, in order to maintain them in their normal position and so avoid the bad effects of convergence.

Another ancient dental appliance discovered in an Etruscan necropolis near Orvieto is now in the possession of the Ghent University, to which

it was sold.[1] It still adheres to a piece of upper jaw (Fig. 21), in which there are four teeth on each side, that is, on the right, the canine, the two bicuspids, and the first molar; on the left, the canine, the second bicuspid, and the two first molars. The alveoli of the four incisors are of normal width and depth, this signifying that these teeth remained in their places until the end of life. The dental appliance, still supported by this fragment of a jaw, is made of the purest gold. It is composed of a small band curved back upon itself, the ends being soldered together, and, by the aid of two partitions, also of pure gold, it forms three compartments, two small lateral ones, and one centre one of double the size. The lateral compartment on the right contains the canine of the same side; that on

FIG. 22



The same piece as in the preceding figure, seen from the palatal side.

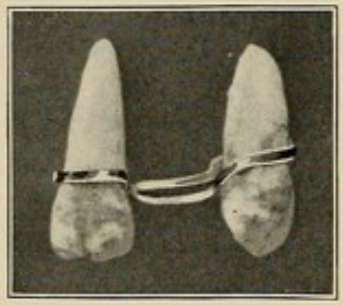
the left must have contained the left central incisor, that has now disappeared, while the large central compartment must evidently have contained the two incisors on the right side. As there is no pivot in the whole appliance, and as the alveoli are not obliterated, there can be no doubt that the appliance was simply destined to prevent the loss of the two right incisors by keeping them steady.

It is to be noted, with regard to the Etruscan dental appliances above described, that the gold bands of which they were constructed covered a considerable part of the dental crown, so that these prosthetic appliances certainly could not have had the pretension of escaping the notice of

[1] Deneffe, op. cit., p. 63.

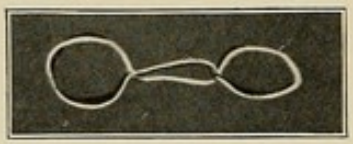
others, they being, on the contrary, most visible. It is in consequence to be surmised that in those times the wearing of false teeth and other kinds of dental appliance was not a thing to be ashamed of; indeed, that it rather constituted a luxury, a sort of refinement only accessible to persons of means. Besides this, as the gold in which these works were carried out was of the purest quality and in consequence very soft, the appliances would not have possessed sufficient solidity if the softness of the pure gold had not been counteracted by the width and thickness of the bands or strips.

FIG. 23



Etruscan appliance (found in 1865 in a tomb by Cervetri), destined perhaps to support a purely ornamental artificial substitute. (Belonging to Castellani's collection, Rome.)

FIG. 24



A reproduction of the gold piece forming the appliance seen in Fig. 23.

In those of the Etruscan appliances destined for the application of inserted teeth, the gum was not made to support the prosthesis, and did not, therefore, suffer any compression from the extraneous body, this resting entirely, like a bridge, upon the neighboring teeth. From which it may be seen that twenty-five centuries and more before our time the Etruscans dentists already practised a system of bridge work, and, relatively to the age, carried it out with sufficient ability.

CHAPTER VII.

THE ROMANS.

For many centuries the Romans, according to the saying of Pliny, lived entirely "without doctors, although not without medicine;"[1] that is, there existed without doubt a popular medicine and also a sacerdotal medicine, but still there were no persons whose exclusive occupation it was to cure disease.

The medical art, properly so called, was introduced into Rome by the Greeks. The first Greek doctor who went to Rome was Archagathus (in the year 535 after the foundation of the city, that is, 218 years before Christ). His arrival was at first welcomed, so much so that he was made a Roman citizen and a shop bought for him in the Acilian square, at the expense of the State. However, his popularity was of brief duration. Being an intrepid operator, the use and abuse he made of steel and fire gained for him the not very honorable qualification of the butcher, and he soon became the horror of all the population.

But it appears that dentistry had begun to be practised in Rome prior to the coming of Archagathus, that is, long before the medical profession existed. We have the clear proof of this in the Law of the Twelve Tables, wherein we find mention made of teeth bound with gold. The Law of the Twelve Tables was written in Rome 450 years before Christ, by a body of ten magistrates (*decemviri*) expressly named for that purpose, as up to that time no written law had existed.

As gold was at that time somewhat scarce, and fears were entertained that it would become still scarcer (to the great damage of the State) by reason of the custom that prevailed among the wealthy of burning or burying gold articles with the corpses to honor the memory of the deceased, or, rather, to satisfy the pride of the survivors, it was thought necessary to prohibit this abuse by a special disposition of the law referring to funeral pomps. This disposition was thus formulated: "*Neve aurum addito, ast quoi auro dentes iuncti escunt (sunt) im cum illo sepelirei vrive sine fraude esto;*"[2] that is, "Neither shall gold be added thereto

[1] Plinius, lib. xxix, cap. v.

[2] This article forms part of the tenth table. The Law of the Twelve Tables was lost, but citations and passages are to be found in Cicero and in the works of other Roman jurisconsults, and by the aid of these it has been possible to reconstruct, at least in part, this very ancient code of laws. See Dionysii Gothofredi, Corpus juris civilis. Amstelodami, 1663; and also Thesaurus juris romani cum prefat. Ottonis, Tome iii, Trajecti ad Rhenum, 1733.

(to the corpse); but it shall not be unlawful to bury or to burn it with the gold with which the teeth may perchance be bound together."

From this it results that at the time when the Law of the Twelve Tables was written, that is, four centuries and a half before the Christian era, there were already individuals in Rome who practised dental operations. And these individuals cannot have been medical men, as at that epoch (corresponding pretty nearly with the date of Hippocrates' birth) Rome had as yet no doctors.

The inquiry naturally suggests itself whether the gold mentioned in the legal dispositions above cited was used for fixing artificial teeth or simply for strengthening unsteady natural teeth. Some authors, Serre among them,[1] have pronounced in favor of the first hypothesis, others, as, for example, Geist-Jacobi,[2] are rather disposed to accept the second. In truth, however, we do not possess sufficient historical data to definitely resolve this problem. I myself am rather of opinion that artificial teeth were already in use in Rome, as they were, even before this time, among the Etruscans. Indeed, if we take into consideration the priority of the Etruscan civilization to the Roman and the relations of vicinity existing between Etruria and the Roman State, of which it afterward became a part, it is even possible that dental prosthesis was first practised in Rome by Etruscans.

In a Greek-Roman necropolis near Teano (Province of Caserta, Italy) there was found in February, 1907, a prosthetic piece of a very peculiar construction, and which may be considered as quite unique in its kind. It is an appliance destined to support three inserted human teeth (the two lower central incisors and the lateral incisor on the right). These teeth—lost perhaps by the patient himself, in consequence of alveolar pyorrhea—were fixed by means of a system of rings, made of laminated gold wire, turned around the teeth and then soldered.

By the examination of the piece it is easy to argue that the author of this prosthesis made at first three separate rings by tightly turning the laminated gold wire around each of the three teeth to be applied, and by soldering together the ends of the wire forming each ring, after having taken away the tooth, in order not to spoil it in making the soldering. Then, with another laminated gold wire of sufficient length, he soldered the three rings together in due position, put the appliance in the mouth and turned the two ends of the wire around the sound teeth, serving as a support for the lateral incisor on the left and the two canines. After this, he took the apparatus delicately out of the mouth, made the soldering necessary for finishing the skeleton of the apparatus, forcibly

[1] Josef Serre, Zahnarznei kunst, Berlin, 1804, p. 6.

[2] Geist-Jacobi, Geschichte der Zahnheilkunde, p. 26.

put the three teeth in their respective rings again, and applied the prosthesis.

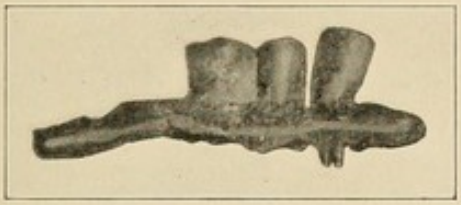
This ingenious appliance was found still adherent to the mandible of a skeleton, in a tomb which, according to the eminent archæologist Dalli Osso, belongs to a period comprised between the third and the fourth century before Christ.

From the nature of the objects found in the tomb near the skeleton (a necklace, perfume vessels, etc.) it was quite evident that the skeleton bearing the above-described prosthesis was that of a woman.

As the said appliance was found in South Italy (the ancient "Magna Græcia") it is quite probable that it was made by some dentist of the Greek colonies.

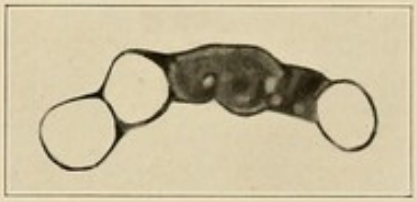
The above apparatus belongs to the archeological collection of Signor Luigi Nobile, in Teano, in whose possession it was found.

FIG. 25



Seen from behind.

FIG. 26



Seen from above.

A prosthetic piece of very peculiar construction (see description), found in 1907 near Teano, Italy.

The Romans, as well as the Hebrews, and other peoples of antiquity, attributed great importance to the integrity of the dental system. This may be deduced with certainty from another article in the Law of the Twelve Tables (Table VII, at the rubric *De delictis*), which says: "*Qui dentem ex gingiva excusserit libero homini, trecentis assibus multator, qui servo C L.*" (Whoever shall cause the tooth of a free man to fall shall pay a fine of three hundred *as*, and for that of a slave one hundred and fifty.) The *as* was worth about ten cents American money, so that the first fine amounted to about thirty dollars and the second to about fifteen dollars. These sums, because of the difference in the monetary value in those times, were considered heavy fines.

After the Romans had conquered Greece (146 B.C.) a very great number of Greek doctors went to Rome. The wealth, luxury, and ever-increasing corruption of the metropolis caused the practice of the medical art (which was almost entirely in the hands of the Greeks) to become a great source of lucre. But an art practised with the sole purpose of making money soon degenerates to the level of a trade; it is, therefore, hardly to be

wondered at if very few doctors of that epoch have merited being recorded in history.

Among these few, the name Asclepiades (born at Prusa, in Asia Minor; died in Rome ninety-six years B.C.) shines with particular lustre. He was the founder of the "methodic school," whose curative precepts, largely based upon hygiene, come nearer to those of modern scientific medicine. Unfortunately, all the writings of this great physician, whose name is almost as glorious as that of Hippocrates, have been lost; we do not know, therefore, whether and in how far he contributed to the development of our specialty.

But one of the first places in the history of dental art is due without doubt to Cornelius Celsus, of whom we will now speak.

CORNELIUS CELSUS. The historical researches in regard to the life of this celebrated author have given but meagre results. It is uncertain whether his birthplace was Rome or Verona. The precise dates of his birth and death are also unknown; but it is very probable that he was born about thirty years before Christ, and that he died during the fifth decade of the first century.

Aulus Cornelius Celsus belonged to the illustrious patrician family of the Cornelii. He was a man of great erudition, and wrote on the most varied subjects, and among others, on agriculture, on rhetoric, on the art of warfare, on medicine, etc. All these writings, however, are lost to us excepting his excellent treatise on medicine.

Some historians consider that Celsus was a true doctor by profession; others, instead, hold that he never undertook the cure of the sick. Neither the one nor the other of these opinions is quite acceptable; and it is much more likely, as Daremberg observes in his valuable *Histoire des Sciences Médicales*, that Celsus was one of those philiatri mentioned by Galen, who had studied medicine rather from books than at the bedside of the sick, but who, although not doctors by profession, in case of necessity, put their knowledge and skill into practice on behalf of their relations and friends.[1]

The work of Celsus, gathered in great part from Greek authors, has an especial value, because it sums up, in an admirable manner, the whole of the medical and surgical science of the ancients, from the earliest times up to the days of Augustus.

The first book of the work *De Medicina*[2] does not contain anything of great importance in regard to dentistry. The following hygienic precept is, however, worthy of note: "After rising, if it be not winter, the mouth should be rinsed with a quantity of fresh water." In regard to

[1] See note, p. 15, Hist. Relations of Medicine and Surgery, Allbutt. (C. M.)

[2] A. Corn. Celsi de Medicina libri octo, Patavii, MDCCXXII.

the hygiene of the mouth, nothing more is found in the work of Celsus; and it is also necessary to note that the aforesaid precept forms part of a chapter, in which he speaks of the rules of life, which must be observed by weak people, to which class—the author remarks—belong a greater part of the inhabitants of cities and almost all literary men. According to Celsus, therefore, perfectly healthy and strong people would not even need to wash their mouths with fresh water, and perhaps the keen-witted Roman doctor was not wrong; for it is very probable that the saliva and mucous secretion of the mouth, in perfectly healthy individuals with normal constitutions, have the power of combating the pathogenic germs that produce caries and other diseases of the teeth and mouth. In this way the fact can be explained of many peasants and the greater part of the individuals of the negro race having such good teeth, without possessing even the remotest idea of what hygiene of the mouth may be. And here I venture to refer to a passage in which Celsus alludes to the relation between diseases and civilization with its vices: "It is probable that in ancient times, although there was but little knowledge of medicine, health was for the most part well preserved; this being due to good habits, not yet spoiled by intemperance and idleness. These two vices, first in Greece and then among us, have brought upon us a very host of evils; whence it is that in our days, in spite of the intricate art of medicine —once not necessary to us, as it is not necessary to other peoples—few among us attain the beginning of old age."[1]

In the second book, speaking of the various kinds of disease to which the different periods of life are subject, he writes: "Children are especially subject to serpiginous ulcers of the mouth, called by the Greeks aphthæ. . . . There are also infirmities due to dentition, such as ulceration of the gums, convulsions, fever, looseness of the bowels; and it is especially the eruption of the canine teeth which produces these disturbances. To these, however, very fat children are more particularly liable, and those, also, who have costive bowels."

In Chapter XXV of the fifth book we find the receipt for a narcotic drug, recommended by the author for producing sleep in persons tormented with odontalgic and other pains. This receipt is very complicated, being composed of ten ingredients, among which are acorns, castoreum, cinnamon, poppy, mandrake, and pepper.

Most important for our subject is Chapter IX, of the sixth book, where the author treats of odontalgia. "In toothache, which may be numbered among the worst of tortures, the patient," says Celsus, "must abstain entirely from wine, and at first, even from food; afterward, he may partake of soft food, but very sparingly, so as not to irritate the teeth by mastica-

[1] Celsus, lib. i, Preface.

tion. Meanwhile by means of a sponge he must let the steam of hot water reach the affected part, and apply externally, on the side corresponding with the pain, a cerate of cypress or of iris, upon which he must then place some wool and keep the head well covered up. But when the pain is violent, the use of purgatives is very beneficial, the application of hot cataplasms on the cheek, and the keeping in the mouth of some hot liquid, prepared with fitting medicine, changing this liquid, however, very frequently. For this purpose the root of cinquefoil may be boiled in wine, or that of hyoscyamus (henbane), or a poppy-head, seedless and not too dry, or the root of the mandrake. But in regard to the last three remedies, one must be careful not to swallow the decoction whilst it is kept in the mouth. For the same purpose one may boil the bark of the root of the white poplar in wine, or the scrapings off a stag's horn in vinegar or figs in mulse[1] or in vinegar and honey. It is useful also to pass repeatedly around the tooth the end of a probe which has first been wrapped around with wool and then dipped in hot oil. It is customary also to apply around the tooth certain remedies, after the manner of plasters. For this purpose the inside of the peel of dried, bitter pomegranates may be pounded with equal quantities of gall-nut and pine bark; to these must be added a little minium[2] and the whole mixed together with the addition of rain water to form a paste; or else a similar paste may be formed with equal parts of panax,[3] poppy, peucedanum,[4] and taminia grape[5] without stones; or with three parts of galbanum to one of poppy. On the cheek, however, must be applied at the same time the cerate spoken of above, covered over with wool."

Celsus then speaks of a revulsive adopted, in his times, against odontalgia. It was composed of myrrh and cardamom, *ana* one part; saffron, pyrethrum, figs, pepper, *ana* four parts; mustard seed, eight parts. The plaster, spread on linen, was to be applied on the shoulder corresponding to the side of the pain, and, according as this was situated in a tooth of the upper or lower jaw, the revulsive was applied on the back of the shoulder, or in front.

When a tooth is decayed, Celsus advises that there should be no haste in drawing it; but that the pain be combated, if the above medicines are not sufficient, with others more energetic. A mixture may, for example

[1] Wine with honey.

[2] [*Minium* is an ancient name for red oxide of lead; it was also applied to mercuric sulphide or vermilion, and the term vermilion was also used as a designation for *granum tinctorum* or *kermes*, the *coccus ilicis*, a variety of cochineal extolled by Galen for its medicinal properties. The exact nature of the meaning of minium in this connection is not altogether clear.—E. C. K.]

[3] A species of herb (all-heal).

[4] Peucedanum officinale, hog's fennel.

[5] A species of wild grape thus called because it is red like minium (vermilion).

be applied to the tooth, composed of one part of poppy, two of pepper, and ten of sory,[1] pounded and mixed to a paste with galbanum; or else, especially in the case of a molar tooth, the remedy of Menemacus, resulting from saffron, one part; cardamom, soot from incense, figs, pepper, pyrethrum, *ana* four parts; mustard seed, eight parts; or even a more complicated remedy made with pyrethrum, pepper, and elaterium,[2] *ana* one part; scissile alum,[3] poppy, taminia grape, crude sulphur, bitumen, laurel berries, mustard seed, *ana* two parts.

"If, says Celsus, the pain renders necessary the removal of the tooth, this may be made to fall to pieces, by introducing into the cavity a pepper berry without its skin, or a berry of ivy, pared in the same way. The same result may be obtained in the following manner: The sharp bone (aculeus) of that flat fish called by the Greeks trygon and by us pastinaca, must first be roasted and then reduced to powder and mixed with resin, so as to form a paste; which applied around the tooth will make it fall out. Likewise, scissile alum induces the fall of the tooth, when introduced into its hollow. This substance, however, is best introduced into the small cavity, after being wrapped around with a tuft of wool, for thus the pain is soothed and the tooth preserved."

Somewhat curious is the following passage, in which Celsus speaks of the superiority of a method of cure used by peasants, compared to the remedies advised by the doctors. From his words we clearly see that he, as we have already remarked, did not belong to the class of doctors properly so called.

"These are the remedies accepted and held in account among the doctors. But it is known through the experience of peasants, that when a tooth aches one must pluck up wild mint by the roots, put it into a large vessel, pour water on it, and make the patient sit near it, covered all around with a blanket; and red hot stones should then be thrown into the water, so that they be entirely immersed; and then the patient, wrapped all around, as we have said before, and keeping his mouth open, receives into it the steam evaporated from the water. Thus profuse perspiration is induced, and a great quantity of pituita flows from the mouth, and with this a cure is obtained for a very long period, often for more than a year."

In the six following chapters of the sixth book, Celsus treats of the diseases which affect the soft parts of the mouth. Against tonsillitis, he recommends, among other things, the application of a remedy principally made of the juice of the sweet pomegranate, cooked, by a slow fire,

[1] Species of mineral. [An impure copper sulphide.—E. C. K.]

[2] Condensed juice of the seeds of the momordica elaterium, a bitter, irritating, and drastic substance.

[3] According to De Giorgi (Sinonimia chimico-farmacotecnica, Milan, 1889), scissile alum is one of the many names for blue vitriol or sulphate of copper.

to the consistency of honey. The same remedy is also of great value, according to the author, for the cure of ulcers of the mouth, when they are accompanied by inflammation, and are somewhat foul and of a reddish color. But under such circumstances it will also be necessary to keep frequently in the mouth an astringent decoction, to which a little honey has been added. The exercise of walking is also profitable, as well as the taking of food that is not acid. When, however, the ulcers begin to be clean, the mouth should be frequently filled with a softening liquid or even with simple pure water. It is also helpful to drink genuine wine and to eat rather freely, avoiding, however, acid food. The ulcers must be sprinkled with a powder composed of two parts of scissile alum to three of unripe gall-nuts. If, however, the ulcers are already covered with a scab similar to those produced on burns, some of those compositions should be used which are called by the Greeks *antheræ;* for example, a remedy may be formed of equal parts of cyperus,[1] myrrh, sandarac, and alum; or another which contains saffron, myrrh, *ana* two parts; iris, scissile alum, sandarac, *ana* four parts; cyperus, eight parts.

"Much more dangerous, says Celsus, are those ulcers of the mouth which the Greeks call *aphthæ;* they oftentimes lead to death in children; in adult men and women, however, there is not the same danger. These ulcers begin in the gums; then they attack the palate and the whole of the mouth, and finally extend to the uvula and to the fauces; when these parts are attacked, it is not very likely that a child will recover."

As to the ulcers of the tongue, Celsus says that those which are situated at the borders of this organ last a very long time, and he adds: "It should be seen whether there may not be some sharp tooth opposite, which hinders the ulcer from healing; in case such a tooth exists, it should have its edge taken off with a file."

He then passes on to speak of the diseases of the gums: "Often small painful tumors, called by the Greeks *parulides*, are produced on the gums. It is necessary at the very first to rub them softly with powdered salt, or with a mixture of burnt mineral salt, cyperus, and catmint, meanwhile keeping the mouth open until there flows from it a good quantity of pituita; after which the mouth must be rinsed with a decoction of lentils. But if the inflammation is great, the same remedies must be used as are adopted for the ulcers in the mouth, and between the tooth and the gum must be inserted a small tent of soft lint, on which has been smeared some one of those compositions which we have said are called *antheræ*. If this, owing to the hardness of the tumor, is not possible, then by means of a sponge the steam of hot water should be made to act

[1] [The *cyperus rotundus*, recommended by Dioscorides in the treatment of ulcers in the mouth. Esteemed also by the Arab medical writers Serapion, Avicenna, and Rhazes. Not the cypress, *cupressus sempervirens*.—E. C. K.]

upon the diseased part, and, besides, an emollient cerate must be applied upon it.

"Should suppuration show itself, it will be necessary to use the above-mentioned steam for a longer period; to keep in the mouth hot mulse, in which some figs have been cooked, and to lance the tumor before it is perfectly ripe, so that the pus may not, by remaining too long in the diseased part, injure the bone. But if the tumor be of great size, it will be more advisable to remove it entirely, so that the tooth remain free on both sides. After the pus has been extracted, if the wound be a small one, it is sufficient to keep hot water in the mouth, and to use externally fomentations of steam, as mentioned above; if it be large, it will be fitting to use the decoction of lentils and the same remedies with which all other ulcers of the mouth are cured.

"It also happens, sometimes, that from an ulcer of the gums—whether it follow a parulis or not—one may have for a long period a discharge of pus, on account of a broken or rotten tooth, or else on account of a disease of the bone; in this case there very often exists a fistula. Then the latter must be opened, the tooth extracted, and if any bony fragment exist, this should be removed; and if there be anything else diseased, this should be scraped away. Afterward, the same remedies which have been indicated for the other ulcers of the mouth must be used.

"If the gums separate from the teeth, it will be useful, in this case also, to employ those remedies called *antheræ*. But it is also beneficial to chew unripe pears and apples and to keep their juices in the mouth. Equal advantage can be derived from keeping vinegar in the mouth, provided it be not too strong.

"Whenever ulcers of the mouth are attacked by gangrene, it is necessary first to consider whether the whole body be unhealthy, and in that case, to do what is necessary to strengthen it. When the gangrenous ulcer is superficial, the use of *antheræ* is sufficient; when it is somewhat deeper, a mixture must be applied on it, of two parts of burnt paper[1] to one of orpiment;[2] when it is very deep, three parts of burnt paper to a fourth part of orpiment must be used; or else, equal parts of roasted salt and roasted iris; or lastly, equal parts of chalcites, lime, and orpiment. It is, however, necessary to dip a small pledget of lint in oil of roses, and put it on the caustic medicinals, so that these may not injure the neighboring healthy parts. If the disease is in the gums, and some of the teeth are loose, it is necessary to pull them out, for they greatly hinder the cure. When this latter, however, cannot be obtained by drugs, the ulcer must be cauterized with a red-hot iron."

[1] Here is meant the paper made of papyrus and called in Latin charta.

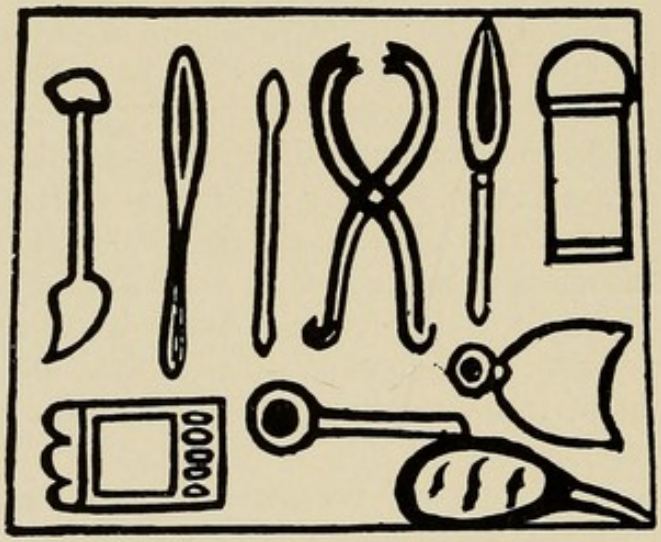
[2] Trisulphide of arsenic.

Chapter XII of the seventh book is, of all the work of Celsus, the one which presents to us the greatest interest, since there the author treats of the surgical operations required by the diseases of the dental apparatus.

He first speaks of the looseness of the teeth, caused by the weakness of their roots, or by the flaccidity of the gums, and says that in these cases it is necessary to touch the gums lightly with a red-hot iron, then to smear them with honey and wash them with mulse, and later on to strengthen them by means of astringent substances.

"When a tooth aches, and it is thought well to extract it, because medicaments are of no use, the gum must be detached all around, and then the tooth must be shaken until it is well loosened, it being very dangerous to draw a firm tooth, as this may sometimes give rise to a dislocation of the lower jaw. And greater still is the danger in regard to the upper

FIG. 27



Dental and surgical instruments represented in a funeral marble of the Lateran Museum, Rome.

teeth, as this might cause a shock to the temples and eyes. After having well loosened the tooth, it must be pulled out by the fingers, if this is possible; or if not, with the forceps."

It is clear that this method of tooth drawing—so excessively cautious and timid—must have been very torturing to the poor patients. A thousand years and more after Celsus, Abulcasis still counsels the same exaggerated precautions, and says that the extraction of a tooth must not be performed in a rapid and violent way after the manner of the barbers. From this one may see that the operation spoken of was then very often performed by certain unprofessional persons, who, being very familiar with it, carried it out with great indifference and rapidity, thus sparing the patients the long-protracted martyrdom which the erudite doctors, followers of Celsus, thought necessary to make them endure. Very probably the same happened in the days of the wise Roman doctor.

When there is a large carious hollow in the tooth to be extracted, Celsus recommends that it should first be filled up either with lint or with lead, in order to prevent the tooth from breaking under the pressure of the instrument. "The latter," he continues, "must be made to act in a straight direction, in order to avoid fracture of the bone. The danger of fracture is still greater in the case of short teeth; often the forceps, not being able to grasp the tooth well, takes hold of the bone with it and fractures the latter. When after the extraction of a tooth much blood flows from the wound, this indicates that some part of the bone has been broken. It is necessary then to search for the detached piece of bone with the probe and to extract it with the forceps. If this be not successful, an incision must be made in the gums just as large as is necessary for the extraction of the fragment. When this is not taken out, it often happens that the jaw swells in such a manner as to prevent the patient from opening his mouth. In such a case it is necessary to apply to the cheek a hot cataplasm of flour and figs, so as to induce suppuration, after which the gums must be lanced and the splinter of bone extracted."

When the teeth show blackish stains, Celsus advises such stains to be scraped away, and the teeth afterward to be rubbed with a mixture of pounded rose leaves, gall-nuts, and myrrh, and the mouth to be frequently washed with pure wine. It is necessary besides, says the author, to keep the head well covered, to walk a great deal, and to partake of no acid food.

"If by effect of a blow or other accident some of the teeth become loose, it is necessary to bind them with gold wire to the neighboring firm teeth, and besides to keep in the mouth astringent substances, for example, wine in which the rind of pomegranates has been boiled, or into which some burning hot gall-nuts have been thrown."

"When in a child a permanent tooth appears before the fall of the milk tooth, it is necessary to dissect the gum all around the latter and extract it; the other tooth must then be pushed with the finger, day by day, toward the place that was occupied by the one extracted; and this is to be done until it has firmly reached its right position."

"Now and again it happens that when a tooth is pulled out its root remains in the socket; it is then necessary to extract it at once, with the forceps adapted for the purpose, called by the Greeks *rizagra*."

The last book of the work of Celsus treats chiefly of fractures and dislocations. In the first chapter the position and form of the bones of the whole human body are described, although not very exactly. Speaking of the teeth, the author says: "The teeth are harder than the bones, and are fixed, some on the *maxilla* (lower jaw) and some on the overhanging bone of the cheeks."[1]

[1] Celsus did not know of the upper maxillary bones as distinct bones. The same may be said of the other bones of the head. Celsus speaks of the osseous sutures and openings, but not of the different bones of the skull and face.

"The first four teeth, being cutting teeth (incisors), are called by the Greeks *tomici*. These are flanked on both sides by one canine. Beyond this there ordinarily exist, on both sides, five grinders, except in the case of those persons in whom the last molars, which commonly are cut very late, have not yet appeared. The incisors and the canines are fixed with one single root; but the molars at least with two, some even with three or four. In general, the shorter the tooth, so much the longer is its root. A straight tooth commonly has a straight root, a curved tooth has it generally curved. The root of a temporary tooth produces in children a new tooth, which usually pushes out the first; sometimes, however, the new tooth appears either above or below it."

In the seventh chapter Celsus treats of fractures in general, but in particular of those of the lower jaw.

"To reduce a fracture of this bone, it should be pressed in a proper manner, from the inside of the mouth and from the outside, with the forefinger and thumb of both hands. Then in the case of a transverse fracture (in which case generally an unevenness in the level of the teeth is produced), it is necessary, after having set the fragments in place, to tie together the two teeth nearest to the fracture with a silk thread, or else, if these are loose, the following ones. After this, one should apply externally, on the part corresponding to the lesion, a thick compress, dipped in wine and oil and sprinkled with flour and powdered olibanum. This compress is to be fixed by a bandage or by a strip of soft leather, with a longitudinal slit in the middle to embrace the chin, the two ends being tied together above the head. The patient must fast the first two days; then he may be nourished with liquid food, but in small quantities, abstaining, however, completely from wine. On the third day it is necessary to take off the apparatus, and after having fomented the part with the steam of hot water, to replace it. The same is to be done on the fifth day, and so on, until the inflammation has subsided, which generally happens from the seventh to the ninth day. After the symptoms of inflammation have vanished, the patient may take abundant nourishment; he must, however, abstain from chewing until the fracture is completely consolidated; and, therefore, he will continue to nourish himself with soups and like food. He must also entirely abstain from speaking, especially during the first few days. Fractures of the jaw commonly heal from the fourteenth to the twenty-first day.

"In luxations of the jaw (Chapter XII) the bone is always displaced forward; but sometimes only on one side, and sometimes on both sides. When the dislocation is only on one side, the chin and the whole jaw are found deviated toward the part opposite to the luxation; and the similar teeth of the two dental arches do not correspond; but instead under the upper incisors will be found the canine tooth of the dislocated

part. If, however, the luxation is bilateral, the chin inclines and projects forward; the lower teeth are farther in front than the upper ones, and the muscles of the temples are tightly stretched. The reduction of the luxation must be performed as quickly as possible. The patient having been made to sit down, an assistant holds the head firmly from behind; or else the patient is made to sit with his shoulders against a wall, with a hard cushion between this and his head, whilst the assistant holds the head against the cushion, and so keeps it steady. Then the operator, after wrapping his two thumbs in linen cloth or strips, that they may not slip, introduces them into the patient's mouth and, applying the other fingers on the outside, firmly grasps the jaw. Then whilst lowering the back part of the latter, he shakes the chin and pushes it upward and backward, seeking to shut the mouth, and in this way making the jaw return to its natural position.

"The bone having been replaced, if the accident should have given rise to pains in the eyes and neck, it will be well to draw blood from the arm. After the luxation has been reduced, the patient must be nourished for some time on liquid food, and abstain, as much as possible, from speaking."

Caius Plinius Secundus. After Celsus, a very celebrated writer on medicine and natural science was Caius Plinius Secundus. He was born at Como in the year 23 of the Christian era, and flourished from the days of Nero to those of Vespasian. Endowed with a liberal education, he gave himself up to public life, filling many important posts, among which, that of Governor of Spain under Nero and his successors. In the year 79 after Christ, while he was in command of the Roman fleet at Misenum, the tremendous eruption of Vesuvius took place, by which Pompeii, Herculaneum, and other neighboring cities were destroyed. Pliny, driven by the desire to study that marvellous and awful natural phenomenon, betook himself to Stabia, but was there suffocated by the ashes and smoke erupted by Vesuvius.

In spite of the many places occupied by him, Pliny found time to write many works, and among these the thirty-seven books on *Natural History*, which have given him eternal fame.

It is not at all to be wondered at that this immense work contains a great number of fables, superstitions, and errors of every kind. To sift the true from the false was not an easy thing, at a time when there was almost no idea as to how natural phenomena were produced, and when all scientific criticism was impossible, for the very simple reason that true science did not exist.

To give an idea of the great absurdities which were believed in at that epoch, and which were considered possible even by higher intellects such as Pliny's, the following passages will suffice: "In many mountains of

India, according to what Ctesia writes, there are men with dogs' heads, who clothe themselves with the skins of wild beasts and bark instead of speaking. There are also a kind of men having only one leg, and who have great speed in leaping. Others are without any neck and have their eyes between their shoulders. Megasthenes writes that among the nomad Indians are men who instead of a nose have only holes, and have their legs bent like serpents. At the extreme confines of India, toward the East, are men without any mouth and with their bodies entirely covered with hair, who live on nothing but air and odors, which they inhale through the nose."[1]

In Pliny's day the most prodigious virtues were attributed to herbs; in regard to this the following example is sufficient:

"The herb near which dogs may have made water, when gathered, but without being touched by iron, cures luxations very promptly."[2]

It must not be thought that Pliny accepted such beliefs without reserve. He notes them, because preceding authors had accepted them, and because if certain things appear to us evidently absurd, their absurdity could not be equally evident at a period when little more than nothing was known in regard to physical and physiological laws, and when the impossibility of rationally explaining natural effects led men to admit the existence of marvellous virtues and influences in every being and in all bodies. On the other hand, Pliny expressly says, for his own justification, in Chapter I of Book VII: "I do not want to bind my faith in many things which I am about to say; but rather refer the readers to the authors from whom I have taken them."

As is to be expected, we find in Pliny's works, in regard to teeth, a strange mixture of truth and errors.

In Chapter XV of Book VII, after having said that some children are born with teeth, and after having cited, as examples, Manius Curius, who was therefore called Dentatus, and Gnæus Papirius Carbo, both illustrious men, he adds:

"In women such a thing was considered a bad augury in the days of the kings. In fact, Valeria having been born with teeth, the seers said that she would be the ruin of the city to which she would be taken; she was sent to Suessa Pometia, which in those days was a very flourishing city; and, in fact, the prediction was verified. Some, instead of teeth, have an entire bone; of this there was an example in the son of Prusias, King of Bithynia, who instead of upper teeth had one single bone."

"The teeth alone are not consumed by fire, and do not burn with the rest of the body. And yet these teeth, which withstand the flames, are worn away and hollowed out by pituita. They wear out by being

[1] C. Plinii Secundi, Historiæ Mundi, lib. vii, cap. ii.

[2] Lib. xxiv, cap. cxi.

used. Nor are they necessary for mastication alone, for the foremost ones regulate the voice and words, producing by the beat of the tongue special sounds."

"Men have thirty-two teeth, women a lesser number. It is, however, believed that augury may be taken from the teeth; and to have a greater number than usual is considered an indication of long life. The presence of two eye teeth at the right side of the upper jaw presages favorable fortune, as was verified in Agrippina, the mother of Domitius Nero; on the left side, however, they are of sad foreboding."

"The last teeth, which are called the genuine teeth, appear toward the twentieth year of age; many persons, however, do not have them until their eightieth year. Teeth fall out in old age and then spring up again; of this there can be no doubt. Mutianus writes of having known a certain Zancle of Samothracia, in whom teeth reappeared after he had completed his one hundred and fourth year. Timarcus, son of Nicocles of Paphus, had two rows of molar teeth, whilst a brother of his did not change his incisor teeth at all, which, therefore, wore down little by little. There once lived a man who had a tooth in his palate. The canine teeth, when by any chance they fall out, do not reappear any more."[1]

"In the teeth of man there exists a poisonous substance which has the effect of dimming the brightness of a looking-glass when they are presented uncovered before it; and if they are uncovered in front of young unfledged pigeons, these take ill and die."[2]

The second of these two statements is but a prejudice, like many others; but we find the first very strange indeed, it being a surprising thing that a man like Pliny should have attributed to an imaginary poison of the teeth what is the simple effect of the moistures of the breath.

In Chapters CXV and CXVII of Book XI are found some observations which are somewhat interesting to us:

"A man's breath becomes infected by the bad quality of food, by the bad state of the teeth, and still more by old age."

"Simple food is very beneficial to man; the variety of flavors instead is very harmful. Sour or too abundant foods are digested with difficulty, and also those which are ravenously swallowed. As a remedy, vomiting has come into use; but it makes the body cold and is most pernicious to the eyes and to the teeth."

There is no doubt that the habit of often provoking vomitus—which, in those times of excessive corruption and intemperance, had come into general use—must have resulted in enormous harm to the teeth, especially by the action exercised upon them by the hydrochloric acid contained in the gastric juice, and by the organic acids of fermentation.

[1] Lib. xi, cap. lxiii.

[2] Lib. xi, cap. lxiv

Among the vegetable remedies in those times considered of use against odontalgia, the principal ones are mentioned in Chapter CV of Book XXV:

"It is beneficial against toothache to chew the root of panax, and likewise to wash the teeth with its juice. It is also useful to chew the root of hyoscyamus soaked in vinegar, or else that of the polemonium. It is also beneficial to chew the roots of the plantain, or to wash the teeth in a decoction of plantain in vinegar. A decoction of the leaves is also useful, not only in the case of simple toothache, but also when the gums are tender and easily bleed. The seed of the same plant cures inflammations and abscesses of the gums. The aristolochia strengthens the gums and the teeth. The same effect may be produced by masticating the verbena with its root, or by washing the mouth with a decoction of it in wine or vinegar. Similarly the roots of the cinquefoil are helpful when boiled down to a third, in wine or vinegar; however, they must first be washed in salt water or brine. The decoction must be kept for a long time in the mouth.

"Instead of using the decoction of cinquefoil, some prefer to rub the loose teeth with the ashes of this plant. Besides the above-mentioned remedies, the root of the verbascum boiled in wine, hyssop, and the juice of the peucedanum with opium are also employed; and it is also beneficial to pour into the nostrils, on the side opposite to that of the sick tooth, some drops of the juice of anagallis.

"It is said that if senecio be taken from the earth, and the aching tooth be touched three times with it, spitting alternatively three times, and then the herb be replanted in the same spot, so that it may continue to live, the tooth will never give pain any more."[1]

"In the fuller's thistle,[2] an herb which grows near rivers, is found a small worm, which has the power of curing dental pains, when the said worm is killed by rubbing it on the teeth, or when it is closed up with wax in the hollow teeth."[3]

"Apollonius writes that a very efficacious remedy for pains in the gums is to scratch them with the tooth of a man who has suffered a violent death."[4]

"It is considered very beneficial for toothache to bite off a piece from wood which has been struck by lightning, and to touch the sick tooth with it; but whilst biting off the little piece of wood, it is necessary to keep both hands behind the back."[5]

"Experience teaches that against the bad odor of the breath it is useful to wash the mouth with pure wine before sleeping, and that to

[1] Cap. cvi.
[2] Dipsacus fullonum.
[3] Cap. cviii.
[4] Lib. xxviii, cap. ii.
[5] Lib. xxviii, cap. xi.

avoid aching of the teeth, it is a good thing to rinse the mouth, in the morning, with several mouthfuls of fresh water, but of an odd number."[1]

"A remedy for toothache is to touch the diseased teeth with the tooth of a hyena,[2] or to scratch the gums with the tooth of a hippopotamus which has been taken from the left side of the jaw."[3]

"The ashes of stag's horn, rubbed over loose and aching teeth, makes them firm and soothes the pain. Some consider that to produce the same effect, of greater virtue is the powder of the horn, unburnt. Both the ashes and the powder of stag's horn are employed as a dentifrice. The ashes of the head of a wolf are a great remedy for toothache. Such pains are also made to cease by wearing certain bones that are oftentimes found in the dung of this animal. The ashes of the head of a hare is a useful dentifrice; and if spikenard be added, it will lessen the bad smell of the mouth. Some mix with it the ashes of the heads of mice. In the side of the hare is a bone as sharp as a needle; and many advise pricking the teeth with this when they ache. The heel of the ox kindled and brought close to loose teeth makes them firm. The ashes of this bone mingled with myrrh is a good dentifrice. A good dentifrice is also made from the ashes of the feet of a goat. To strengthen teeth loosened by a blow, asses' milk or the ashes of the teeth of this animal are very useful. In the heart of the horse there is a bone like an eye-tooth; it is said that it is very beneficial to pick with it the teeth that ache. The carpenter's glue boiled in water and plastered on to the teeth also takes away their pain; but soon after it must be taken away and the mouth rinsed with wine in which have been boiled the rinds of sweet pomegranates. It is also thought beneficial to wash the teeth with goat's milk or with ox-gall."[4]

"Butter, either alone or with honey, is very useful for children; and is very helpful, especially during dentition, in the diseases of the gums, and to cure the ulcers of the mouth. To prevent the disorders that generally accompany dentition, it is a useful thing that the child should wear a wolf's tooth, or one of the first teeth lost by a horse. The rubbing of the gums with goat's milk or with hare's brain renders the cutting of teeth much easier."[5]

"To sweeten the breath it is very helpful to rub the teeth and the gums with wool and honey."[6]

"The filth of the tail of sheep rolled up in little balls, and left to dry and then reduced to powder and rubbed on the teeth, is marvellously useful against the loosening and other diseases of the teeth themselves and against the cankerous ulcers of the gums."[7]

[1] Lib. xxviii, cap. xiv. [2] Ibid., cap. xxvii. [3] Ibid., cap. xxix.
[4] Ibid., cap. xlix. [5] Ibid., cap. lxxviii. [6] Lib. xxix, cap. ix.
[7] Lib. xxix, cap. x.

"Eggshells deprived of their internal membrane and afterward burnt afford a good dentifrice."[1] (Hence we see that the use of carbonate of lime as a dentifrice is a very ancient one.)

"If the head of a dog that has died mad be burnt, the ashes obtained may be advantageously used against toothache, mixing it with cyprine oil and then dropping the mixture into the ear, on the side of the pain. It is beneficial also to pick the sick tooth with the longest tooth, on the left side, of a dog; or with the frontal bones of a lizard, taken from the head of the animal at full moon, and which have not touched the earth. The teeth of a dog, boiled in wine until this is reduced to one-half, thus, furnish a mouth wash which can be advantageously used against toothache. In the cases of difficult dentition, benefit is derived by rubbing the gums with the ashes of the teeth of a dog, mixed with honey. Such ashes are also used as a dentifrice. In hollow teeth it is useful to introduce the ashes of the dung of mice, or of the dried liver of lizards. It is the opinion of some, that in order not to be subject to toothache, a mouse should be eaten twice a month. If earth-worms be cooked in oil, this latter has the virtue of calming toothache when dropped into the ear on the side of the pain. The same effect is obtained by rubbing the teeth with the ashes of the aforesaid worms, after they have been burnt in a terra-cotta vase; and if such ashes be introduced into the hollow teeth, these fall out very easily. A good remedy against toothache is to wash the mouth with vinegar of squills in which earth-worms and the root of the mulberry have been boiled. The ashes of the shells of snails mixed with myrrh, rubbed on the gums, strengthens them. Even the slough which the snakes cast off in spring can furnish a remedy against toothache. For this purpose it must be boiled in oil, with the addition of resin of the larch, and then the oil dropped into the ear. For the same purpose, according to some, oil of roses is useful, when a spider, caught with the left hand, has been pounded in it. If a sparrow's fledglings be burnt with dry vine twigs, the resulting ashes rubbed with vinegar on the teeth makes all pain cease in them.[2] It is stated by many that to improve the odor of the breath, it is well to rub the teeth with ashes of mice mixed with honey. Some also mingle with this the root of fennel. Picking the teeth with the quill of a vulture renders the breath sour. It makes the teeth firm to pick them with a porcupine's quill. A decoction of swallows in wine sweetened with honey cures ulcers of the tongue and lips. Scaldings in the mouth produced by hot food or drinks are readily healed with the milk of a bitch."[3]

That Pliny did not put great faith in many of the things which he relates is clearly proved by several passages of his book, and among others by the following:

[1] Lib. xxix, cap. xi. [2] Lib. xxx, cap. viii. [3] Lib. xxx, cap. ix.

"One can hardly relate without laughing, some things, which, however, I will not omit, because they are found already written. They say that the ox has a small stone in the head, which it spits out when it fears death; but if its head be suddenly cut off, and the stone extracted, this, worn by a child, helps it in wondrous manner to cut its teeth."[1]

In Book XXXI, Pliny speaks of various waters—mineral, thermal, etc.—especially from the medical point of view. It was already known in those days that those waters were most active agents. And in this respect a fact which the author relates in Chapter VI of Book XXV is worth mentioning:

"When Caesar Germanicus moved his camp beyond the Rhine, there was found, in the whole maritime tract of the country, only one spring of fresh water, the drinking of which, within two years, produced the fall of teeth and a loosening of the knee-joints. The doctors called these evils stomacace and scelotyrbe."

Sea salt and nitre are of use, according to Pliny, against various maladies of the teeth and mouth. He counsels the application of salt on lint to the ulcers of the oral cavity, and to rub it on the gums when they are swollen. To prevent diseases of the teeth, it would be advantageous, every morning before breaking one's fast, to keep a little salt under the tongue until it is dissolved. Against the pain of the teeth it would be beneficial to use common salt dissolved in vinegar, or nitre in wine.

"The rubbing of the blackened teeth with burnt nitre gives them back their natural color."[2]

The prophylactic remedies against odontalgia believed in, at that period, were sufficiently numerous, and, among many other such things, Pliny informs us that in order not to be subject to toothache, it is sufficient to wash the mouth three times a year with the blood of the tortoise.[3] Analogous virtue was also attributed to the brain of the shark, which was boiled in oil, and this put by for washing the teeth with once a year.

Besides the many anti-odontalgic remedies so far related, several others are found enumerated in Chapter XXVI of Book XXXII:

"The pain in the teeth is lessened by picking the gums with the bones of the sea dragon. It is also very beneficial to pick the gums with the sharp bone of the puffin.[4] If the same be pounded together with white hellebore, and the mixture thus obtained be rubbed on the diseased teeth, they may be made to fall out without pain. The ashes, also, of salt fish burnt in an earthen vase, with the addition of powdered marble, is a remedy against toothache. Frogs are also boiled in a hemina[5] of

[1] Lib. xxx, cap. xlvii. [2] Lib. xxxi, cap. xlv, xlvi. [3] Lib. xxxii, cap. xiv.

[4] Trygon pastinaca, a large fish whose tail is armed with sharp and strong bones.

[5] A measure equal to 0.274 liter.

vinegar, the decoction being then used to wash the teeth with; but this, however, must be kept in the mouth for some length of time. In order to render this remedy less nauseous, Sallustius Dionisius used to hang several frogs, by their hind feet, over a vase in which he boiled the vinegar, so that the juices of the animals might drip into this from their mouths. To make loose teeth firm, some advise the soaking of two frogs, after having cut off their feet, in a hemina of wine, and the washing of the mouth with the latter. Others tie them, whole, on the jaws. Some, to strengthen unsteady teeth, rinse them with a decoction made by boiling ten frogs in three sextaries[1] of vinegar, until the liquor is reduced to one-third. By others, thirty-six hearts of frogs are well boiled in a sextary of old oil, in a copper vessel, and the oil is then used against toothache, dropping it into the ear, on the side of the pain. Some, after having boiled the liver of a frog, pound it with honey, and smear it on the sore teeth. If the teeth are decayed and fetid, many counsel the drying of a hundred frogs in an oven, leaving them there for one night, then the addition of an equal weight of salt, reducing the whole to powder, and rubbing the teeth with it. In such cases the ashes of crabs are also used. That of the murex[2] is adopted as a simple dentifrice."

"The cutting of teeth is facilitated by rubbing the gums of the child with the ashes of dolphin's teeth mixed with honey, or even simply by touching the gums with a tooth of this animal."[3]

In Chapter XXXIV of Book XXXVI it is said that the decoction of gagates[4] in wine cures the diseases of the teeth; and in Chapter XLII of the same book are praised the dentifrice powders made of pumice stone.

From the examination of Pliny's work several important facts come out.

The diseases of the teeth were, in those days, most common; very often we find mention of loose teeth, and the medicines suited to make them firm again; from which we may deduce the great frequency of alveolar pyorrhea. It is reasonable to think that such a fact was caused principally by the intemperate life of those times, in which the followers of Epicurus were extremely numerous and the unbridled desire for pleasure reached such a degree that no abhorrence was felt of provoking vomit during the course of a long banquet, in order to continue dining merrily.

Concerning the teeth, their affections, and the means of healing and preventing them, the strangest superstitions existed, and this not only among the common, but also among educated and learned people. The number of remedies reputed useful against diseases of the teeth

[1] [The sextarius was accorded different values, thus a sextary of oil was ℥xviij, of wine ℥xx, and of honey, ℥xvij.—E. C. K.]

[2] [Lat., the purple fish, a carnivorous marine mollusk.—E. C. K.]

[3] Lib. xxxii, cap. xlviii.

[4] A kind of lignite, now called jet.

was extraordinarily great; but the modern saying, "therapeutic wealth is poverty," could have been applied only too well.

Of the cleanliness of the teeth, it seems, great care was taken, for dentifrices were in great use. These, as we have already seen, were made of the most varied substances—stag's horn burnt, ashes obtained by burning the head of the mouse, of the hare, of the wolf, etc., eggshells burnt and reduced to powder, pumice stone, and so on. For the cleanliness of the mouth, for strengthening the teeth and gums, mouth washes of sundry kinds were likewise adopted, especially formed of decoctions of astringent substances in water, wine, and vinegar.

Not only among the Romans was great care given to the cleanliness and beauty of the teeth, but also among many other nations. In this regard the following poem of Catullus, in which he lashes the silly vanity of a Celtiberian resident in Rome, who made continual show of his white teeth, is somewhat interesting:

"Egnatius, quod candidos habet dentes
Renidet usquequaque; seu ad rei ventum est
Subsellium, cum orator excitat fletum,
Renidet ille: seu pii ad rogum filii
Lugetur, orba cum flet unicum mater,
Renidet ille; quidquid est, ubicumque est,
Quodcumque agit, renidet: hunc habet morbum,
Neque elegantem, ut arbitror, neque urbanum.
Quare monendus es mihi, bone Egnati,
Si Urbanus esses, aut Sabinus, aut Tiburs,
Aut parcus Umber, aut obesus Hetruscus,
Aut Lanuvinus ater, atque dentatus,
Aut Transpadanus, ut meos quoque attingam,
Aut quilibet, qui puriter lavit dentes:
Tamen renidere usquequaque te nollem;
Nam risu inepto res ineptior nulla est.
Nunc, Celtiber, in celtiberia terra
Quod quisque minxit, hoc solet sibi mane
Dentem, atque russam defricare gingivam.
Ut quo iste vester expolitior dens est,
Hoc te amplius bibisse prædicet lotii."[1]

[1] Ignatius, because he has white teeth, is always laughing; if he be present at the felon's trial, whilst the counsel is moving all to tears, he laughs; he laughs even when everyone is mourning at the funeral pyre of a dutiful son, whilst the mother is weeping for her only child. He laughs at everything, everywhere, and whatever he be doing; this is his weakness, which methinks is neither polite nor elegant. Wherefore, I must tell thee, O good Ignatius, even if thou wert a citizen of Rome, or a Sabine, or of Tibur, or one of the thrifty Umbrians, or of the fat Etruscans, or wert thou a black and large-toothed Lanuvin, or a Transpadane, if I may speak of my own people, or belonging to any people that cleanly wash their teeth; even then I would not have thee be always laughing; for nothing is more silly than a silly laugh. Now, O Celtiberian, in thy Celtiberian land, each is accustomed, with the water he has himself emitted, to rub his teeth and gums. Wherefore the cleaner are thy teeth, the more surely stale dost thou accuse thyself of having drunk.

STRABO. From Strabo we learn that the Cantabri and other peoples of Spain used to clean their teeth and sometimes even to wash their face not with fresh, but with old urine, which, so it seems, was kept for the purpose, in suitable cisterns![1]

In regard to this filthy custom, Joseph Linderer says[2] that the superstition has reached even to our times, although not widely diffused, that, to beautify the face, it is useful to wash it with urine. He relates that he knew a girl who, to become beautiful, had recourse to this heroic method, but, unfortunately, without at all obtaining the desired end!

MARTIAL. In the epigrams of Martial (about 40 to 101 A.D.) allusions of great value with regard to several points concerning the subject we are treating of are found.

Toothpicks (*dentiscalpia*) are mentioned by this poet several times; from which we may argue that they were in great use. They were ordinarily made of lentisk wood (*Pistacia lentiscus*), as may be deduced from the Epigram LXXIV of Book VI, in which the author ridicules the old dandy who, stretched at length on the triclinium, cleans with *lentiski*

FIG. 28



An ancient toothpick and ear-picker of gold, found in Crimea.

the toothless mouth, to give himself the air of a man not too far stricken in years.[3] Besides, in Book XIV, containing, for the greater part, saws and sayings on objects of common use, there is an epigram bearing the title of "Dentiscalpium," in which the author says that toothpicks of lentisk are to be preferred, but that, in their absence, quill toothpicks may be used.[4]

From other sources we learn that in those days metal toothpicks were also made use of. So in a satire of Petronius, it is said that Trimalchiones made use of a silver toothpick (*spina argentea*). Objects of this kind, both Roman and of other origin, are even now in existence, and

[1] Rerum geographicarum libri. Lutetiæ Parisiorum, 1620. Lib. iii, p. 164; quippe qui urina in cisternis inveterata laventur, eaque cum ipsi, tum eorum uxores dentes tergant; quod Cantabros facere et eorum confines ajunt (Carabelli, Systematisches Handbuch der Zahnheilkunde, Wien, 1844, i, 12).

[2] Handbuch der Zahnheilkunde, Berlin, 1848, ii, 412.

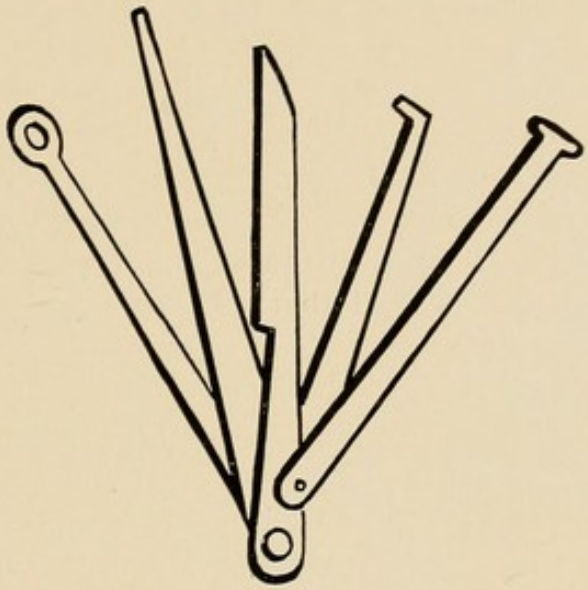
[3] Medio recumbit imus ille qui lecto,
Calvam trifilem segmentatus unguento,
Foditque tonsis ora laxa lentiscis;
Mentitur, Esculane; non habet dentes.

[4] Lentiscum melius; sed si tibi frondea cuspis
Defuerit, dentes penna levare potest.

may be found in various collections of antiquities. In Crimea a most elegant gold object, of Greek make, was found, which is, by its two ends, both a toothpick and an ear-picker. It belongs most probably to the fourth century before Christ.[1]

In an object found in the north of Switzerland, and coming from a Roman military colony of the times of the Empire, the toothpick and ear-picker are joined at one of their ends, by a pivot, to other toilet articles.[2]

FIG. 29



A metal toothpick and ear-picker joined to other toilet articles. An object found in Switzerland, in the ancient seat of a Roman military colony.

FIG. 30



An ancient toothpick and ear-picker of bronze, found in the north of France, at Bavai (the ancient Bagacum).

Caylus, in his valuable work *Recueil d'antiquités égyptiennes, étrusques, grecques, romaines et gauloises* (Paris, 1752 to 1767), gives the picture of a toothpick and earpicker of bronze, two inches long, with the middle part wrought in spiral form, so as to increase the solidity of the article, and also to enable the hand to keep it easily firm in all positions. It was found in the north of France, at Bavai (the ancient Bagacum), and forms part of the collection of M. Mignon of Douai.[3]

[1] Antiq. du Bosphore au Musée de l'Ermitage, pl. xxx, 8 et 9 (Dictionnaire des antiquité grecques et romaines, par Daremberg, Saglio, etc.).

[2] Mittheilung. d. antiq. Gesellschaft in Zürich, xv, pl. xi, 32 (Daremberg and Saglio, ibid.)

[3] Caylus, vol. vi, pl. cxxx, 5.

Martial is one of the first Roman writers who speak clearly of artificial teeth. In Epigram LVI of Book XIV, the poet, by a bold personification, makes the dentifrice powder say to a toothless old woman, furnished with false teeth: "What have you got to do with me? Let a girl use me. I am not accustomed to clean bought teeth."[1]

Elsewhere[2] Martial atrociously derides a courtesan, who, among her other physical defects, was also without an eye: "Without any shame thou usest purchased locks of hair and teeth. Whatever will you do for the eye, Laelia? These are not to be bought!"[3]

This epigram shows that, while dental prosthesis was already in use, ocular prosthesis did not as yet exist.

To a plagiarist, who passed off Martial's poetry as his own, the latter says: "With our verses, O Fidentinus, dost thou think thyself and desire to be thought a poet. Even so, it seems to Ægle that she has all her teeth, because of her false teeth of bone and ivory."[4]

There is, therefore, not the least doubt that in the days of Martial artificial teeth were in use; and that these, as may be seen from the epigram just now quoted, were made of ivory and bone; we do not know whether they were formed also of other substances. The question, however, arises: In those times did they manufacture movable artificial sets, or was the dental art then limited to fixing the artificial teeth unmovably to the neighboring firm teeth, by means of silk threads, gold wire, and the like? The answer to this question may be found in another epigram of Martial,[5] where the latter ridicules a wanton old woman, telling her, among other things still worse, that she at night lays down her teeth just as she does the silken robes.[6]

It is, therefore, beyond all doubt that, at that period, the manner of constructing movable artificial sets was known; and most probably not only partial pieces were made, but even full sets. In fact, from the verse quoted above we have justly the impression that the poet means a whole set rather than a few teeth.

From the words of Martial, it may also be concluded that these dentures could be put on and off with the greatest ease; or, as we may say, by a

[1] Dentifricium ad edentulam:
Quid mecum est tibi? me puella sumat,
Emptos non soleo polire dentes.

[2] Lib. xii, epig. xxiii.

[3] Dentibus atque comis, nec te pudet, uteris emptis.
Quid facies oculo, Lælia? non emitur.

[4] Nostris versibus esse te poetam,
Fidentine, putas, cupisque eredi?
Sic dentata sic videtur Ægle,
Emptis ossibus, indicoque cornu. (Lib. i, epig. lxxii.)

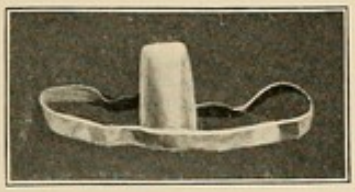
[5] Lib. ix, epig. xxxviii.

[6] Nec dentes aliter quam serica nocte reponas

maneuver as simple as that of removing any articles of apparel; they must, therefore, have been extremely well constructed.

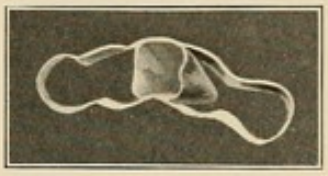
This alone should be sufficient, even were further proof wanting, to give us an idea of the degree of development and of the point of perfection reached by dental prosthesis at that time. But besides this, we now also possess an ancient Roman piece furnishing a palpable proof of the ability and ingenuity of the dentists of that epoch. Some few years since, I had occasion, in the pursuit of dental archeological research, to visit the Museum of Pope Julius in Rome, where I was shown a prosthetic piece, not yet exhibited to the general public, that had been discovered a few months previous in excavating at Satricum, near Rome. I was invited to give an opinion as to this appliance, and, after having examined it accurately, became aware, not without some emotion, I am fain to confess, that I held in my hands a prosthetic piece of exceptional historical importance, that is, no less than a specimen of ancient *crown work*.

FIG. 31



Roman appliance found at Satricum; crown of lower incisor made of gold.

FIG. 32



The same, seen from below.

The appliance found at Satricum (Fig. 31) is made in the following manner: Two small plates of gold, stamped out, represent respectively the lingual and labial superficies of a middle lower incisor; these two pieces soldered together form the crown of the tooth. At its base the crown is soldered, back and front, to a narrow strip of gold which folds back on itself at each end, so as to tightly encircle the two neighboring teeth on the right and on the left, which thus serve as supports to the appliance.

We are now, therefore, able not only to affirm that the Etruscans knew how to execute a kind of *bridge work*, but that later the dentists of ancient Rome even carried out *crown work*.

This, notwithstanding the examples of dental prosthesis discovered up to now in Roman and Etruscan tombs, can in no way be considered as representing all the varieties of dental prosthesis of ancient construction. It is to be hoped that, in spite of the destructive action of time, in continuing the excavations and archeological researches, many other specimens of early dental prosthesis will yet come to light. In any case,

judging by some indications to be found in Latin literature, it must be admitted that the Roman dentists of antiquity constructed other kinds of prosthesis besides the specimens we possess, and in particular movable dentures. We are led to suppose this, not only from the above cited epigram of Martial, but also from what we read in one of the satires of Horace, who dates contemporarily with Augustus, and therefore anteriorly to Martial. Speaking of two old witches who had been put to flight by Priapus, Horace writes: "You would have laughed to see those two old witches run toward the town, losing in their flight, Canidia, her false teeth, Sagania, her false hair."[1]

Now, as Prof. Deneffe very rightly observes, the prosthetic appliances of antiquity known to us are so firmly fixed to the natural teeth that no race, however unbridled, could ever have made them fall out of the mouth. It must, therefore, be admitted, as I have said, that the ancients constructed other kinds of dental appliances, of which no specimens have, as yet, been discovered.

Neither in Celsus nor in Pliny, nor in any other Roman writers on medicine, do we find any allusion to the art of dentistry. The doctors of those days probably had no idea of the advantages which could be derived from dental prosthesis in regard to digestion and consequently to the health of the whole body. They therefore must have considered artificial teeth as something totally foreign to their art, and intended solely to hide a physical defect. It is therefore not at all surprising that they have not treated of this subject.

As the art of setting artificial teeth was exercised by persons not belonging to the medical profession, it is very probable that these persons also undertook the extraction of teeth and the cure of dental pains. Martial (Book X, Epigram LVI) names a certain Cascellius, who, he says, "extracts or cures diseased teeth,"[2] and this is the first dentist whose name has been sent down to us. In spite of this, nothing permits us to affirm that there existed at that time a class of real dentists, viz., of persons dedicated to the exclusive cure of dental disease. There are strong reasons for doubting this, especially when we consider that the Latin language has no word corresponding to the word dentist. If there had existed a true dental profession, there ought also to have existed a name for indicating the individuals who exercised it. Therefore, it must be considered highly probable that, although there undoubtedly existed individuals who were especially skilled in the cure of the diseases of the teeth, such persons did not form a special class; perhaps, among those to whom recourse was had for the cure of dental diseases, some were doctors, particularly skilled in such diseases, others were perhaps barbers,

[1] Horat. Sat. viii, lib. i.

[2] Eximit aut reficit dentem Cascellius ægrum.

and so forth. As to the far-fetched deductions of Geist-Jacobi, according to whom the name given to dentists by the Romans must have been that of *artifex dentium* or *artifex medicus dentium*, these are founded, above all, on imagination. It is extremely improbable that such names existed, when one considers that they are not met with, even once, in the whole range of Latin literature.

SCRIBONIUS LARGUS. Among the writers on Medicine in the early period of the Empire, one of the most eminent was, without any doubt, Scribonius Largus, physician to the Emperor Claudius, whom he accompanied to England in the year 43.

Scribonius Largus, in his book *De compositione medicamentorum*, pronounces himself energetically against the division of Medicine into single special branches. He declaims against the many who attributed to themselves the name of doctors, simply because they knew how to cure some diseases. According to him, the true doctor must be skilled in curing all kinds of affections. This, in truth, was possible in those times, but would be almost impossible nowadays, on account of the enormous development of the healing art. The ideas, however, expressed by Scribonius Largus have a certain historical importance, for they show that in his times the medical art had certainly the tendency to split up into many special branches, among which there must certainly have been dentistry, but that the necessity of such separation was not by any means universally recognized; the great doctors of those days undertook the cure of the diseases of the teeth, as well as those of any other part of the body.

The tenth chapter of the book of Scribonius Largus treats of the cure of odontalgia. The author begins by saying that it is the opinion of many that the only true remedy against toothache is the forceps. With all this, he adds, there are many medicaments, from which great benefit may be derived against these pains, without it always being necessary to have recourse to extraction. Even when a tooth is affected with caries, says the author, it is not always advisable to extract it; but it is much better, in many cases, to cut away the diseased part with a scalpel adapted for the purpose.

"Violent toothache may be calmed in various ways, viz., with mouth washes, masticatories, fumigations, or by the direct application of fitting medicaments. It is beneficial to rinse the mouth frequently with a decoction of parietaria or of cypress berries, or to apply to the tooth the root or the seeds of the hyoscyamus wrapped up in a cloth, and dipped from time to time in boiling water, or to chew the portulaca (purslane), or to keep for some time its juice in the mouth."

"Suitable also against toothache are fumigations made with the seeds of the hyoscyamus scattered on burning charcoal; these must be followed

by rinsings of the mouth with hot water; in this way sometimes, as it were, small worms are expelled."[1]

This passage of Scribonius Largus has given rise to the idea that the dental caries depends upon the presence of small worms, which eat away the substance of the tooth. Such an explanation must have well succeeded in satisfying the popular fancy; and it is for this that such a prejudice, although fought against by Jacques Houllier in the sixteenth century, has continued even to our days.

With regard to this I would like to record the following fact: Not many years ago there lived in Aversa, a small town near Naples, Italy, a certain Don Angelo Fontanella, a violin player, who professed himself to be the possessor of an infallible remedy against toothache. When summoned by the sufferer, he carried with him, in a bundle, a tile, a large iron plate, a funnel, a small curved tube adjustable to the apex of the funnel, a piece of bees' wax, and a small packet of onion seed. Having placed the tile on a table, the iron plate was put upon it, after it had been heated red hot. Then the operator let a piece of bees' wax fall upon the red-hot iron, together with a certain quantity of the onion seed; then, having promptly covered the whole with the funnel and made the patient approach, he brought the apex of the said funnel close to the sick tooth, in such a way as to cause the prodigious, if somewhat stinking, fumes produced by the combustion of the wax with the onion seed to act upon it. In the case of a lower tooth, the above-mentioned curved tube was adapted to the funnel, so that the fumes might equally reach the tooth. The remedy, for the most part, had a favorable result, whether because the beneficial effect was due to the action of the hot vapor on the diseased tooth, or to the active principles resulting from the combustion of the wax and onion seed, or to both, or perhaps also, at least in certain cases, to the suggestion that was thus brought to bear upon the sufferer. It would not be at all worth while to discuss here such a point. The interesting part is that when the patient had declared that he no longer felt the pain, Don Angelo, with a self-satisfied smile, turned the funnel upside down, and showed on its internal surface a quantity of what he pretended to be worms, which he affirmed had come out of the carious tooth. Great was the astonishment of the patient and of the bystanders, none of whom raised the least doubt as to the nature and origin of these small bodies, no one having the faintest suspicion even that these, instead of coming from the tooth, might come from the onion seed!

According to Scribonius Largus, toothache might also be taken away by fumigations of burnt bitumen. He affirms also that great benefit

[1] Suffire autem oportet ore aperto alterci semine carbonibus asperso, subinde os colluere aqua calida; interdum enim quasi vermiculi quidam eiciuntur.

may be derived against odontalgia by masticating the wild mint, or the root of the pyrethrum, or by covering the diseased tooth with a plaster composed of peucedanum juice, opopanax, incense, and stoneless raisins. But before making use of this last remedy, he advises that the tooth and the gums near it should be fomented with very hot oil, by means of a toothpick or ear-picker wrapped around, at one end, with some wool. If the pain does not entirely cease, or comes on again, it is well, says the author, to continue the fomentations with hot oil, above the plaster, until the pain ceases. To strengthen loose teeth, Scribonius advises frequent rinsings of the mouth with asses' milk or with wine in which have been cooked the roots of the sorrel until the liquid has boiled down to one-third. Another remedy which he recommends against looseness of the teeth is composed of honey and alum mixed together in a mortar, in the proportion of two parts of the first to one of the second, and then cooked in an earthen vase, so as to render the mixture more homogeneous, and to give it more consistency. He also speaks of a third medicament, resulting from cooking strong vinegar, alum, and cedria[1] in a copper vessel until it has the consistency of honey. This remedy would serve not only to make loose teeth firm, but the author assures us also that whoever rubs the teeth with it, three times a month, will never be subject to dental pains.

Scribonius Largus gives the receipts for various dentifrice powders in use at that period. The skin of the radish dried in the sun, pounded to powder, and then passed through a sieve, would furnish a good dentifrice, suited to strengthen the teeth and to keep them healthy. Very white glass, similar to crystal, reduced to a very fine powder and mixed with spikenard, is also, according to Scribonius Largus, a valuable dentifrice.

Octavia, sister of Augustus, used a powder which our author highly commends, saying that it strengthens the teeth and makes them very beautiful.[2] To prepare it, one must take a sextary[3] of barley flour and knead it well to a paste with vinegar and honey mixed together, and must divide the mass into six balls, each of which must be mixed with half an ounce of salt; these balls must then be cooked in the oven until carbonized; and lastly pounded to powder, as much spikenard being added as is necessary to give it an agreeable perfume.

Scribonius Largus also lets us know the tooth powder made use of by Messalina, the wife of the Emperor Claudius; this was composed of calcined stag's horn, mastic of Chios, and sal ammoniac, mixed in the

[1] Gum of the cedar tree.

[2] Dentifricium, quod splendidos facit dentes et confirmat, chap. xi, lix.

[3] A Roman measure of capacity, equal to a little more than half a liter.

proportion of an ounce of mastic and an ounce and a half of sal ammoniac to a sextary of the ashes of stag's horn.

SERVILIUS DAMOCRATES, a Greek physician, who acquired great renown in Rome toward the middle of the first century, was the author of many valuable works, both in verse and prose, which, unfortunately, have been lost. His works are mentioned by Galen, who testifies to his great esteem for Damocrates, calling him an eminent physician, and quoting various passages from his works, and among others three poetical receipts for dentifrice powders. From these receipts it appears that Damocrates attached the greatest importance to the cleanliness of the teeth, and that he considered this the indispensable condition for avoiding disease of the teeth and gums.

ANDROMACHUS THE ELDER, of Crete, the physician of Nero, who conferred upon him, for the first time, the title of *archiater*, became famous through his *theriac*, an extremely complicated remedy, the virtues of which were sung by him in a Greek poem, dedicated to the Emperor. The theriac was considered an antidote against all poisons and a remedy against the greater part of diseases, in short, as a real panacea. It is not even necessary to remark that this portentous medicine, which has held a post of honor, from ancient times almost up to the present day, was also used against odontalgia; and in those cases in which this was produced by caries, Andromachus advised the filling up of the cavity with the electuary which he rendered so famous. As the chief basis of the theriac was opium, combined with stimulating and aromatic substances, there is no doubt that its use locally or even internally would prove beneficial, temporarily at least, in many cases of odontalgia.[1]

ARCHIGENES, of Apamea, a city of Syria, lived in Rome toward the end of the first century and at the beginning of the second, under the Emperors Domitian, Nerva, Trajan, and Hadrian. He acquired great

[1] The origin of the theriac, according to what Galen writes in his book De antidotis, is to be traced back to Mithridates, King of Pontus, who lived from the year 132 to the year 63 B.C. This king, patron of Art and Science, was, for his times, an eminent toxicologist. By making experiments on condemned criminals he sought to discover by what drugs the action of the various poisons, both mineral and vegetable, and those inoculated by the bites of poisonous animals might be counteracted. He afterward mixed the various antidotes together for the purpose of obtaining a remedy that might prove a preservative against the action of any poison whatever. This universal remedy, the receipt of which was carried to Rome by Pompey, the conqueror of that great king, was named *mithridatium*, after the name of him who had composed it. Andromachus modified the mithridate; he took away certain ingredients and added others, reducing the number of them from about eighty to sixty-five. The principal modification was that of introducing into the composition of this drug the flesh of the viper; wherefore, Galen is of the opinion that the theriac (so called from the Greek word *therion*, a noxious animal) was more efficacious than the mithridate against the bite of the viper. The theriac still exists in the French pharmacopeia, although considerably simplified. In every 4 grams it contains 5 centigrams of opium.

fame as a physician and as an operator, and distinguished himself particularly by daring amputations and trepannings. He recommends various remedies against odontalgia, among which are mouth washes of strong hot vinegar, in which gall-nuts or halicaccabum[1] have been boiled. He usually introduced into carious teeth a mixture of turpentine and vitriol of iron (*sory ægyptium*), or a mixture of pepper, and oil of spikenard or of almonds, and this was also dropped into the ear, on the side on which the pain was felt.

Archigenes, too, like other great physicians of that time, recommended various remedies taken from the animal kingdom against diseases of the teeth, which now seem very strange to us, but at that period appear to have been in great use. Thus, it would be of great benefit to hold in the mouth for some length of time a mixture of vinegar and water in which a frog has been well cooked. The slough of a serpent, burnt and then reduced, by the addition of oil, to the consistency of solidified honey, would be a valuable remedy, which being introduced into a carious hollow, and plastered all around the tooth and on the surrounding parts, would cause the most violent pain to cease. And, moreover, desiring to cause a diseased tooth to fall out, it would be enough to apply to and press upon it a piece of the unburnt slough of a serpent. Two excellent anti-odontalgic remedies to be introduced into carious hollows would be roasted earth-worms and spikenard ointment mixed with the crushed eggs of spiders. It would be also of use to drop into the ear on the side of the aching tooth some oil of sesamum in which earth-worms have been cooked.

When the pain is situated in broken teeth, Archigenes advises them to be cauterized with a red-hot iron.

Against bleeding of the gums, he recommends rubbing them with very finely pulverized alum and myrtle and the application of astringent and tonic liquids.

When odontalgia appears to depend upon an inflammatory condition, he advises the aching teeth to be plastered up with a mixture composed of red nitre, pounded peach kernels, and resin.

Archigenes repeatedly recommends the cleaning of the teeth and of the carious cavities before applying to the former or introducing into the latter the appropriate remedies.[2]

But Archigenes' principal merit, so far as concerns the art of dentistry, consists in his having guessed that odontalgia, in certain cases, arises from a disease of the interior part of the tooth (viz., from inflammation of the pulp) and in having discovered an excellent method for curing

[1] A species of solanaceæ of the Physalis genus, probably the Physalis alkekengi.

[2] Galeni de compositione medicamentorum secundum locos, liber v.

such cases. When a tooth appeared discolored, without being affected by caries, and was the seat of violent pains, against which every remedy had proved of no avail, Archigenes perforated it with a small trephine, invented by himself for the purpose. He applied the instrument to that part of the crown which was most discolored and drilled right down to the centre of the tooth.[1]

Without doubt this talented surgeon was induced to adopt this method of cure by the idea of the existence of morbid substances in the interior of the tooth and by the consequent indication of giving them a free exit.

The operation devised by Archigenes proves, among other things, two important facts: first, that the anatomical constitution of the teeth had already been explored, seeing that Archigenes did not ignore the existence of the pulp cavity; and secondly, that Archigenes was greatly opposed to the extraction of a tooth unless absolutely necessary. It might be thought that such aversion depended upon an exaggerated idea of the dangers connected with the extraction of a tooth, an idea widely diffused at that period; but regarding such a daring surgeon as Archigenes was, it is more logical to suppose that in similar cases he had recourse to trephining and not to extraction, especially on account of the importance he attached to the preservation of the tooth.

Surgery in ancient times was eminently conservative; later on—partly by effect of its own progress—it became too readily inclined to the removal of diseased parts; in modern times it has again become what it was originally, and what it must ever be, viz., conservative in the highest possible degree.

Claudius Galen, after Hippocrates the greatest physician of ancient times, was born at Pergamus, a city in Asia Minor, in the year 131 of our era. His father Nicon, a man of great abilities, who was at the same time a man of letters, a philosopher, a mathematician, and an architect, had put him, at a very early age, to the study of science and of the liberal arts. Galen began to study medicine at the age of seventeen, under the guidance of skilful doctors of his native country; he made several journeys in order to have the benefit of the instruction of celebrated masters, and finally frequented the renowned medical school at Alexandria. On going to Rome, in the thirty-fourth year of his life, he soon acquired in that city a very high renown. He died in the first decade of the third century, but we do not know exactly in what year.

Galen was a most prolific writer, and his works, considering the period in which they were written, form a real medical encyclopedia. Anatomy through his researches made considerable progress, for he studied with

[1] J. R. Duval, Recherches historiques sur l'art du dentiste chez les anciens, Paris, 1808, p. 19. (See Carabelli, p. 13.)

the utmost care and attention (especially in apes) the bones, muscles, heart, bloodvessels, brain, nerves, and every other part of the organism. His anatomical researches enabled him to correct many errors, but as he had dissected almost exclusively animals and not human corpses, he himself fell into several errors, especially in attributing to man parts which he does not possess, for example, the intermaxillary bone.

Galen justly observed that the inferior maxilla (resulting, according to him, from the union of two bones, which, indeed, is embryologically true) has in man, proportionally to the other bones of the skeleton, a lesser length than in animals.

He holds that the teeth must be enumerated among the bones, and does not admit any doubt to be raised on this point, as these parts can be looked upon neither as cartilages, nor as arteries, nor as veins, nor as nerves, nor as muscles, nor as glands, nor as viscera, nor as fat, nor as hair—a method of reasoning by elimination which is very specious but far too weak!

Galen indicates exactly the number of incisor, canine, and molar teeth (without, however, making any distinction between small and large molars), and speaks of the different functions of these three kinds of teeth. Not always, he says, are the molars of each jaw five in number on each side; in some individuals there appear only four; in others six. The incisors and canines have but one root; the upper molars have generally three, but sometimes, though not often, four; the lowers have for the most part two, rarely three.

Galen is the first author who speaks of the nerves of the teeth. He says that these organs are furnished with soft, that is sensitive, nerves[1] belonging to the third pair.[2] The teeth, according to him, are furnished with nerves, both because, as naked bones, they have need of sensibility, so that the animal may avoid being injured or destroyed by mechanical or physical agencies, and because the teeth, together with the tongue and the other parts of the mouth, are designed for the perception of the various flavors.[3]

In regard to odontalgia, Galen made some very important observations on his own person:

"Once when I was troubled with toothache, I directed my attention to the seat of the pain, and thus I perceived very clearly, that not only was the tooth painful but also pulsating, which is analogous to what

[1] Galen admits three kinds of nerves: soft or sensitive nerves, originating from the brain; hard or motor nerves, originating from the spinal marrow; medial nerves, motor-sensitive, originating from the medulla oblongata.

[2] Galen distinguishes seven pairs of cerebral nerves; his third pair corresponds to the trigeminus.

[3] Galeni de usu partium corporis humani, lib. xvi.

happens in inflammations of the soft parts. To my astonishment, I had to persuade myself that inflammation may arise even in a tooth, in spite of the dental substance being hard and lapideous. But another time, when I again was attacked by odontalgia, I perceived very distinctly that the pain was not localized in the tooth, but rather in the inflamed gums. Having, therefore, suffered these two kinds of pain, I have acquired the absolute certainty that, in certain cases, the pain is situated in the gums, in others, on the contrary, in the very substance of the tooth."

When a tooth becomes livid, Galen deduces from this that the tooth is the seat of a morbid process equivalent to inflammation. Besides, he says, we cannot be surprised that the teeth may be subject to a phlogistic process, when we consider that these, like the soft parts, assimilate nourishment. The teeth, by effect of mastication, are continually worn down, but nutrition repairs the losses, and they, therefore, preserve the same size. But when a tooth from want of its antagonist is consumed but little or not at all by mastication, we see that it grows gradually longer, for the very reason that under such conditions the increase due to nutrition is not counteracted by a corresponding waste.

The nutritive process of the teeth may, according to Galen, be altered either by excess or by defect; from which arise morbid conditions, quite different the one from the other. An excess of nutrition produces a phlogistic process analogous to that of the soft parts; a defect of nutrition makes the teeth thin, arid, and weak. The first of these pathological states is met with especially in young men and must be fought against with the ordinary antiphlogistic means, designed to eliminate the excess of humors (evacuant, resolvent, revulsive, and astringent remedies). As to defect of nutrition, this is met with most frequently in old people. It has the effect not only of making the teeth thin, but also of enlarging the alveoli, from which there results a looseness of the teeth more or less noticeable. Against this morbid condition we do not possess, says Galen, any direct remedy; however, it can be combated, up to a certain point, by strengthening the gums with astringent medicaments, so that they may close tightly around the teeth and thus make them firm.

Dental caries is produced, according to Galen, by the internal action of acrid and corroding humors, that is, it is produced in the same manner as those cutaneous ulcers which appear without any influence of external causes. The cure must consist in acting upon such vicious humors by means of local or general medicaments according to circumstances and also in strengthening the substance itself of the teeth by the use of astringents and tonic remedies.[1]

After these preliminary remarks, Galen gives a minute description of

[1] Galeni de compositione medicamentorum secundum locos, lib. v.

the numerous remedies which, from his own experience and from that of other great doctors, were to be considered useful for the cure of the various affections of the teeth and gums.

Against gingivitis and the pains deriving from it, the best remedy, according to Galen, consists in keeping in the mouth the oil of the lentisk moderately warm; noting, however, that such a remedy is the more efficacious the more recently it has been prepared.

A decoction of the root of the hyoscyamus in vinegar, used as a mouth wash, is another remedy recommended by Galen against the pains in the gums. It would also be of benefit to apply on the inflamed gums a powder composed of one part of salt to four of alum, afterward washing the mouth with wine or with a decoction of olive leaves. If the gums are ulcerated, Galen recommends them to be cauterized with boiling oil, using for the purpose a little wool wrapped around a probe or tooth-pick. This medicament, says Galen, greatly modifies the diseased part, exciting a reparative process in it, to aid which, however, suitable remedies must be used, and especially frictions with a mixture of gall-nuts and myrrh reduced to a fine powder.

For the cure of epulides the application of green vitrol, together with an equal quantity of powdered myrtle and a little alum, is especially recommended.

In dentition, if the gums are painful, it is advisable to rub them with the milk of a bitch. The teeth, moreover, appear very readily, says Galen, if the gums be rubbed with hare's brain.

Against odontalgia, properly so called, independent, that is, of diseases of the gums, Galen particularly recommends warm applications, either on the cheek or directly on the tooth. Externally, on the side of the pain, may be applied dirty (!) pieces of linen, well warmed, or else small bags full of roasted salt, or cataplasms of linseed or barley flour. But if it is desired to act directly upon the sick tooth, this may be rubbed with a branch of origanum (wild marjoram) dipped in hot oil, or else, after applying a bit of wax on the tooth, the heated end of a probe may be laid upon it; or lastly, fumigations may be made by burning the seeds of the hyoscyamus. In case the above remedies, or others like them, be found of no use, Galen recommends them to be adopted anew after having perforated the sick tooth by means of a small drill. But if even from this no benefit be derived, and it is considered well to remove the tooth, this can be done without pain by the application of special medicaments. Among these the root of pyrethrum kept in very strong vinegar for forty days and then pounded takes the first place. The remedy is applied after having well cleaned the sick tooth, and after having covered the others with wax. At the end of an hour the tooth will have already become so loose that it can be drawn out with the fingers or with the mere help

of a style. The same effect may be obtained, says Galen, by the application of blue vitriol mixed with very strong vinegar.

To prevent a carious tooth from producing pain or fetor, he advises the carious hollow to be filled up with black veratrum mixed to a paste with honey.

To restore to blackened teeth their whiteness, Galen advises them to be rubbed with special medicaments, one of which is made up of dried figs, burnt and pounded, with spikenard and honey. He gives, besides the receipts of many dentifrice powders and tinctures designed both to strengthen the teeth and gums and as preservatives against the diseases of these parts. Such powders and tinctures do not offer any interest to us, since they do not much differ from those recommended by other authors whom we have previously quoted.

When one or more teeth, in consequence of a trauma, or from other cause, become loose and project above the level of the others, Galen removes the whole exuberant part by means of a small iron file. In performing this operation, after having covered the gums with a soft piece of cloth, he holds the tooth to be filed steady with the fingers of the left hand, using the file in such a way as not to give the tooth any shock. Besides, he does not complete the operation at one sitting, but rather interrupts it as soon as the patient feels any pain, and continues it after one or two days. In the meanwhile, he makes use of remedies suited to strengthen the loosened teeth, and bids the patient remain silent and nourish himself with liquid or soft food.

When the teeth, without the action of external causes, become loosened, Galen holds that this is due to a relaxation of the dental nerve in consequence of an excessive abundance of humors. In such cases he counsels the use of desiccative remedies.

Galen, like ancient authors in general, is not very favorable to the extraction of teeth with the forceps. Even he seems convinced that a tooth may be made to fall out, without pain, by means of the application of certain remedies, to which we have already alluded. However, in one of the Galenic books[1] we find the precept already given by Celsus, that before extracting a tooth the gums must be detached all around; from which one may argue that, at least in certain cases, instrumental extraction was considered inevitable. Galen even alludes to the pain which sometimes remains after the extraction of a tooth, and is of the opinion that this depends upon an inflammatory condition of the stump of the dental nerve.

In Galen are found recorded many means of cure, recommended by celebrated doctors of ancient times. Elsewhere we have already spoken

[1] Medicus, chap. xix.

of some remedies counselled by Damocrates, by Andromachus the elder, and by Archigenes. Apollonius, as a medicament against odontalgia, advised that the juice of the beet root be dropped into the nostrils, or else a liquid prepared from cumin seed, myrrh, cucumber, and woman's milk. Heraclides of Tarentum recommended against the pains and looseness of teeth that a vinous decoction of black veratrum, mandrake, and hyoscyamus root should be kept in the mouth. Criton prescribed, for strengthening loose teeth, that the mouth should be frequently washed with a vinous decoction of lentisk, myrtle, and gall-nuts.

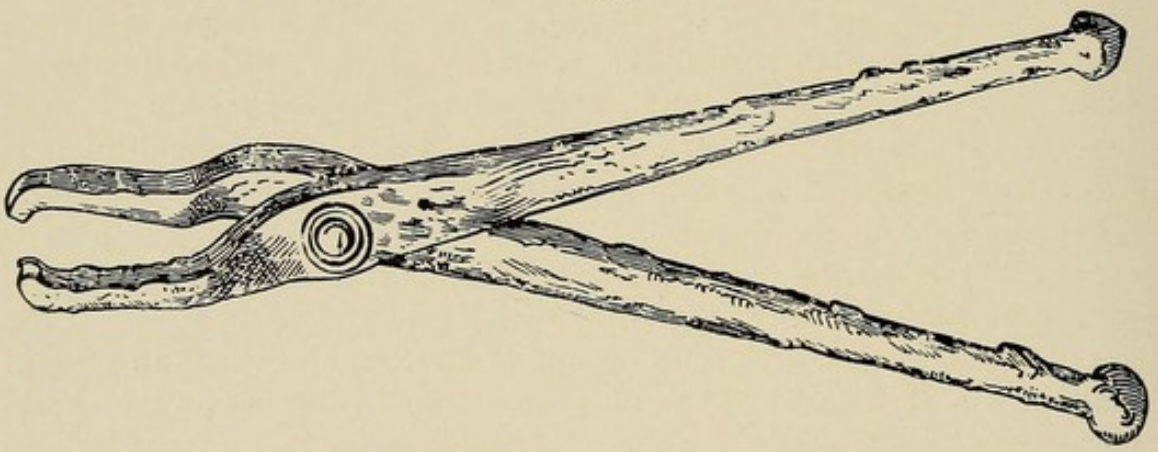
Celius Aurelianus. In the book *De morbis acutis et chronicis*, written by Celius Aurelianus (who lived, according to some, in the third century, according to others, in the fourth or at the beginning of the fifth), a very interesting chapter on odontalgia is found. He shows himself to be, for the most part, a follower of Celsus. During the violence of the pain he advises abstinence from food and rest in bed with the head somewhat raised. As remedies he recommends several mouth washes (infusions or decoctions made with wine or vinegar and with various drugs: ironwort, acacia, mercury herb, mandrake, cinquefoil, poppy, verbascum, hyoscyamus, figs, stag's horns, etc.), and besides, the application of wool soaked in hot oil on the cheek of the affected side, or the application of little warm bags, and also that some hot oil, or the juice of fenugreek,[1] should be kept in the mouth, or milk with honey. When the pain is excessively violent, he has recourse to bloodletting, and after two days' fasting, he begins to feed the patient with liquid and warm food. If the bowels are closed he prescribes the use of clysters, and when, in spite of all, the pain persists, he has recourse to scarified cuppings on the cheek, in correspondence with the pain. In certain cases he also proceeds to scarification of the gums, or else he detaches them all around from the tooth, by means of a special instrument called a *pericharacter*. It would often turn out useful to apply to an aching tooth a grain of incense warmed by the fire and wrapped in a thin piece of cloth, or to press between the teeth, where the pain is situated, several pieces of cloth, in succession, in which some powder of incense has been wrapped, and which are dipped into hot oil before being used. The author, moreover, commends external fomentations made by means of sponges soaked with emollient decoctions and afterward squeezed; and also the application of moderately hot cataplasms.

When the odontalgia has already become inveterate and recurs in paroxysms, separated by intervals of calm, Celius Aurelianus counsels, among other things, that the general health be strengthened by temperate living, exercise, rubbing of the whole body (an ancient practice, now

[1] Trigonella fœnum græcum, a papilionaceous plant.

revived under the name of massage). He recommends, besides, special rubbing of the cheeks (to be carried out with a rough cloth), and also of the gums and teeth, and indicates a great number of medicaments, some of which are to be used during the paroxysms and others during the periods of calm. In regard to the use of narcotics, he very shrewdly observes that such remedies take away sensibility but not pain. Some doctors of those days, for the cure of odontalgia, had recourse to sternutatories, or to the dropping of special medicaments into the nose or into the ear, but Celius Aurelianus seems to have put but little faith in such means of cure. He, moreover, solemnly reproaches those who, to cure odontalgia, are too hasty in having recourse to the extraction of the aching tooth. To remove a part, says he, is not to cure it; and if every tooth that aches has to be extracted, it would be necessary to draw them all out when they all ache. Therefore, before having recourse to extrac-

FIG. 33



Roman dental forceps found (1894) at Hamburg, Germany, in the ancient Roman castle Saalburg. (Geist-Jacobi.)

tion, every other means of cure should first be tried. If the removal of the tooth becomes indispensable, he advises that it should never be performed during the violence of the pain, for from this serious consequences might arise (a prejudice which has not yet entirely vanished, and which is met with, sometimes, not only among common people, but even among physicians); and a still greater danger would be the extraction of teeth neither carious nor loose, seeing that, by consensus, the muscles, the eyes, and the brain might suffer. The author, on this point, quotes Herophilus and Heraclides of Tarentum, who related some cases in which the extraction of a tooth was followed by death. He alludes, moreover, to a passage of Erasistratus, regarding the "odontagogon of lead" (*plumbeum odontagogum*) which was exposed in the temple of Apollo at Delphi; as much as to show that it was not lawful to extract teeth

other than those which were so loose that an instrument of lead was sufficiently strong to extract them.

When the looseness of the teeth seems to depend upon the flaccidity of the gums, Celius Aurelianus recommends astringent mouth washes: decoctions of rind of pomegranate, of gall-nuts, of acacia, of quince, of myrtle berries, etc.; and besides these, lentiscine oil and asses' milk, which latter was also believed to possess astringent virtues. Against hemorrhages of the gums, he advises the use of very fine coral powder, or of alum with honey.

Gnaeus Marcellus Empiricus, of Burdigala (Bordeaux), who lived at the end of the fourth century and at the beginning of the fifth, wrote a book, *De medicamenti*, which shows, more than anything else, the decadence of the medical science in those days. Regarding the diseases of the teeth and their cure, Marcellus does not tell us anything new. He freely copies Scribonius Largus and other authors, not adding anything save a few methods of cure, which are exceedingly strange and superstitious. To get rid of toothache, it is sufficient that the patient, when the moon is waning, and in the days of Mars (Tuesday) or of Jupiter (Thursday), repeat seven times the words *argidam*, *margidam*, *sturgidam*. It is a great pity that a curative method so simple and easy be efficacious in two days of the week alone, and even then on condition that the moon be waning.

The following method is also a very good one: Whilst in the open country, one must take a frog by the head, open its mouth and spit into it, then having begged the animal to take the toothache with it, must replace it on the ground and let it free. To remove loose teeth easily, it is necessary to keep in reserve some juice of black ivy mixed with a little green oil; in case of necessity, the nose of the patient must be anointed with it, and after having drawn a deep inspiration, he must put a little stone between his teeth, and stay with his mouth open, inclined a little forward, so as to let all the morbid humor flow out, which sometimes flows very abundantly and even may reach to three herminæ.[1] Having afterward rubbed the nose with pure oil, and washed the mouth with wine, the teeth will be free from every pain and may be very easily pulled out. If the root[2] of a tooth be rubbed with dried African sponge, the tooth will fall out within three days; naturally, says the author, care must be taken not to touch, whilst doing this, any healthy tooth. He who desires never to be subject to pain in the teeth, may obtain this end by the following method: When at the beginning of spring he sees the first swallow, he must go in silence to some running water, take some of it in his mouth, rub his teeth with the middle fingers of both his hands, and say: "*Hirundo*,

[1] [About twenty-eight fluidounces.—E. C. K.]

[2] Under the name of *root*, the ancients meant also the *neck* of the tooth.

tibi dico, quomodo hoc in rostro iterum non erit, sic mihi dentes non doleant toto anno."[1]

The same must be done each following year, so as to continue to enjoy the effects of such a cure!

Adamantius, an Alexandrine philosopher and physician, who probably lived in the fourth century, paid much attention to the diseases of the teeth, as may be argued from two chapters of the *Tetrabiblos* of Ætius. One of these chapters is entitled, according to the Latin translation of Giano Cornario: "Cura dentium a calido morbo doloroso affectorum, ex Adamantio, sophista."[2] This writer clearly belonged to the pneumatic school, founded as early as 69 A. D. by Athenæus of Cilicia. According to the pneumatics (so called, because they admitted the existence in the animal organism of an aëriform principle, *pneuma*, to which they attributed great importance), heat and dryness gave rise to acute maladies; the phlegmatic affections generally arose from humidity, and melancholy was brought on by cold and dryness, as every object dries up and becomes cold on the approach of death. The author says that the cure must vary according as the disease affects in a greater degree the gums or the teeth themselves with or without participation of the dental nerves and neighboring parts. He makes, in regard to this, many subtle distinctions; but the remedies which he counsels do not offer to us any special interest, being almost identical with those that had been recommended by Galen and by other doctors prior to Adamantius. The latter also gives much importance to dietetic therapy; he prescribes that such patients should nourish themselves with pottages of barley, or of spelt, with eggs, lettuce, pumpkins, and other cooling food, abstaining, however, from wine.[3]

The author enumerates among the causes of such dental affections the dryness of the air, the autumnal season, the dry constitution of the individual, a troubled life, and scanty nourishment. The use of sour and piquant substances is not favorable to these patients, so much so that the mulberry preserve produces, not unfrequently, violent dental pains in them. Adamantius, therefore, advises, in such cases, not to use strongly astringent mouth washes, but rather lenitive, moistening, and emollient substances; simple lukewarm water, decoction of bran, licorice juice, starch with boiled must of wine diluted with warm water, milk, especially asses' milk, decoction of mallows and the like.[4]

The work of Adamantius from which Ætius has taken the above-mentioned chapters is lost to us. Of his writings there only remain to

[1] Swallow, I tell thee, as this water will not be again in my mouth, even so my teeth will not ache for the whole year.

[2] The cure of teeth affected by warm painful disease; according to Adamantius the sophist.

[3] Ætii tetrabibl., ii, sermo iv, cap. xxvii.

[4] Ibid., cap. xxxi

us the treatise *on the winds* and the one *on physiognomics*. In this latter book the author attributes great importance to the canine teeth as physiognomonic elements, and from their shape and size he makes deductions in regard to the character of the individual.

Oribasius (316 to 403), the most celebrated of all the compilers who appeared during that long period of decadence, wrote, by order of the Emperor Julian the Apostate, whose physician and friend he was, a whole medical encyclopedia and later on a summary (synopsis) of this same work of his. In the books of Oribasius are found many things about dentition and diseases of the teeth, but they are all taken, substantially, from preceding authors, and therefore it is not worth while repeating them.

Ætius of Amida, a celebrated Greek writer on medicine, lived at the end of the fifth century, and at the beginning of the sixth, and has also left us a kind of medical encyclopedia, which, being divided into four sections, each composed of four books, was called *Tetrabiblos*. He teaches that the mucous membrane of the gums, tongue, and mouth is provided with nerves from a portion of the third pair of cerebral nerves, and that the teeth, too, by a small hole existing at the end of every root, receive tiny ramifications of sensitive nerves, having the same origin. The nutrition of the teeth is understood by Ætius in the following way: The nourishment which reaches the dental nerves is not entirely assimilated by them; these only appropriate the liquid or soft part and reject the drier part. This accumulates in the alveoli, becomes by degrees more tenacious and denser, finally being transformed into osseous substance and forming the nutriment of the teeth; these, therefore, tend to grow continually, although the waste arising from the mechanical action of mastication prevents them from undergoing any real or visible growth. On the other hand, in the old, from the weakening of the nutritive functions, the teeth become thin and loose, and finally fall out.[1]

Ætius advises that during dentition hard objects to chew should not be given to children, seeing that the gums being hardened by these and becoming almost callous would render the cutting of the teeth very difficult.[2]

For curing parulides, he reco nmends emollients at the beginning of the disease, and later on astringents. But if the inflammation of the gums does not resolve and passes into suppuration, he prefers to perform the excision of the parulis, instead of making a simple incision, which might very easily cause the abscess to change into a fistula.[3]

The epulis, according to Ætius, is a fleshy excrescence of the gums, brought on by inflammation. To cure it, he uses, during the inflammatory

[1] Ætii tetrabibl., ii, sermo iv, cap. xix.
[2] Ibid., i, sermo iv, cap. ix.
[3] Ibid., ii, sermo iv, cap. xxiv.

period, emollients, and then, when the inflammation has subsided, astringents and weak caustics. Lastly, if the epulis resist these remedies, he takes hold of it with a vulsella and proceeds to remove it with a small scalpel.[1]

When the incision of a fistula of the gums and the use of appropriate remedies are not sufficient for curing it, Ætius advises the extraction of the diseased tooth, from which the fistula has its origin.[2]

Apart from what has been mentioned, Ætius does not tell us, in regard to dental diseases, anything worthy of note, and in many places he only repeats Galen's observations.

Paul of Ægina (seventh century) establishes a very clear distinction between epulis and parulis. The epulis is a fleshy excrescence of the gums in the neighborhood of a tooth; the parulis is an abscess of the gums. To cure the former affection it is necessary, says the author, to sieze and stretch the tumor with a vulsella or with a hook and to perform its excision. As to the parulis, although not unfrequently it is sufficient, for curing it, to give an exit to the pus by means of a slight incision, the author, however, usually prefers the method of cure recommended by Ætius, viz., excision. After such operations he orders the patient to rinse his mouth with wine and on the morrow with hydromel.[3] From the third day onward he sprinkles the wound with a cicatrizing powder, until a complete cure is obtained. But if the wound, instead of healing, be transformed into a putrid ulcer resisting all the ordinary means of cure, it is necessary to cauterize the part affected with an oval-shaped cautery.[4]

In extracting a tooth, the operation is begun by detaching the gum all around it as far as the alveolar border; then the tooth is seized with the forceps, shaken loose, and drawn out. Paul of Ægina, like Celsus, recommends that before extracting a tooth deeply attacked by caries, the cavity be filled up with lint, in order to avoid the crumbling of the tooth under the pressure of the instrument. On the other hand, he too is convinced that a diseased tooth can be made to fall out without pain, by the use of suitable remedies.

When supernumerary teeth cause an irregularity of the dental arches, this must be corrected, says the author, either by resection of such teeth, if they are very firm, or by their extraction.

If a tooth projects above the level of the others, the protruding part must be removed with the file. This instrument must also be employed to remove the sharp edges of broken teeth.

[1] Tetrabibl., ii, sermo iv, cap. xxv. [2] Ibid., cap. xxvi.

[3] [The author quoted directs hydromel to be made from one part of honey and eight parts of water boiled until it has ceased frothing.—E. C. K.]

[4] Pauli Æginetæ de re medica, lib. vi, cap. xxvii.

Tartar incrustations must be removed either with scrapers or by means of a small file.[1]

During the period of dentition one must not give children any food which requires mastication, and to soften the gums they must be anointed with hen's fat or with hare's brain.[2]

To preserve the teeth and to keep them healthy, Paul of Ægina recommends all tainted food to be avoided, and also all possibility of indigestion and frequent vomitings; the use of very hard or glutinous food or of such as may easily leave a residuum between the teeth, for example, dried figs, and likewise very cold food and such as set the teeth on edge. He also advises that hard things should never be broken with the teeth and that the latter be carefully cleaned, especially after the last meal of the day.[3]

Paul of Ægina also belongs to the class of compilers; but in utilizing the writings of the great physicians who had preceded him, he gives evidence of exquisite good sense, and not infrequently subjects the assertions of his predecessors to an intelligent and enlightened criticism. Besides, he inserts here and there observations and experiences of his own that are not without interest. He has always been, and rightly so, considered one of the greatest physicians of ancient times, the great reputation which he justly held among the Arabs contributing not a little to his renown.

This author is the last of the Byzantine period, and with him, therefore, we must close the earlier part of the history of dentistry. If, before passing to the middle period, we cast a glance over the ground already traversed, it is easy to perceive that dental art, in ancient times, reached its highest degree of development at the time when the Roman civilization was in its greatest splendor, when, in the capital of the world, wealth, luxury, and the refinements of social life marvellously increased its needs, and by this also gave an impulse to the evolution of all human activity. But ancient civilization, after having reached its culminating point, soon fell into decadence, and this necessarily would result in a hindrance to the development of dental art. From the days of Archigenes right up to those of Paul of Ægina, dentistry did not make the least progress; indeed, as far as prosthetic dentistry is concerned, there was probably a retrograde movement, it being very likely that when Italy was subject to the dominion of the barbarians and when Christianity —which but recently had asserted itself—was strongly imposing on the human mind a deep contempt for all that regarded the welfare and beauty of the human body, no one could, any longer, think of artificially repairing the losses sustained by the dental system through disease or injury.

[1] Lib. vi, cap. xxviii. [2] Ibid., cap. ix. [3] Ibid., cap. xxix.

PART II.

SECOND PERIOD—THE MIDDLE AGES.

CHAPTER VIII.

THE ARABIANS.

The religious fanaticism excited by Islamism, transformed the obscure and nomad inhabitants of Arabia into a conquering nation, who very soon extended their power over a considerable part of Asia, Africa, and Europe. Spain, invaded by the Arabs in 711, fell almost entirely into their hands. After having by force of arms rendered themselves powerful and dreaded, the Arabians acquired also great fame by the culture of art and science within the limits allowed them by their religious code; and in these, for more than four centuries, they maintained an incontestable preëminence.

Unfortunately, as the Koran most absolutely prohibited the dissection of dead bodies, all serious anatomical research was thereby rendered impossible. This was a very great hindrance to the progress of anatomy, of physiology, and, in consequence, of the whole of medical science. The Arabians certainly had the merit of keeping alive the study of medicine in an age of decadence and barbarism; but, apart from the important progress realized by them in chemistry and pharmacology, it may be affirmed that the Arabs contributed but scantily to the development of the healing art; they followed almost entirely in the footsteps of Galen and other ancient, and especially Greek, authors.

One of the characteristics of Arabian medical art consists in the aversion to bloody operations and in the effort to avoid them. A like tendency shows itself also in the sphere of dentistry; the Arabians, even more than their Greek and Roman predecessors, were reluctant to extract teeth, and employed all possible means, in order to avoid the operation.

Rhazes (or more precisely, Abu Bekr Muhammed ben Zacarja er Rhazi) was born in Persia toward the middle of the ninth century, and gave himself up to the study of medicine when about thirty years of age, having previously been a musician. He wrote many works which,

unfortunately, have, for the most part, been lost. Rhazes did not have recourse to the extraction of teeth, save as a last resource when every other attempt at cure had proved useless; which method would no doubt have deserved high praise, had the author been inspired by the principles of conservative surgery, rather than by unjustifiable fears. Caries of the teeth is, according to him, identical with that of the bones. To hinder its progress and propagation to the neighboring teeth, he advises the carious cavity to be filled with a "cement" composed of mastic and alum. We have here a laudable attempt at permanent stopping of decayed teeth, although it is clear that the duration of such stopping, owing to the nature of the materials employed, could not be a long one. Furthermore, he counselled the patient to abstain from the use of acid food or drink and to rub the teeth with powder of gall-nuts and pepper.

To strengthen loosened teeth, he recommended astringent mouth washes and sundry dentifrice powders. Others, partly taken from Galen, are recommended by him for prophylactic purposes and for cleansing and beautifying the teeth.

Against periodontitis and the pains produced by it, he sometimes had recourse to bleeding. He commended, besides, opium, oil of roses, pepper, and honey, and also the scarification of the gums and the application of a leech. If, however, these remedies did not succeed, he applied his theriac, which was composed of castoreum, pepper, ginger, storax, opium, and other ingredients, to the roots of the teeth. If even this method of cure failed, he touched the root of the diseased tooth with a red-hot iron, or sought to provoke its fall by the use of special medicaments, such as coloquintida and arsenic (a substance to which he had recourse, particularly in those cases where there was ulceration of the gums). It is no wonder that such means of cure would sometimes produce, as a final result, the actual falling out of the tooth; and this, as is natural, served to strengthen the belief that the same result could also be obtained with less energetic remedies, but which were supposed to be equally endowed with expulsory virtues.

Rhazes relates an interesting case of regeneration of a whole lower jaw; he, however, observes that the newly formed osseous mass was less hard than the original bone.[1]

Ali Abbas, another great Persian physician (who died in 994), wrote a lengthy treatise on theoretic and practical medicine, one chapter of which is dedicated to the diseases of the teeth. When a molar tooth is affected by caries, and the pain cannot be subdued in any other way, Ali Abbas applies, inside the carious cavity, the end of a small metallic tube, into which he repeatedly introduces red-hot needles, leaving them

[1] Rasis opera, Venetiis, 1508.

in the tube until quite cooled. Should even this have no effect, he tries to provoke the fall of the tooth by the application of asses' milk with assafetida, or, finally, extracts it.[1]

He cures epulis, like Paul of Ægina, by excision. As to parulis, or abscess of the gums, he opens it with a lancet or a wooden stylus.

When the dental arch is deformed by the existence of supernumerary teeth, he removes these with an instrument in the shape of a beak.[2]

Serapion (Jahiak Ebn Serapion), who lived in the tenth century, and up to the beginning of the eleventh, contributed but slightly to the development of medicine and dentistry, as he was in his writings little more than a mere compiler. He indicates with great precision the number of dental roots, and expresses an opinion that the upper molars have need of their three roots in order to keep firm in spite of their pendent position, whilst two roots alone are sufficient to keep the lower molars in place, on account of the support which they receive from the jaw. Serapion, like Galen, admits the nutrition and continual growth of the teeth—a growth which is produced in the same proportion as the waste due to mastication —and he too makes the dental diseases depend upon an alteration in the nutritive process, either by excess or by defect.

Against dental pains of phlogistic origin, he recommends bloodletting, purgatives, and many local medicaments, reproduced in great part from Rhazes. In cases of persistent odontalgia due to caries, he advises, as an excellent remedy, the application of opium in the carious cavity. To strengthen loosened teeth, he first employs astringents, and if these are of no use, as often happens in the old, he binds the loose teeth together and to the neighboring healthy ones, by means of gold or silver wire.

In Serapion, too, we find many formulas for dentifrice powders, some of which are intended simply for cleaning the teeth, others for special prophylactic or curative purposes.[3]

Avicenna. One of the greatest luminaries of medicine among the Arabs was Avicenna (Ebn Sina). He was born in 980 son of a high Persian functionary; he lived a very adventurous life, held some very high places, and died in 1037. Among his works, the most important is the *Canon*, a book which procured him the title of "second Galen" and the still more pompous one of "prince of doctors." A very evident proof of the immense fame which he acquired is the fact that among many oriental peoples Avicenna, even in our own days, is considered the greatest master of medicine.

The anatomy and physiology of the teeth are treated by Avicenna very minutely, but nevertheless he does not teach us, in regard to these,

[1] Haly Abbas Pract., lib. v, cap. lxxviii.

[2] Ibid., cap. xxxiii.

[3] Serapionis practica, Venetiis, 1503.

anything new. Like Galen, Avicenna admits that the teeth continually grow, and as a proof he gives the fact of the lengthening of the teeth, which, owing to the absence of antagonists, are not subject to any pressure or friction.

He gives much good advice with regard to the preservation and cleanliness of the teeth, to which he attaches very great importance; and on this point he remarks that the use of very hard tooth powders must be avoided, as these are liable to injure the dental substance. To this latter are also harmful, says the author, some narcotic remedies, employed against odontalgia. Burnt hartshorn is, according to him, a most valuable dentifrice. To remove tartar from the teeth, he indicates many remedies, and especially dentifrices of meerschaum, salt, burnt shells of snails and oysters, sal ammoniac, burnt gypsum (plaster of Paris), verdigris with honey, etc. Among the substances able to facilitate dentition, he enumerates several oils and fats, besides the brain of the hare and the milk of the bitch, and he disapproves the custom of giving to children, during dentition, hard objects to chew, in the erroneous belief that the biting of such objects is useful in facilitating the cutting of the teeth; he recommends, instead, the gums to be rubbed with the fingers. When the teeth begin to appear, he drops some oil into the ears of the child and covers its head, neck, and jaws with a plaster spread on cotton that has been soaked in oil.

Avicenna minutely examines the various causes of odontalgia, and among them includes also the little worms by which the dental substance was supposed to be gnawed away.

When a tooth becomes the seat of intense pain, accompanied by a throbbing feeling, Avicenna considers that this is due to an excessive accumulation of humors in the root; he therefore advises, as already Archigenes had done, the tooth to be drilled, in order to empty it, and afterward to introduce into it appropriate remedies.

According to Avicenna, he who has a loosened tooth and desires to make it firm again, must avoid using it in mastication, must not touch it with the fingers, nor move it with the tongue; besides this, he must speak as little as possible, and make use of astringent remedies.

To remove a tooth, Avicenna made use of either the forceps or the "eradicating remedies," in which he, too, had full confidence. Like the greater part of his predecessors, Avicenna is of the opinion that the extraction of a firm tooth must be avoided as much as possible, as it may give place to an injury of the jaw, or become harmful to the visual organ, or bring on fever. On this point he remarks that, if an aching tooth appears to be sound, it is not always necessary to perform its extraction in order to cause even the most rebellious odontalgia to cease; in certain cases he obtained a complete cessation of the pain after having

simply shaken the tooth without completing its extraction; which according to him was due to the double reason that by shaking the tooth a resolution of the morbid matter stagnating under it is provoked, and the action of the medicaments that are afterward made use of is thus favored.

Among the eradicating remedies, the author enumerates white arsenic, orpiment, coloquintida, tithymallus, the fat of frogs, and others. He remarks, however, that before using them it is advantageous to detach the gum all around.

Against the supposed worms in carious teeth, he praises fumigations made with the seeds of the hyoscyamus, garlic, or onion.

Arsenic is used by him not only for the above-mentioned purpose, but also for the cure of fistulas and foul ulcers of the gums.

When a tooth has become abnormally long, Avicenna makes use of the file to reduce it to a proper size; and in performing such an operation, he holds the tooth firmly between the fingers, or with a pair of pincers suited for the purpose. As a consecutive treatment, he prescribes frictions with alum, laurel berries, and aristolochia.[1]

Abulcasis. Among the Arabian authors, he who has the greatest importance in regard to dental art is undoubtedly Abulcasis (Abul-Casem-chalaf-ben-Abbas). Whilst Avicenna was one of the greatest physicians, Abulcasis was one of the greatest surgeons; and very justly he has been called the genius of Arabian surgery.

Abulcasis had his birthplace in Alzahra, a small Spanish village, five miles from Cordova; from this he derived the name of Alzaravius, by which he is also known. Historians are not agreed upon the date of his birth. According to the most probable opinion, he was born about the year 1050 and died in 1122 at Cordova, a city which, on account of its celebrated school, was then a most important centre of scientific and literary culture.

Among the works of Abulcasis, the one which brought him the greatest fame was the treatise *De Chirurgia*. It is divided into three books, in the first of which he speaks of all the diseases which can be treated by cauterization; in the second are described all the operations which are performed by cutting, perforating, or extracting (wherefore, obstetrics is also included in this book); in the third, lastly, the author treats, region by region, of fractures and luxations.

Chapters XIX, XX, and XXI of the first book have reference to diseases of the teeth and gums. As these chapters are very short, we are pleased to give here an almost literal translation of them:

"When in the lower part of the gums, or in the palate, there appears a little tumor, which afterward becomes purulent and opens and changes

[1] Avicennæ opera in re medica, Venetiis, 1564.

into a fistula, against which no medical remedy is of any use, it is necessary for thee to take a cautery corresponding in size to the aperture of the fistula, and after having heated it, to introduce it there and to keep it applied there until the cauterizing iron reaches the bottom of the said fistula and beyond. This thou shalt do once or twice, and then shalt use fitting medicaments until a complete cure is obtained. This is attained when suppuration ceases. Otherwise one cannot do less than uncover the bone and extract that part of it which is diseased."[1]

"When through excess of moisture the gums become flaccid, the teeth loose, and of no use are the remedies employed by thee, thou shalt lay the patient's head on thy lap, and after having applied to the tooth, where it borders on the gum, the end of an appropriate little metal tube, in this thou shalt quickly introduce the cautery of which mention will be made in the following chapter; and thou shalt prolong the application as long as suffices to let the patient feel the heat right in the root of the tooth. This thou shalt repeat as often as thou shalt think necessary. Then the patient shall keep salt water in the mouth for an hour. By effect of such a cure, the corrupted moisture will dry up, the gums will regain their tone, and the tooth its firmness."[2]

"When toothache depends upon cold, or if there exist some worm in the tooth, and the medicaments are of no use, recourse must be made to cauterization, which in such cases may be performed in two ways, viz., either by means of butter or with a cautery. Desiring to use butter, some of it must be warmed in an iron or copper spoon; a little cotton must then be wrapped around the extremity of a probe, dipped into the boiling butter, and then immediately applied to the tooth, keeping it there in contact until it has cooled. This must be repeated several times, so that the action of the heat reaches right down to the root of the tooth. If thou preferest, thou canst use cold butter, applied to the aching tooth by means of a little tuft of wool or cotton, upon which thou shalt lay a red-hot iron; prolonging the application of this until the heat has reached the very root of the tooth.

"To perform the cauterization directly with the iron, thou must first rest on the tooth a small tube of iron or copper, designed to preserve the neighboring parts from the action of the heat, and which must, therefore, be of sufficient thickness. Through such a tube thou shalt apply on the tooth a cautery of the shape given here below, and shalt keep it there until it is cooled. This thou shalt do several times. The pain will cease the same day or on the morrow. It is, however, necessary that

[1] Abulcasis de Chirurgia, lib. i, cap. xix, p. 47; Latin translation by Channing with the Arabic text in front, Oxford, 1778.

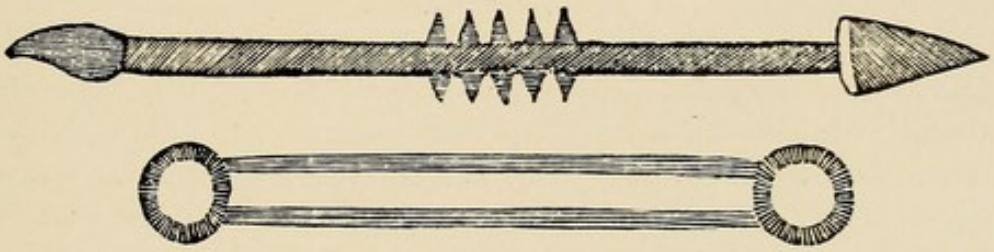
[2] Cap. xx, p 47.

after the cauterization the patient should keep his mouth, for an hour, full of good butter. The shape of the cautery is as follows (Fig. 34): Thou canst perform the cauterization with one or other of its two extremities, as is most convenient."[1]

In regard to epulis, Abulcasis prescribes that after catching hold of the little tumor with a hook or a vulsella its complete excision should be performed. This done, one must wait awhile, until the hemorrhage ceases, and then either a little "zegi" pulverized,[2] or other drying and styptic powder, must be applied on the part. If the epulis recurs, which very often happens, the excision must be repeated and this followed by cauterization, since after this latter the evil will not return.[3]

Abulcasis is the first author who has taken into serious consideration dental tartar and who has recommended that a scrupulous cleansing of the teeth should be performed. The chapter relating to this, "On the Scraping of the Teeth," is very interesting and is worthy of being here reproduced.[4]

FIG. 34



Abulcasis' dental cautery and the tube through which it was applied, in order to preserve the neighboring parts from the action of the heat.

"Sometimes on the surface of the teeth, both inside and outside, as well as under the gums, are deposited rough scales, of ugly appearance, and black, green, or yellow in color; thus corruption is communicated to the gums, and so the teeth are in process of time denuded. It is necessary for thee to lay the patient's head upon thy lap and to scrape the teeth and molars, on which are observed either true incrustations, or something similar to sand, and this until nothing more remains of such substances, and until also the dirty color of the teeth disappears, be it black, or green, or yellowish, or of any other color. If a first scraping is sufficient, so much the better; if not, thou shalt repeat it on the following day, or even on the third or fourth day, until the desired purpose is obtained. Thou must know, however, that the teeth need scrapers of various shapes and figures, on account of the very nature of this operation. In fact, the scalpel with which the teeth must be scraped on the inside is unlike

[1] Cap. xxi, p. 49.
[2] Zegi was the name given by the Arabs to blue vitriol.
[3] Lib. ii, cap. xxviii, p. 181.
[4] Lib. ii, cap. xxix, pp. 181 to 183.

that with which thou shalt scrape the outside; and that with which thou shalt scrape the interstices between the teeth shall likewise have another shape. Therefore, thou must have all this series of scalpels ready if so it pleases God."[1]

The work of Abulcasis is, so far as we know, the first book in which are found figures of dental instruments. We do not know, however, how far such figures are exact, that is, to what degree of faithfulness they represent the instruments which Abulcasis really employed as the original figures of the book of Abulcasis were copied and recopied by successive transcribers of the work. And that such copies have been very often unfaithful may be deduced from the fact that not unfrequently figures of surgical instruments are found in the book which do not at all agree with the verbal description which the author gives of such instruments.

In the edition by John Channing, we find at the end of the chapter on the scraping of the teeth two series of figures. The first series is found under the Arabic text, and is composed of the fourteen figures reproduced as Fig. 35; the other series, existing under the Latin text, has only twelve figures, as shown in Fig. 36.

As Channing has made his translation from two different Arabic copies of Abulcasis,[2] among the corresponding figures of which there exists a very notable difference, he, for the greater part, had to follow the plan of reproducing the figures of both codices. But besides this numerical difference, there is also a considerable difference in the shape of the instruments represented. We must, therefore, ask ourselves which of the two series of figures is to be regarded as the more faithful representation of the instruments used by Abulcasis. Most probably the first series. In it we find figured some scrapers which have a certain resemblance to those actually in use; besides this, the figures of the first series seem to be drawn with greater accuracy than those of the second. Among other things it may be noticed that the handle of each instrument (excepting the last two) is furnished with a row of prominences, which, it is almost certain, were designed to afford a better grip in holding the scrapers during the operation.

We now consider the chapter on the extraction of teeth.[3] The author begins by saying that it is necessary to use all possible means to cure an attack of odontalgia, and to be very slow in deciding to extract a tooth, as this is a very noble organ, the want of which cannot in any way be perfectly supplied. When there is no way of avoiding extraction and the

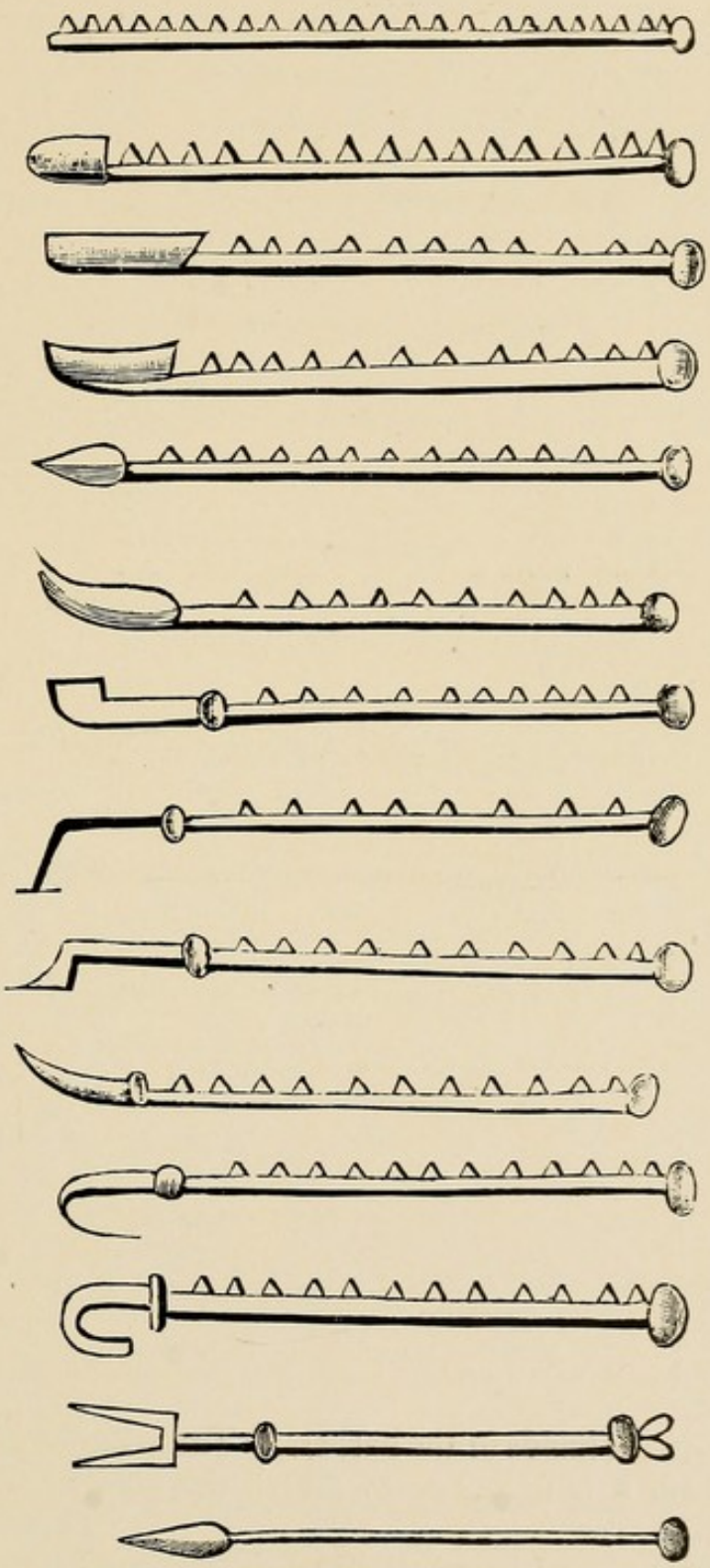
[1] This great Mahommedan surgeon was, it seems, very religious. His book begins with the words: "In the name of the merciful God, Lord perfect in goodness," and almost every chapter ends with "If God so wills," and the like.

[2] These two manuscript codices are found in the Bodleian Library at Oxford.

[3] Lib. ii, cap. xxx, p. 185.

patient is obliged by pain to submit to this, it is necessary first to ascertain which is the aching tooth, as very often the pain deceives the patient,

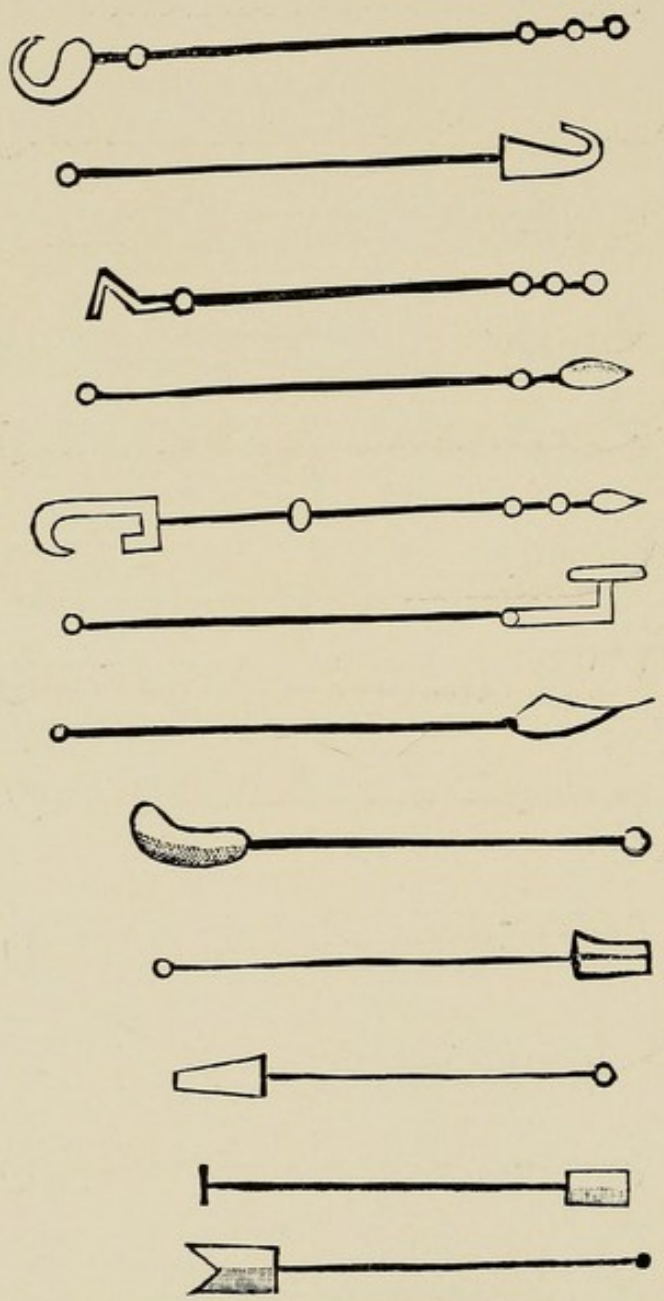
FIG. 35



Set of fourteen dental scrapers (Abulcasis).

so that he may indicate as the seat of the pain another tooth which is perfectly sound, and desire it to be extracted; after which, naturally, the pain does not cease, if not when the diseased tooth is also extracted, as

FIG. 36



Twelve dental scrapers as represented in another manuscript codex of Abulcasis.

often happens in the hands of the barbers.[1] The aching tooth having been well ascertained, it is necessary to detach the gum from the tooth, all

[1] The Arabic word used by the author means more precisely "those who apply cupping glasses." Channing has translated it by *tonsores*, barbers.

around, with a sufficiently strong scalpel. Then either with the fingers or with a light pair of forceps the tooth must be shaken very gently, until it is loosened. Then the surgeon, keeping the head of the patient firmly between his knees, applies a stronger pair of forceps and extracts the tooth in a straight direction, so as not to break it. If it is not possible to draw it out, one of those elevators must be taken which the author advises for the extraction of roots (as may be seen afterward), and by insinuating it under the tooth the surgeon must endeavor to extract it. When the tooth is corroded and hollow, it is necessary to fill the cavity with lint, compressing it hard inside with the end of a probe,[1] so that the tooth may not break under the pressure of the instrument. In all cases, the operator must take great care not to break the tooth, for if this happens the re-

FIG. 37

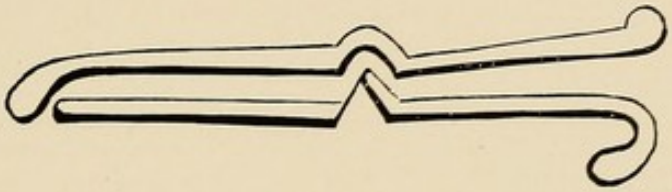
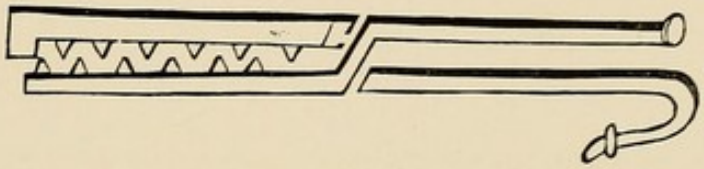


FIG. 38



Forceps for loosening the tooth previous to extraction (Abulcasis).

maining part will give the patient still greater suffering. It is necessary, therefore, to avoid acting like the ignorant and foolish barbers, who in their temerity do not observe any of the above-mentioned rules, and therefore very often cause the patients great injuries, the least among which is the breaking of the tooth, the root being left in the socket, or else the taking away, together with the tooth, of a piece of the maxillary bone, as the author often happened to see. After the extraction the patient must rinse his mouth with wine, or with vinegar and salt. If, as often happens, hemorrhage is produced, a little powdered blue vitriol must be applied inside the wound; and if this is not sufficient, the part must be cauterized with a red-hot iron.

The small forceps (Figs. 37 and 38) to be used in loosening the tooth must have the handle shorter than the jaws and be sufficiently strong not to bend when pressure is put upon the tooth.

The large forceps (Figs. 39 and 40) with which the extraction must

[1] An advice already given by Celsus.

be performed should be made of very good Indian or Damascene iron, and have the handle longer than the jaws; these, moreover, on the inside must be toothed, or striated after the manner of files, so that they may have a perfectly firm grip, without slipping.

From the foregoing quotations and on examining the annexed figures, it very clearly appears that the extraction of teeth was performed by Abulcasis with excessive timidity and in a manner which must have been torturing to the poor patients. These had to undergo, first of all, the detachment of the gums, then the prolonged shaking of the tooth either with the fingers or with the forceps, then the attempt at extraction by means of a stronger pair of forceps, but, so far as can be seen from the figure, very little fitted for the purpose; and finally, in many cases, fresh maneuverings to extract the tooth with an elevator.

FIG. 39

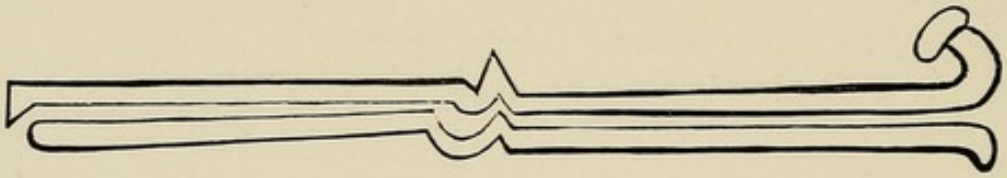
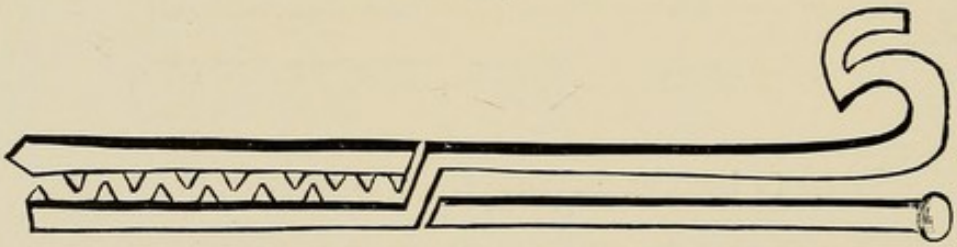


FIG. 40



Forceps for performing the extraction after the tooth has been loosened (Abulcasis).

Nothing better, in truth, could have been done with such imperfect instruments. But it is possible that even then there perhaps existed, for the extraction of teeth, other instruments, so shaped as to be able to act with greater force. Abulcasis himself[1] alludes to the existence of dental instruments not mentioned by him. It is probable, therefore, that the barbers, in spite of the scorn with which Abulcasis overwhelms them, used, for the extraction of teeth, forceps far more suitable than those described by him. These individuals, certainly unfurnished with a scientific education, must have had, however, a great practice in the extraction of teeth, being perhaps almost the only ones to whom recourse was had for this operation. They performed it very quickly, as may be argued from the words of Abulcasis himself. It is no wonder, therefore, that not unfrequently the work of these *fatui tonsores*[2] was the cause

[1] Lib. ii, cap. xxxi, p. 191.

[2] Silly barbers.

of more or less serious injuries, but for the most part it had the advantage of not making the patients suffer excessive torture.

Another very interesting chapter is that which treats of the extraction of dental roots and fragments of the maxillary bone.[1]

FIG. 41

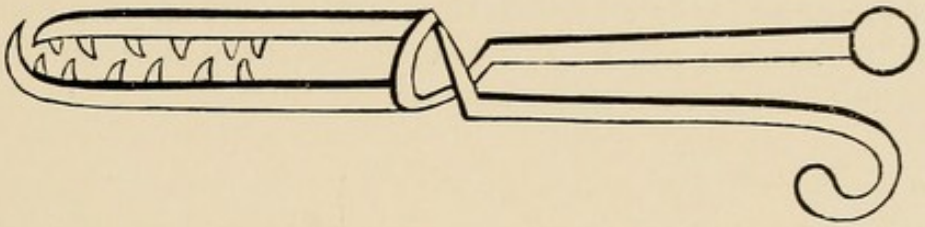
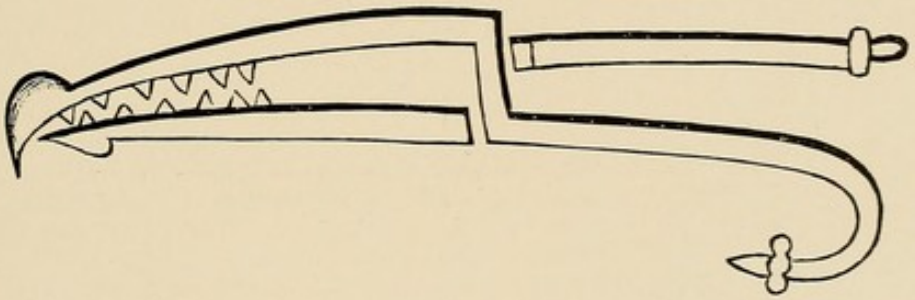


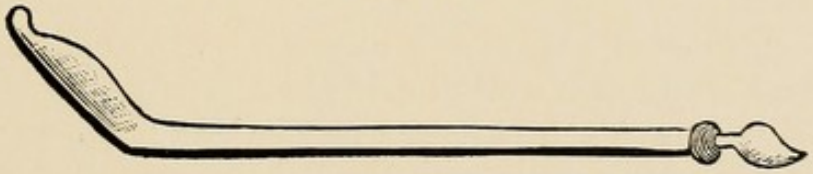
FIG. 42



Forceps for extracting the root when the tooth breaks in the extraction. These figures are evidently very badly drawn, as are most of the figures to be seen in Abulcasis' work.

When, says the author, on extracting a tooth, this breaks, so that the root remains in the socket, it is necessary first of all to soften the part, by applying for a day and a night, or for two days, some cotton wool well smeared with butter; then attempts must be made to extract the root with a pair of forceps, the jaws of which are like the beak of a pheasant or stork.

FIG. 43



Elevator to be used when the extraction of a root by means of the root forceps proves impossible (Abulcasis).

If this is not successful, it is necessary to remove with a scalpel the whole of the gum which covers the root; then under it must be insinuated a small elevator having the shape here below represented.

If not even in this way can the end be attained, recourse must be made

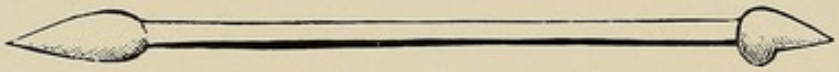
[1] Lib. ii, cap. xxxi, p. 187.

to one of the following instruments, choosing that which in every particular case seems to be the most suitable.

Besides these, says the author, use may be also made of some of the instruments which serve for the removal of tartar.

It is precisely in this chapter that Abulcasis speaks of the great variety and multiplicity of dental instruments; which, he says, cannot, like other kinds of instruments, be all enumerated and described. He then adds that a skilful surgeon will be able to devise new instruments, according as the peculiarities of each single case require them.

FIG. 44



FIGS. 45, 46, 47

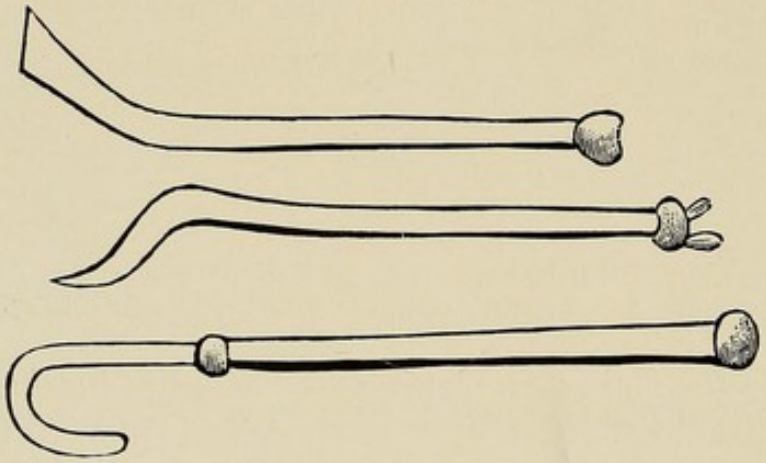
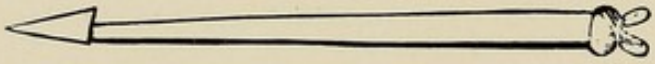


FIG. 48



Elevators (Abulcasis.)

For the extraction of a splinter or necrosed fragment of the maxillary bone, the same instruments must be used which serve for the extraction of dental roots; but also a pair of forceps may be used (Figs. 50 and 51).

It will be necessary to grip with them the osseous fragment firmly, so that it cannot escape whilst it is being extracted. The part shall then be medicated with fitting remedies.

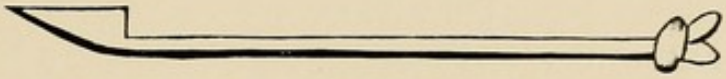
Whenever it is thought proper, the bone must be scraped and all the diseased part of it removed.

When a tooth is irregularly placed, or projects above the level of the others,[1] a deformity ensues which is particularly displeasing in women. The way of correcting this varies according to the nature of the case.

[1] Lib. ii, cap. xxxii, p. 193.

It consists sometimes in the simple extraction of the misplaced tooth. But when there exists an intimate (osseous) union of the irregular tooth with another one, it is necessary to operate for the resection of the former with an instrument of the following shape, that is, like a small axe:

FIG. 49



An instrument like a small axe, for resecting irregularly situated teeth (Abulcasis).

The operation must be performed in many days, not only on account of the hardness of the tooth, but also in order not to shake any of the neighboring teeth.

In other cases, the deformity, consisting in one tooth projecting above the level of the others, may be corrected with a saw.

The instrument must be made entirely of Indian iron, and the operation, like the preceding one, is to be carried out in several days, that the fall of the tooth may not be provoked by excessive shaking. The file (Fig. 55), too, must be used to destroy the edges and points of broken teeth, that they may not injure the tongue, or give any trouble in speaking.

FIG. 50

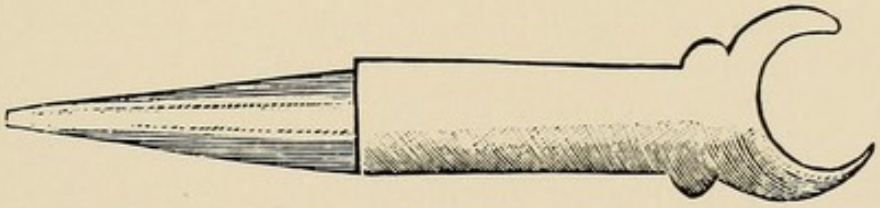


FIG. 51



Forceps for extraction of splinter or necrosed fragments of the maxillary bones (Abulcasis).

When, in consequence of a blow or fall, one or more teeth have become loose so that the patient cannot bi e his food with them, if the use of styptic remedies has been found of no use, it will be necessary to bind and make such teeth firm by a gold or silver wire. Gold is to be preferred as being unalterable, whilst silver in a few days turns green. Having chosen, therefore, a suitable gold wire of perfectly uniform consistency, it must be passed at its middle part between two firm teeth, that is between the two nearest on one side to the loosened tooth or teeth; then, by binding tightly around the sound tooth and each of the loosened teeth the two

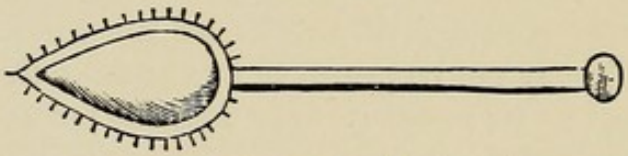
lengths of the wire and crossing them in the dental interstices so as to form a kind of network, the sound and firm tooth of the opposite side will be reached, and this too must be wound around in a mesh, as it were, of the said network. Then, turning back, the same operation must be repeated, but inversely, until the point of departure is reached. All this must be done with much skill, so as to render the loose teeth completely unmovable. When the wire is tied, this must be done near the dental roots, so that the knot may not get untied; then with a pair of

FIG. 52



A dental saw (Abulcasis).

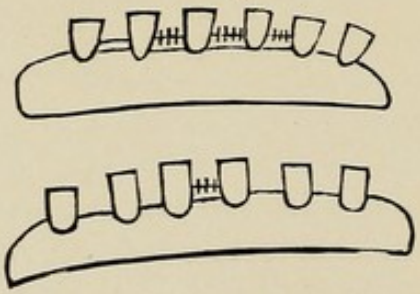
FIG. 53



Another dental saw (Abulcasis).

scissors the remaining part must be cut off and its two ends joined and twisted with a pair of pincers, hiding them between the sound tooth and the neighboring loose one. Such a ligature should remain in place during a whole lifetime; and in case it should come undone or the wire should break, it will be necessary to renew the operation. The following figure represents the ligature described:

FIG. 54



Ligation for steadying teeth in cases of blow or fall (Abulcasis).

"Sometimes, when one or two teeth have fallen out, they are replaced in the sockets and bound in the aforesaid manner and remain there. The operation must be carried out with great delicacy and ability, by skilful hands."

As may be seen from the above quotation, in the days of Abulcasis

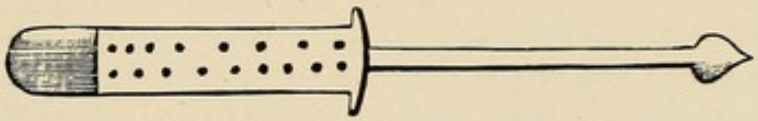
replanting was already performed, although it is probable that the ligature was then left permanently.

The author says, next, that the vacancy left by fallen teeth can be filled up with artificial ones, made of ox bone, they also being fixed in the manner above described; and he adds that they will be found not only of advantage from the esthetic but also from the functional point of view.

Speaking of the cure of the ranula,[1] Abulcasis says that when the tumor, examined by the clear light of the sun, appears brown or black, hard and insensible, it is not to be operated, it being then of a cancerous nature. If, instead, it is whitish and full of liquid, it must be seized with a hook, and by means of a fine scalpel extirpated. The hemorrhage must be combated with powdered blue vitriol. After the operation mouth washes must be used of vinegar and salt.

In cases of fracture of the lower jaw[2] it is not only necessary to cure the fracture itself according to the rules which the author prescribes for the various cases, but it is also necessary to pay attention to the teeth and with a gold or silver wire, or a silk thread, to tie, in the manner already described, those teeth which in consequence of the wound have become loose, but the consolidation of which may be hoped for.

FIG. 55



A dental file (Abulcasis).

MESUE THE YOUNGER, a disciple of Avicenna, is of opinion that when a tooth is the seat of violent pain, this may easily propagate itself to the other teeth; and therefore advises, if the pain does not soon cease, to extract the tooth affected, without delay. This operation, however, must not be performed, says the author, whilst the pain is at its height, but rather when it is somewhat lessened, otherwise, the extraction of the tooth may result in a syncope sometimes ending in death, or else be the cause of intense inflammation and of suppuration, which, also, may, in certain cases, place the patient's life in danger. He recommends an infinite number of remedies against odontalgia; in these, however, there is nothing new to us. As to the removal of a tooth, this may be obtained in three different ways, that is, with the forceps, with eradicating remedies, or by cauterization. In order to cause a tooth to fall out by the use of acrid, eradicating substances, the author advises to proceed in the following manner: The tooth is first freed, by means of a scalpel, from the surrounding gum; the eradicating remedy is next applied to the root of

[1] Lib. ii, cap. xxxv, p. 197.

[2] Lib. iii, cap. iv, p. 545.

the tooth, every needful precaution, however, being taken that it may not injure the neighboring teeth. Cauterization, when practised to produce the exfoliation of a diseased tooth, may be performed, according to Mesue, either with a small red-hot iron, passed through a little metal tube in order to protect the neighboring parts, or with the heated kernel of a nut, or with a grain of burning incense.[1]

To cure a dental fistula, Mesue cauterized it to the very bottom with a cautery in the form of a probe, or extracted the tooth, which by reason of its diseased root was the cause of the fistula; and when the bone was likewise affected, he laid bare the carious part, which he then scraped.[2]

[1] [In connection with the practice of applying medicines to the teeth or upon the gums, with the object of rendering the operation of tooth extraction less difficult, the use of arsenical compounds as an ingredient of these topical applications is of peculiar interest. In an Italian translation of the writings of Johannes Mesue, published at Venice in 1521, the following interesting reference to the use of arsenic appears:

"The son of Zachariah Arazi compounds a medicine to assist the extraction of the teeth. ℞—Pyrethrum, colquintida root and the bark of the mulberry root, the seed and leaves of almezeron, huruc, and yellow arsenic, milk of alscebram or pieces of it, ground very thoroughly with vinegar; then pour some of it over bdellium and halasce, of each, equal parts, dry and dissolve in strong vinegar and make trochisi of it, and with them anoint the roots of the tooth from hour to hour; this facilitates the extraction of it.

"There is also another medicine with which one fills the decayed tooth and breaks it: ℞—Seeds of almezereon and milk of alscebram compounded with liquid pitch, and fill with it the decayed tooth. Another one: ℞—Bauras, bark of the willow, of each, one part; yellow arsenic, two parts; compound with honey and place it upon and around the tooth and immediately extract it.

"The fat of the green frog which lives upon the trees breaks teeth which are anointed with it the same as when you anoint them with milk of alscebram or titimallo, and similarly also the milk of celso with yellow arsenic."

In this connection it is also interesting to note that the ancient Arabian medical writers referred to the red sulphide of arsenic or realgar as sandarach. The term Sandarach was clearly used by these writers to designate two different medicaments—one the gum-vernix, exudate of the Juniper tree, and which we now know as Sandarach gum. They also apply the term to red arsenic, as above stated. Avicenna clearly distinguishes between the two kinds of Sandarach, and says with regard to the gum-vernix or Juniper Sandarach that it is the best of all known remedies for toothache. While, as shown by Dr. Guerini, many of the medicaments used as topical applications to facilitate the extraction of teeth were wholly without any possible effect of that character, it cannot be doubted that the application of arsenical preparations, such as those referred to by Mesue, could not fail to set up an arsenical necrosis about the roots of the tooth, rendering it loose and easy of removal, but necessarily with the disadvantage of producing a dangerously extensive necrosis of the tissues.

Mesue Vulgar.—Impresso in Venitia per Cesaro Arrivabeno Venitiano a di vinti octubrio, mille cinquecento e vintiuno.

Delle Medicini Particulare, Libro Quarto, Capitolo XLI.—E. C. K.]

[2] Joannis Mesue opera, Venetiis, 1562.

AVENZOAR. The last of the great Arabian physicians was Avenzoar. He was born at Peñaflor, near Seville, in 1070 and died in 1162. He became famous by his very valuable work on medicine, entitled the *Teisir*. It is strange, however, that in this book there is hardly anything about the treatment of dental diseases. Against caries and looseness of the teeth the author limits himself to recommending bloodletting either from the ranine or the basilic vein. Apart from this, he speaks neither of operations nor of remedies for diseases of the teeth.[1] Probably at the time in which Avenzoar wrote, that is, in the first half of the twelfth century, doctors in general did not occupy themselves with the curing of teeth at all, this being abandoned entirely to barbers and other persons. This would sufficiently explain why this author is so silent in regard to dental diseases.

But what can have been the reason for doctors refusing thus contemptuously to occupy themselves with so important a branch of therapeutics? In every age there have been a great number of ignorant persons, who either in good faith, or else for imposture, have practised, within a more or less limited circle, the art of healing, usually dedicating themselves to some particular class of diseases. Even in our days, notwithstanding the superabundance of duly qualified doctors, there is, especially in certain countries, no small number of quacks, secretists, bone-setters, chiropodists, and the like. It is, therefore, not to be wondered at that in times when dentistry was still in its infancy there should have been persons more or less ignorant who undertook tooth drawing and the concoction and sale of specifics against odontalgia. The doctors, on their part, under the pretext of being unwilling to have anything to do with these individuals, found it very convenient to dispense with the cure of dental diseases and with the extraction of teeth, this operation being sometimes too difficult for them, on account of their want of practice, besides being almost always very painful, and considered, even from the most ancient times, capable of eventually producing evil consequences, among which, in some cases, even the death of the patient.

But perhaps this was not the only reason for the fact above mentioned. In the middle ages the extraction of one or more teeth was some imes inflicted as a punishment; for example, for having eaten flesh during Lent,[2] or on those found guilty of felony, for having refused to contribute sums of money demanded from them by their liege lord. Now, as this punishment was carried out on the guilty ones by the executors of public justice, it is only natural that doctors should have refused to practise an operation which would have degraded their profession by bringing it down nearly to the class of the hangman.

[1] Sprengel, Geschichte der Chirurgie, Part II, p. 279.

[2] Linderer, Handbuch der Zahnheilkunde, Berlin, 1848, ii, 403.

CHAPTER IX.

THIRTEENTH TO FIFTEENTH CENTURIES.

Bruno of Longobucco. After the Arabian period, the first author whom we must mention is Bruno of Longobucco, of the school of Bologna, who lived in the thirteenth century and wrote a treatise on surgery, which gave him a certain renown.[1] This book, however, contains but little about diseases of the teeth. The author shows himself a great friend of the actual cautery, and advises its use in the cure of dental caries and of various diseases of the gums. He says nothing about the extraction of teeth; instead, he recommends, as a means for making a diseased tooth fall out, that the milky juice of the tithymal be applied around its root after having been reduced to the consistency of paste by the addition of flour.[2]

Lanfranchi, of Milan, another writer of the thirteenth century, who acquired great fame by his book *Chirurgia magna et parva*—partially translated into German, more than two centuries later, by Otto Brunfels—also shows himself very timid in the sphere of dentistry, and to combat dental pains he recommends, by preference, the use of narcotics. He is not at all favorable to the extraction of teeth; and especially that of the molars is considered by him a very dangerous operation.[3]

Teodorico Borgognoni (1205 to 1298), known also under the name of Teodorico of Cervia, is according to Hæsar the first author who made mention of sialorrhea following mercurial frictions. Worthy of note, too, is what he says in regard to fistulas of the gums, or, in general, of the maxillary region. He advises that in every case of this kind special attention be paid to the state of the dental roots; when there is a discharge of ichorous pus, the roots are certainly affected; and then the diseased teeth must all be extracted as soon as possible.[4]

John Gaddesden, an English doctor who flourished at Oxford in the first half of the fourteenth century, wrote a very curious medical book, taken the greater part from Pliny and the Arabian writers and entitled *Rosa anglica: practica medicinæ a capite ad pedes* (English rose: the practice of medicine from head to foot). In his time many strange methods of cure were in use, sometimes simply ridiculous, and others even filthy;

[1] Bruni Chirurgia magna.
[2] Sprengel, Geschichte der Chirurgie, Part II, p. 280.
[3] Sprengel, loc. cit.
[4] Sprengel, loc. cit.

and the *Rosa anglica* furnishes us with not few examples. In order to make a tooth fall, Gaddesden advises the application of dried crow's dung reduced to powder, or else to annoint it with the fat of a green frog. This last means would be quite infallible and would make the tooth fall out on the spot. It had such power that if peradventure an ox in grazing chews a little frog with the grass, its teeth will all fall out on the instant! We do not know whether the author himself believed in the marvellous virtues of the fat of green frogs. It is certain, however, that he enumerates this among his "secrets," and says that he has gained much money from it through the mediation of the barbers.

Other absurdities of the same kind are the following: The brain of the hare can, by being rubbed on the gums and jaws, serve for two important purposes, since it has not only the virtue of facilitating dentition, but also of making teeth grow again to those who have lost them! The brain of a partridge applied to a carious tooth makes it fall in pieces!

The treatment of odontalgia embraces, according to Gaddesden, both general and special means of cure. To the former belong purgatives, bloodletting, scarifications of the labial and sublingual mucous membrane, leeches, the application of scarified cuppings under the chin. The special means of cure are represented by a great number of plasters, powders, and ointments, in the composition of which almost constantly hyoscyamus and pyrethrum take part. When odontalgia depends on caries, the author advises, among other things, the use of a red-hot iron. Against the supposed worms of carious teeth he counsels fumigations with the burnt seeds of hyoscyamus or of leeks. In cases of dental fistulas, it is necessary to cauterize the fistulous tract, to extract the diseased tooth, and if the bone be also affected, to scrape it. To clean the teeth: Gaddesden recommends several dentifrices; some of which are composed of pulverized cuttle bone, either with addition of meerschaum, pumice stone, burnt hartshorn, in different proportions and combinations, or used quite alone; others are made with myrrh and alum.

Since Gaddesden affirms the existence of means capable of promoting the fall of any tooth, we should suppose that he says nothing about instrumental extraction, or at least that he considers it entirely useless; for if in order to make a tooth fall out, it be sufficient to smear it with frog's fat, why should there ever be any need to have recourse to the very painful extraction by means of the forceps?

However, this is not so; the author treats of instrumental extraction as a very important operation, without being at all afraid of being reproved for contradicting himself. Besides, to anyone who thus reproved him he perhaps would have answered, without being disconcerted, that it is not always possible to have the fat of frogs or the dung of crows in readiness.

The extraction of a tooth is only justifiable, says Gaddesden, when all the remedies employed against odontalgia have proved useless and when, on the other hand, the pain has its seat in the tooth itself and not in the nerves or gums. Before undertaking the operation, however, the patient must be prepared for it with an evacuant cure, that is, by injections and purgatives. For the operation itself the author recommends the same rules given by Celsus, and says, besides, that the head of the patient ought to be held firm by an assistant. In certain cases, the extraction can be performed, better than with the forceps, by means of an instrument in the form of a lever, broad at one end, narrow and sharpened at the other. But when a tooth is very firmly seated, its extraction is always dangerous; therefore, in such a case, Gaddesden recommends, before having recourse to the operation, the use either of acrid substances, such as the milky juice of the euphorbiaceæ (for example, of the tithymal), or else of a red-hot iron; and this, for the purpose of promoting the fall of the tooth, or of rendering it, at least, so far movable that it can be extracted without any difficulty.

Guy de Chauliac, the greatest surgeon of the middle ages, was born about 1300, in a little village on the confines of Auvergne, which still preserves the name of Chaulhac; he died in 1368. This author immortalized his name by a work which even up to the eighteenth century was, as it were, the official code for the teaching of surgery. Guy wrote his *Chirurgia magna* in barbarous Latin—such as was then used by the learned; but his book was soon translated into French, Provençal, and afterward also into Italian, English, Dutch, and Hebrew. E. Nicaise, who, in 1890, gave to the scientific world a very valuable new edition of Guy de Chauliac,[1] and who made very accura e researches on all that regards this author and his work, has succeeded in finding in the libraries of Europe and America as many as thirty-four manuscript copies of the *High Surger.*[2] The survival of so many copies, in spite of all the destructive agencies which have been in action during more than 500 years, is a very clear proof of the wide diffusion which this work obtained even before the invention of printing.

Guy's work was printed for the first time in 1478, and the editions that have been published since then in various countries are in all about 130.

This book is very important for our subject, since we may gather from it very clearly the condition of dentistry in the fourteenth century; but, on the other hand, we see from it, with equal clearness, that this branch

[1] La Grande Chirurgie de Guy de Chauliac, chirurgien maistre en médecine de l'Université de Montpellier, composée en l'an 1363, revue et collationnée sur les manuscrits et imprimés latins et français par E. Nicaise, 1890.

[2] Of these copies, twenty-two are written in Latin, four in French, two in Provençal, three in English, one in Netherlandish (Dutch), one in Italian, and one in Hebrew.

of the healing art had not made any progress from the time of Abulcasis to that of Guy de Chauliac (about two centuries and one-half), and that this most famous surgeon did not contribute anything worthy of note to the development of dentistry.

On the anatomy and physiology of the teeth Guy de Chauliac expresses himself very briefly: "Teeth are of the nature of bones, although they are possessed of sensibility, due to some nerves which the third pair sends to their roots. The number of these latter may vary from one to four, according to the different teeth. The uses of these organs are well known."[1]

Worthy of being recorded are the names which Guy gives to the different kinds of teeth. After having said that these latter are generally thirty-two, but sometimes only twenty-eight, he adds, that the sixteen teeth of each jaw are divided into: *deux duelles, deux quadruples, deux canines, huiet maschelieres*[2] *et deux caisseaux* (in the barbarous Latin: *duo duales, duo quadrupli, duo canini, octo molares et duo caysales*). So that the two middle incisors were then called *duales;* the lateral incisors were called *quadrupli*, because, together with the middle ones, they formed a series of four teeth. Guy gives the name of *caysales* (*caisseaux*) to the last two molars; but Joubert, one of the translators and commentators of Guy de Chauliac, tells us that the molars in general were called in Languedoc *caisseaux*: "Les cinq molaires sont appelées en Languedoc *caisseaux*, parce qu'elles servent à casser les choses dures, comme les noix et semblables." In regard to the canines of the upper jaw, we learn that they were called *oeillères* (eye teeth), because their root was believed to reach near the eye.[3]

According to Guy de Chauliac, *les dents sont engendrées non seulement en l'enfance, ains aux autres ages.*[4] And this passage was commented by Joubert in the following note, which we reproduce textually:

"En Languedoc, près de Pezenas y a une gentil femme, nommé Mademoiselle de Lobatiere, dès long temps vieille édentée, à laquelle (comme tesmoignent beaucoup de gens très-dignes de foy) environ l'an 70 de son age, sont sorties cinq ou six dents nouvelles. Le conciliateur tesmoigne avoir veu, à qui les dents perdues devant l'an 60 ont été derechef engendrées, moindre toutes fois que les premieres et plus foibles."[5] (In Languedoc, near Pezenas, there is a lady named Mademoiselle de Lobatiere, who having been for a long time old and toothless (according to

[1] Nicaise, La Grande Chirurgie de Guy de Chauliac, Second Chapitre: De l'Anatomie de la face et de ses parties, p. 47.

[2] Here, as elsewhere, is preserved the old orthography of the text.

[3] Nicaise, p. 711.

[4] Teeth may be produced not only in infancy, but also at a later age.

[5] Nicaise, p. 205.

the testimony of persons well worthy of belief), at about the age of seventy got five or six new teeth. The Conciliator[1] testifies to having seen teeth grow anew—smaller, however, and weaker than the first—in persons who had lost them before the age of sixty years).

In regard to the pathology and therapy of the teeth, Guy but rarely abandons the footsteps of the Arabian writers. Following the example of one of these, Ali Abbas, he admits five or six dental maladies: pain, corrosion, congelation, and *agacement* (teeth set on edge), limosity or fetidness, fall or loosening.[2] As to the cure, this is divided into universal and particular. The former includes, before all, hygienic rules, and then purgatives, bloodletting of the cephalic vein or the veins of the lips or tongue, revulsion, obtained by means of cupping glasses, friction, etc., and the remedies for curing the rheums of the head, or for throwing out the phlegmatic humors (pyrethrum, mastic, and the like).

The hygienic rules are the following: Not to eat food apt to putrefy, such as fish and milk foods; to avoid food or drink either too hot or too cold, and especially the rapid succession of cold and hot, or *vice versa;* not to bite hard things, nor to eat viscous food, such as figs and confectionery made with honey; to avoid certain foods which are known to be bad for the teeth, such as leeks; not to clean the teeth too roughly, but to rub them with honey and burnt salt, to which, very advantageously, may be added some vinegar.

Before speaking of the special methods of cure of single dental affections, Guy observes that operations on the teeth are *particular* (proper) to barbers and to "dentatores,"[3] to whom doctors have abandoned them. But it is safest of all, says he, to have such operations performed under the direction of doctors. These, however, to be in a position to give advice in regard to diseases of the teeth, must know the various methods of cure which are suited to these diseases, that is to say, mouth washes, gargles, masticatories, fillings, evaporations, anointments, rubbings, fumigations, cauterizations, sternutatories, instillations into the ears, and manual operations.

Lastly, Guy notes that the "*dentator*"[4] must be provided with all the appropriate instruments, that is, with "rasoirs, rapes, spatumes, droits et courbes, eslevatoires simples et à deux branches, tenailles dentelées, et diverses esprouvettes, cannules, deschaussoirs, tarieres, aussi des limes, et plusieurs autres necessaires a cette besogne" (in Latin: rasoriis, raspatoriis, et spatuminibus rectis et curvis, et levatoriis simplicibus

[1] Pietro of Albano (1250 to 1316), the writer of many books, among which one bearing the title of Conciliator differentiorum philosophorum et præcipue medicorum, is often quoted by Guy de Chauliac and by many others under the name of Conciliator.

[2] Nicaise, p. 505.

[3] Appropriatæ barbitonsoribus et dentatoribus.

[4] In one Latin manuscript of 1461 instead of *dentator* we already find the word *dentista.*

et cum duobus ramis, tenaculis dentatis, et probis diversis, cannulis, scalpis et terebellis, et etiam limis."[1]

Whilst Abulcasis bitterly declaims against the barbers, because they, in spite of their ignorance, permit themselves to perform operations on the teeth, and especially to extract them, Guy de Chauliac speaks in quite a different tone. He recognizes that such operations are *particular*, which is as much as to say, in modern language, that the practice of dental surgery constitutes a *specialty*. Guy, it is true, expresses his desire that dental operations be performed, for greater security, under the direction of doctors, but he does not use one word of blame or contempt against the *dentatores*, thus leaving it to be understood that, according to him, their art had every good reason to exist. Besides, from the enumeration of the surgical instruments which Guy says are necessary to them, we can easily argue that the *dentatores* of the fourteenth century were not, as at the very first one might be led to believe, mere "tooth-pullers," but that, at least, the best among them cured teeth as well as the scanty knowledge and means of cure then available enabled them to do.

In the chapter on odontalgia,[2] Guy de Chauliac distinguishes between the pains, the point of departure of which is in the tooth itself, and those resulting from disease in other parts, for example, from apostema[3] of the gums; in these latter cases, in order to cause the pain to cease, it is necessary to cure the part from which the pain is derived, taking into account the nature of the disease and its causes.

When the pain is situated in the root of the tooth or in its nerve, it is necessary, says the author, to distinguish whether it is caused by an accumulation of morbid matter, or whether it is, instead, a simple pain *without matter*. Besides, it is necessary to distinguish, in the first case,

[1] Nicaise, p. 506. To make clear the meaning of these names, the following must be noted: The *rasoirs* (*rasoria*) were instruments with one cutting edge alone, which were used in performing any kind of incision. *Raspatoria* (râpes, *i. e.*, rasps) signified almost certainly scrapers, not rasps. The *spatumes* were instruments with one or two cutting edges, of various shapes, but usually small. *Esprouvettes* (Latin, *probæ*) were the sounds or probes. *Scalpra* means scalpels, but in this case has especially the meaning of *déchaussoirs*, gum lancets. *Terebelli* (French, *Tarières*) are the trepans or perforators.

[2] Nicaise, p. 507.

[3] By the word *apostema*, Guy de Chauliac, and many other writers, indicate every pathological condition in which the normal elements of the tissues are separated from one another, by a humorous or gaseous gathering, or by any phlogistic or neoplastic formation. The word signifies, in Greek, *removal*, just like the Latin word *abscessus*. In fact, these two terms were often used as synonyms; but at other times the word apostema had a wider meaning, and included, besides the abscess, the phlegmon, the furunculus, the anthrax, erysipelas, herpes, and other dermal affections, especially the pustulous ones, edema and other serous gatherings, subcutaneous emphysema and other gaseous gatherings, glandular tumefactions, cysts, benignant and malignant tumors.

whether the matter producing the pain is hot, cold, or windy; and also, in the second case, it is necessary to ascertain if the pain is of a warm, cold, dry, or humid nature. As may be seen, the principles and subtle distinctions of the pneumatic school were then in full vigor.

The treatment must vary according to all the aforesaid cases; but the means of cure advised by Guy de Chauliac do not present any special interest, as they are almost entirely taken from Galen and from the Arabian authors, and especially from Rhazes, Ali Abbas, and Avicenna.

On coming to speak of the looseness of teeth,[1] Guy says that this may depend on various causes: that is, on a fall or a blow; on humidity, which softens the nerve and ligament;[2] on dryness and lack of nourishment of the teeth; and lastly, on corrosion of the gums.

The looseness of teeth, which depends on dryness or want of nutrition, as in the old and in consumptive people, is incurable. In other kinds of looseness, astringents are useful; but it is also well that the patient should speak but little, that he should not touch or move the loose tooth, nor use it in masticating. In cases of corrosion of the gums, this disease must be cured.

If looseness of the teeth follows a blow, it is well, first of all, to let blood, and then to use astringents and excitants. When all this is of no avail, Guy advises that the loose teeth be tied to the healthy ones with a little gold chain,[3] after the manner of Abulcasis. And if, says he, the teeth fall out, they may be replaced with teeth of another person, or with artificial teeth of ox bone, fixing them in their place with a fine ligature; and, he adds, that such teeth are serviceable for a long time. Here are the precise words of the text: "Et si les dents tombent, qu'on y mette des dents d'un autre, ou qu'on en forge d'os de vache, et soient lisez finement, et on s'en sert long-temps."

This extremely concise manner of treating dental prosthesis, summing all up in some thirty words, is in strong contrast with the usual fulness of explanation and methodical accuracy of Guy de Chauliac, to whom, very justly, could be given the title of founder of didactical surgery. Such a strange contrast cannot be explained, unless by admitting that Guy considered dental prosthesis as foreign to the general plan of his book, that is, as something which did not directly concern surgeons, and for which, therefore, a mere allusion ought to be sufficient. Without the

[1] De la dent esbranlée et affoiblie, Nicaise, p. 509.

[2] "De l'humidité qui amollist le nerf et le ligament."

[3] Evidently the author speaks of a "little gold chain," because, as he is not versed in the practice of dentistry, he does not know that it was a simple gold wire which was used for keeping loose teeth firm. A small chain as thin as a thread could not be possibly made, and would even then be excessively weak.

slightest doubt, dental prosthesis was practised neither by doctors nor surgeons, but by the *dentatores*.

Abulcasis, too, certainly for the same reason, is extremely brief in speaking of artificial teeth, but, on the other hand, he very minutely describes the process of ligating loose teeth. Guy omits this description entirely, and only alludes briefly to this therapeutic practice. From this it is easy to perceive that whilst Abulcasis considered this operation within the province of surgeons, Guy de Chauliac was disposed to exclude it from the field of general surgery, considering that this, too, like the other dental operations, belonged to the *dentatores*. In his days, in short, dentistry had become much more clearly specialized than it was in the days of Abulcasis.

After having spoken of the looseness of teeth, Guy de Chauliac goes on to treat of caries, in a short chapter, entitled "De la Pourriture, des vers, de corrosion et pertuifement des dents."

The method of cure, he says, is double, viz., universal and particular. The general treatment embraces the hygienic and therapeutic means already mentioned. As to the particular or local treatment, it consists, first of all, in washing the teeth with aqua vitæ or with a vinous decoction of mint, salvia, melissa, pepper, or pyrethrum. Then it is necessary to fill the carious cavity with gallia[1] and root of cyperus,[2] mastich, myrrh, sulphur, and camphor, wax, ammoniacum, asafetida and the like. As may be seen, Guy does no more than mention the substances used in his days for the filling of carious teeth, and does not tell us what various combinations were formed with the said materials, nor the proportions in which they were used. In short, he does not give us any formula for the composition of a filling mass, and from this may be inferred, without fear of error, that this operation also was never performed by him, consequently it, too, was not practised by doctors and surgeons, but rather by the *dentatores*.

When the aforesaid means of cure—that is, the mouth washes and the filling—are of no use, Guy advises the margins of the carious cavity being taken away with a scalpel and file, so that alimentary substances may not be retained inside it. However, here are his words, which seem especially to refer to cases of interstitial caries:

"Si ces choses n'y valent rien, la dent soit esbuschaillee avec un ciseau et lime,[3] e qu'on luy fasse un passage, à ce que la viande ne s'arreste

[1] This name was first given to medicaments containing gall-nuts, then, by extension, also to compound remedies not containing such substance, and to which was given the name of *aliptæ*, v. Nicaise, p. 677.

[2] According to Nicaise, the Cyperus esculentus (in French, "souchet") is here referred to.

[3] In the Latin text: Buccelletur cum scalpro et lima.

au trou." If advantage is not even derived from such an operation, recourse must be had to cauterization, or, if necessary, to extraction.

Even Guy de Chauliac believes in the worms of the teeth, and against these he recommends the usual fumigations. He advises that the seeds of leek, onion, and hyoscyamus be mixed with goat's tallow and made into pills of a dram each in weight, one of which is to be used for each fumigation: "Si dans le trou il y a un ver, apres le susdit lavement,[1] la dent soit suffumiguée avec une graine de porreau et d'oignon et semence d'hyosciame, confits avec suif de bouc; et qu'on en fasse des pilules chacune d'une drachme et qu'on y en employe une à chaque fois."

In the following chapter Guy treats "De la limosite et laide couleur des dents." Here, too, he recommends, before all, the general hygienic rules above mentioned. Besides, he advises the mouth being rinsed with a vinous decoction of wild mint and of pepper, and then the use of the following dentifrice:

"℞—*Cuttle-bone, small white seashells, pumice stone, burnt stag's horn, nitre, alum, rock salt, burnt roots of iris, aristolochia, and reeds.* All these substances must be reduced to powder together, or each one separately." Use may also be made of a liquid dentifrice thus prepared:

"℞—*Sal ammoniac and rock salt, half a pound of each; saccharine alum, one-quarter of a pound.* These to be reduced to a powder and placed in an alembic of glass, so as to obtain a liquid, with which the teeth must be rubbed by means of a little scarlet cloth."

If these means of cure are of no avail, on account of the presence of hardened limosity (tartar), this must be removed by scraping it away with appropriate instruments. "Et si cela ne profite, à cause qu'il y a là des limosites endurcies; soient rasclées avec des rapes et spatumes."[2]

Against the setting of teeth on edge (*endormement et congelation des dents; stupor et congelatio dentium*), Guy de Chauliac recommends hot wine or aqua vitæ, to be kept in the mouth; or the teeth to be rubbed with roasted salt; or the application to them of hot roasted walnuts and filberts and similar things which convey heat; or lastly, masticating substances, which possess heating properties, such as the portulaca (purslane) and its seeds.

The chapter on the extraction of teeth and of dental roots is a simple summary of what Abulcasis says on this subject; some passages of this author are copied word for word.

Whilst the Arabian surgeon treats rather lengthily of the deformities of the dental arches, and the methods to be employed in correcting these,

[1] Here lavement means mouth wash, not injection.

[2] Cum raspatoriis et spatuminibus radantur.

Guy de Chauliac almost entirely neglects this subject and limits himself to saying that if any tooth has become abnormally lengthened, it is necessary to reduce it to the right length with the file, but operating "wisely," so as not to loosen it:

"S'il y a quelque dent augmentée outre nature, soit egalisée et applanie sagement avec la lime, que ne soit ébranlée."

Guy strongly throws doubt upon the efficacy of supposed eradicating remedies. In regard to this he says: "The ancients mention many medicaments, which draw out the teeth without iron instruments or which make them more easy to draw out; such as the milky juice of the tithymal with pyrethrum, the roots of the mulberry and caper, citrine arsenic, aqua fortis, the fat of forest frogs. But these remedies promise much and operate but little—*mais ils donnent beaucoup de promesses, et peu d'operations.*"

From the book of Guy de Chauliac we can gather a very important fact, which is worth mentioning here; that is to say, that some surgeons of that period made use already of anesthetic inhalations, especially for amputations. Here is what Guy says:[1]

"Some prescribe medicaments which send the patient to sleep, so that the incision may not be felt, such as opium, the juice of the morel,[2] hyoscyamus, mandrake, ivy, hemlock, lettuce. A new sponge is soaked by them in these juices and left to dry in the sun; and when they have need of it they put this sponge into warm water and then hold it under the nostrils of the patient until he goes to sleep. Then they perform the operation."

It seems that the narcosis thus obtained was sufficiently intense, since Guy also speaks of the means used to awaken the patient. These consisted in applying another sponge, soaked in vinegar, under the nose, or in dropping into the nostrils and ears the juice of rue or fennel.

Guy lets us know that other surgeons made the patients go to sleep by giving them opium to drink; but he decidedly disapproves of such a practice, as he has heard of patients who through this have died.

Valescus of Taranta (called by the French authors Valescon or Balescon de Tarente or Tharare), professor at the University of Montpellier at the beginning of the fifteenth century, wrote a valuable treatise on medicine and surgery, entitled *Philonium pharmaceuticum et chirurgicum, de medendis omnibus humani corporis affectibus.* As to the diseases of the teeth, he especially follows Guy de Chauliac, but treats the

[1] Treatise vi, doctrine i, chap. viii: "Des membres qu'il faut amputer," etc., Nicaise, p. 435.

[2] According to Joubert several solanaceæ had this name, among others *Solanum nigrum* and *Solanum somniferum* (Physalis somnifera L.), which probably corresponds to the *Strychnos hypnoticus* of Dioscorides.

subject at greater length, profiting by what has been written on the subject by all the ancient writers, and especially the Arabians.

Among the many remedies which he recommends against toothache, here are some:

"℞—Wild mint, pyrethrum, white pepper, myrrh, two drams of each; let these be pulverized and made into a paste with the pulp of raisins or with white wax and with some turpentine; and let this mass be divided into small balls as large as filberts, of which one must be masticated at a time, with the aching teeth."[1]

Another masticatory is composed of origanum, pyrethrum, cinnamon, and ginger, made into a paste with the yolk of an egg cooked under the coals.

To calm dental pains, the vapors of a decoction of wild lavender, marjoram, rue, chamelea, and melilot are often efficacious. As to fumigations, they can be made not only with vegetable substances (onion or mustard seed, rue, etc.), but also by burning scrapings of the hoof of an ass. The fumes may be made to reach the aching tooth, by means of a funnel. Here are the words of the author: "Fiant suffitus ex rasura ungulæ asini, et fumus recipiatur per infundibulum."

Decayed teeth may be filled, according to Valescus, to satisfy four different indications: To calm or prevent pain, to prevent any further spreading of the caries, to kill the worms, and to sweeten the breath. He advises that the carious cavities should be filled up with powdered nigella, pepper, myrrh, salt, and theriac; or else with pyrethrum, gum ammoniac, and opium; or else with celery seeds pulverized, opium, and hyoscyamus; or with the cast-off skin of serpents boiled in vinegar; or with gallia and cyperus. The filling with these last two substances are especially suitable, according to the author, to preserve the teeth from further spreading of the caries: "Si gallia et cyperus cavis dentibus applicentur, dentes ulterius non corrodentur."

To kill the supposed worms of the teeth, Valescus counsels three different methods, of which the first consists of the usual fumigations with seeds of hyoscyamus, onion, leek, coloquintida; the second consists in filling the carious cavity with a mixture of myrrh and aloes; and lastly, the third, in applying inside the cavity the milky juice of the tithymal, or the juice of the persicaria.[2]

In regard to tartar of the teeth—which he calls *materia lapidea, i. e.*, stony substance—Valescus says that it must be removed little by little, either with iron instruments or with dentifrices partly cleansing and partly

[1] Valesci Philonium, etc.; Francofurti MDXCIX, cap. lxiv, De dolore dentium, p. 195 et seq.

[2] Plant belonging to the order of the Polygonaceæ.

styptic. After the tartar has been removed, it is necessary to wash the teeth often with white wine and to rub them with roasted salt.[1]

Valescus, too, like the majority of ancient writers, is not at all favorable to the extraction of teeth. He says that recourse must not be had to this operation except when a tooth is the cause of most violent pain and every remedy has been of no avail. But the reasons which he gives in support of this opinion are very plausible; and whilst most of the authors who preceded him showed themselves adverse to extraction, because they considered it dangerous, he does not allude in the least to such dangers, but wishes extraction to be avoided, if possible, "because the teeth, even when they are in some parts corroded, yet nevertheless, after the pain is calmed, aid mastication and besides render the others firmer."[2]

This author agrees with Galen in considering the teeth as bones, but he is of opinion that they differ from the other bones in more than one respect; that is, first of all, on account of their sensibility; secondly, because, whilst the other bones are formed in the uterus, the teeth are formed outside the uterus; and lastly, for a reason which cannot but appear very strange to us, that is: "The bones are produced by the sperm and menstrual blood, whilst the teeth are produced by the blood in which there has remained the virtue of the sperm."[3] This passage gives us an idea of the state of embryological knowledge of those days!

Pietro of Argelata (or of La Cerlata), professor of surgery at Bologna (died in 1433), wrote a treatise on surgery in six books, in which diseases of the teeth are also taken into serious consideration. He speaks of a great number of dental instruments, which, however, are the same as those enumerated by Guy de Chauliac. His methods of cure do not offer anything very new, being for the most part identical with those of Avicenna and Abulcasis. He considers cleanliness of the teeth of the greatest importance; shows what great injury is done by dental tartar—which by him is considered a very important sign of the bad state of the teeth —he counsels the removal of it by means of scrapers, files, or the use of strong dentifrice powders; and to make the teeth white, he even advises the use of aqua fortis.

He says nothing in regard to the filling of decayed teeth; he, however, counsels the cleansing of the carious cavities with aqua fortis, or even,

[1] "Materia lapidea paullatim abradatur ferro et dentifriciis partim mundificativis, et partim stypticis. Deinde colluantur dentes sæpe vino albo, et fricentur sale torrefacto." Cap. lxvii, De colore dentium præter naturam, p. 202.

[2] "Quoniam, licet ex parte corrosi sint, attamen dolore sedato masticationem iuvant, et alios firmiores reddunt." Appendices, p. 205.

[3] "Ossa fiunt ex spermate et sanguine menstruo; dentes autem ex sanguine, in quo remansit virtus spermatis." Appendices, p. 205.

in some cases, the widening of them, in order to render them shallower and therefore less liable to retain alimentary residues.

Pietro of Argelata cured dental fistulas by means of caustics and arsenic. He counselled simple palliative means of cure for hard epulides of a cancerous nature. In regard to soft, benignant epulides, he was little favorable to excision, as this might cause hemorrhage; he preferred ligating the tumor; or he repeatedly cauterized it with boiling oil or other caustics, until he caused it to fall.[1]

Bartolomeo Montagnana, who taught surgery in the University of Padua and died in 1460, recommended, as an excellent anti-odontalgic remedy, a mixture of camphor and opium. In his days, faith in the pretended eradicating virtues of certain substances was being gradually lost; but, on the other hand, a tendency now arose to neglect, in regard to the teeth, the conservative principle, to which the ancients had held so jealously; and little by little the extraction of a tooth began to be considered an operation of small or no importance, that could be performed with the greatest indifference. Montagnana himself considers the extraction of a tooth as the best means of curing odontalgia, whilst the ancients did not have recourse to it, saving as a last resource. Notwithstanding this, if the caries was not deep, he preferred to extraction the use of caustics and a red-hot iron.[2]

Giovanni Plateario, a professor at Pisa in the latter half of the fifteenth century, cauterized carious teeth with a small piece of kindled ash wood, or with a red-hot iron, and held that cauterization was more effectual when, before performing it, the carious hollow had been filled up with theriac.[3]

He, too, made the administration of purgatives or bloodletting precede the extraction of a tooth. Platearo has, however, the merit of having introduced the sitting position for operations on the teeth, whilst preceding surgeons made the patient lie in a horizontal position, or held his head steady between their knees, as may be read in Abulcasis and in other writers. Besides, he recommends taking care, when the extraction of a tooth had to be performed, that the surrounding air should be pure; perhaps because he thought that when operating in a place where the air was tainted, complications might more easily arise, on account of contagious substances reaching the inside of the wound; or perhaps because he judged, not without reason, that certain accidents, such as syncope, could more easily happen, and were more dangerous in a tainted atmosphere than in the midst of pure, vivifying air. After the operation,

[1] Petri de Largelata chirurgiæ libri sex, Venetiis, 1480.

[2] *Bartolomæi Montagnanæ* Consilia, Venetiis, 1497.

[3] Johannis Platearii Salernitani practica brevis, Lugduni, 1525.

he prescribed astringent mouth washes. Against dental worms, whose existence no one at that period doubted in the least, Plateario recommended various remedies, chiefly under the form of fumigations; and among these latter, those performed with burnt opium. Against ulcerations of the gums and mouth he commended the use of wine and aromatic substances. An excellent remedy was also, according to him, lime dissolved in very strong hot vinegar, and mixed, after complete evaporation of the liquid, with a fourth part of orpiment.

Giovanni of Arcoli (in Latin, *Joannes Arculanus*), professor at Bologna and afterward at Padua (who died in 1484), wrote a commentary on a celebrated book of medicine, which Rhazes had dedicated to the glorious King Almansor, great patron of science and art.[1]

In this most valuable work of Arculanus there are several chapters relative to diseases of the teeth; and this subject is treated rather fully and with great accuracy.

The author, first of all, treats of the anatomy and physiology of the teeth; he, however, falls into many errors, for instance, in regard to the number of dental roots. ("The first six teeth of the upper jaw have only one root; the first six of the lower not more than two; the molars of the upper jaw have three; those of the lower generally only two in like manner; the *neguezid*[2] of the upper jaw have four roots, but the two lower neguezid have only three.")

According to him there is not the least doubt that the teeth grow during the whole lifetime, thus repairing the continual waste caused by use; and among other proofs he adduces that, whilst in the old all other organs shrink and waste away through lack of nourishment, the teeth, on the contrary, show very frequently an increase in length.

For the preservation of teeth—considered by him, quite rightly, a matter of great importance—Giovanni of Arcoli repeats the various counsels given on the subject by preceding writers, but he gives them as ten distinct canons or rules, creating in this way a kind of decalogue of dental hygiene. These rules are: (1) It is necessary to guard against the corruption of food and drink within the stomach; therefore, easily corruptible food—milk, salt fish, etc.—must not be partaken of, and after meals all excessive movement, coition, bathing, and other causes that impair the digestion, must also be avoided. (2) Everything must be avoided that may provoke vomiting. (3) Sweet and viscous food—such as dried figs, preserves made with honey, etc.—must not be partaken of. (4) Hard things must not be broken with the teeth. (5) All food,

[1] Joannis Arculani commentaria in nonum librum Rasis ad regem Almansorem, etc., Venetiis, 1542.

[2] This Arabian word was used to indicate the last molars.

drink, and other substances that can set the teeth on edge must be avoided. (6) Food that is too hot or too cold must be avoided, and especially the rapid succession of hot and cold, and *vice versa*. (7) Leeks must not be eaten, as such a food, by its own nature, is injurious to the teeth. (8) The teeth must be cleaned, at once, after every meal, from the particles of food left in them; and for this purpose must be used thin pieces of wood somewhat broad at the ends, but not sharp pointed or edged; and preference should be given to small cypress twigs, to the wood of aloes, of pine, rosemary, of juniper, and similar sorts of wood which are rather bitter and styptic; care must, however, be taken not to search too long in the dental interstices and not to injure the gums or shake the teeth. (9) After this, it is necessary to rinse the mouth, using by preference a vinous decoction of sage, or one of cinnamon, mastich, gallia, moschata, cubeb, juniper seeds, root of cyperus, and rosemary leaves. (10) The teeth must be rubbed with suitable dentifrices before going to bed, or else in the morning before breakfast. Although Avicenna recommended various oils for this purpose, Giovanni of Arcoli appears very hostile to oleaginous frictions, because he considers them very injurious to the stomach. He observes, besides, that whilst moderate frictions of brief duration are helpful to the teeth, strengthen the gums, prevent the formation of tartar, and sweeten the breath, too rough or too prolonged rubbing is, on the contrary, harmful to the teeth and makes them liable to many diseases. As a dentifrice, he recommends a mixture of two parts of honey to one of the best sugar; or the ashes of the burnt head of a hare; or burnt salt made into an electuary by the addition of honey. To use the last two dentifrices, a quantity about equal in volume to a filbert must be wrapped and tied inside a thin, loosely woven piece of linen cloth, and with this the teeth must then be rubbed. Finally, theriac, too, is considered by him a very good dentifrice. According to Arculanus, dental pains are sometimes situated in the very substance of the tooth, at other times in the nerve, and at others in the gums.

The dental substance may become painful, owing to bad "complexion" (viz., constitution), without there being any morbid matter in it. When, however, such matter exists, it may proceed from the head or from the stomach, and in certain cases it gives rise to an apostema of the tooth; in other cases it corrodes the latter; and at other times generates (!) in it a worm, which in its turn corrodes the tooth.

In regard to the diagnosis of dental pains, it is necessary first of all to examine the state of the gums, that is to say, to observe whether these, in the aching spot, appear healthy, or whether, on the contrary, they are discolored or tumid, sanguinolent, suppurating, or the seat of corrosion or putrefaction, or if, when pressure is put upon them, an exit of matter

is produced. In such cases it may be considered that the gums are the seat of the pain. But if none of these symptoms are observed, and if, on comparing the gums of the aching spot with the other gingival regions, no difference is observed, this means that the cause of the pain exists either in the substance of the tooth itself, or else in its nerve. In this latter case the pain is usually very violent, and principally localized in the root of the tooth, but also extending along the jaw, and the tooth itself is often, as it were, benumbed. When, however, the pain is not situated either in the gums or in the dental nerve, but in the very substance of the tooth, this latter is very often corroded (carious), and very often in the hollow there exists a worm; and this may be deduced from the fact that during the intervals of calm the patient sometimes feels a peculiar sensation, the movement of the worm in the diseased tooth; when, however, these signs are wanting, we shall find at any rate that the whole tooth is painful in the direction of its length, instead of the pain being localized in the root of the tooth and radiating along the jaw.

When the cause of the pain resides in the gums the extraction of the tooth is neither necessary nor beneficial, but is, on the contrary, always harmful, since, in spite of the loss of the tooth, the cessation of the pain is not obtained; when the pain is situated in the tooth itself, the removal of the latter always makes the pain cease; lastly, when the dental nerve is the seat of the evil, the removal of the tooth sometimes takes away the pain, at other times it does not.

Among the many anti-odontalgic remedies, Arculanus enumerates pepper mixed with tar, pepper with asafetida, mustard seeds with asafetida, and the like. When a tooth is to be cauterized, it is necessary to protect the healthy teeth with bits of cloth dipped in rose water or else with some kind of paste. Sometimes it is useful to drill the tooth with a small trephine so that the cautery may act more deeply, thus giving better results.

In regard to the filling of decayed teeth, Giovanni of Arcoli says that, in the choice of the substances to be used, the *complexion* (constitution) of the teeth must be taken into consideration; and according as this is cold or warm, it is necessary to perform the filling with substances which are, by their own nature, warm or cold, thus acting in opposition to the dyscrasia of the tooth:

"*Eligantur calida aut frigida secundum opportunitatem, in contrarium dyscrasiæ dentis.*"

As to the quality of the complexion, this might be deduced, says the author, from various signs, among which the color of the gums, these being red in the warm and humid complexion, yellowish in the warm and dry, brownish in the cold and dry, and whitish in the cold and humid complexion. When, however, the complexion does not show any distinct

characteristic, and varies but little from the average, Arculanus advises the teeth being filled with gold-leaf: "*Ubi non fuerit multus recessus a mediocritate, impleatur cum foliis auri.*"

Although Arculanus is the first writer who alludes to the filling of teeth with gold, nevertheless it is by no means admissible that he was himself the inventor of gold filling. His words do not at all sound to us as the announcement of a new discovery, as the enunciation of a new fact, in which the author himself had had, at least, a part, be it great or small. Nothing of all this; the advice as to filling the teeth, in certain cases, with gold leaf is given quite impersonally, and is found, as if it were a point of minor importance, at the end of a long paragraph, which includes various other counsels in regard to the filling of teeth, one of which is, that this operation should not be performed with too great violence.[1] In short, the writer does not show the least intention of putting in evidence the aforesaid fact, or of giving to it any special importance. We must, therefore, hold that gold filling had already been in use for a long time among dentists, and that Arculanus simply mentions what was done by the dentists of those days. (See note page 164.) It is evident, on the other hand, that he had no special competence in dental art, when we consider that he was even ignorant of the exact number of dental roots. Naturally, the question here arises: At what period did gold begin to be used for the filling of teeth? But unfortunately history has not, up to the present, furnished us any evidence which may lead to the solution of this problem.

For the eradication of a tooth Arculanus gives three very precise indications: (1) When the pain resists every other means of cure. (2) When there is any danger of the disease spreading to the neighboring healthy teeth. (3) When the tooth is troublesome in speaking and in masticating.

Before extraction, the patient must be prepared for it by bloodletting, purgatives, and narcotics; and the operation must be commenced by separating the gums from the tooth.

Arculanus admits, like many of his predecessors, that the eradication of a tooth may be effected not only by the forceps and other suitable instruments, but also by other means. One of these would be the use of the actual cautery, repeatedly applied inside the hollow of the tooth, if this is decayed; or, in the contrary case, made to act all around its root

[1] "Regimen autem implendo dentem corrosum est, ut impleatur in causa calida cum frigidis, et in frigida cum calidis. Secundo, ut non impleatur cum labore et vehementia addente in dolore, et ex propriis est gallia cum ciperis aut cum mastiche, et eligantur ex suprascriptis, calida aut frigida secundum opportunitatem, in contrarium dyscrasiæ dentis, sed ubi non fuerit multus recessus a mediocritate impleatur cum foliis auri." Cap. xlviii, p. 195.

(neck). The fall of the tooth might also be obtained with potential cauteries and especially by the application of boiling oil, or of a grain of incense heated to the melting point.

It is plain that Giovanni of Arcoli has simply copied these things from preceding authors, since if he had made a trial of the pretended eradicating means, he would soon have verified their inefficiency.

Against hemorrhage of the gums, Arculanus recommends arsenic, lime, gall-nuts, alum, and oil of roses. But, says he, the surest remedy is the red-hot iron; and still more effectual, cauterization by means of red-hot gold.

Giovanni of Arcoli's work is not only noteworthy because it mentions gold filling for the first time, but also because in it are given the drawings of three dental instruments, among which the pelican (here called *pulicanum*). According to Carabelli, the first author who has mentioned the pelican was the Dutchman Peter Foreest; according to Geist-Jacobi, instead, it was the German Walter Ryff. But both these statements are false, because as we have just now said, the pelican was already named and designed (not very well, it is true) in the book of the Italian Giovanni of Arcoli, who died in 1484, that is, even before either Walter Ryff or Peter Foreest came into the world. Neither does Giovanni of Arcoli say one word that might imply that he was the inventor of the pelican, and so we are led to believe that in his days this instrument had already been in use for some time. In the text he only says: "The teeth are to be extracted with suitable instruments, whose figures may be seen in the margin."[1]

We here reproduce the three figures alluded to, with the relative indications. The first (Fig. 56) represents the pelican; the second (Fig. 57) is a pair of curved forceps, which seems, in those days, to have been the instrument most commonly used for the extraction of teeth, since this figure is accompanied by the very generic indication "shape of the forceps for extracting teeth;" finally, the third (Fig. 58) represents the forceps used for extracting dental fragments (roots), and which from the long and straight shape of its jaws, was called "stork's bill" (rostrum ciconiæ).

Alessandro Benedetti, of Verona, who lived from 1460 to 1525, and taught medicine at Padua, was, for his times, a man of uncommon scientific merit; but to the development of the dental art he did not contribute anything very worthy of note.

He relates that he once abstained from buying a slave simply because

[1] In the Venetian edition (1542), however, all the figures which Arculanus inserted in his work are found in the beginning of the book, in a single table, together with the indication of the use to which each single instrument was destined.

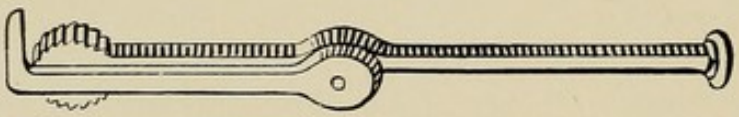
the teeth of the latter were like those of wild beasts, a thing which he considered as a bad omen.

According to him, toothache is a disease proper to man, no other animal being liable to it.

To keep free from odontalgia, there is, says he, a very simple means, which consists in rubbing the teeth once a year with the blood of a tortoise.

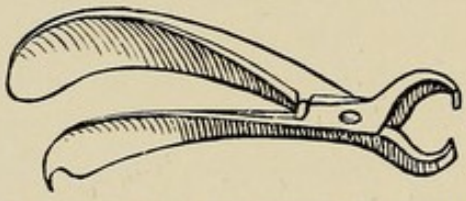
This is the first writer who has noted the harmful effect which mercury has on the gums and teeth, whether this remedy be used internally or externally, that is, by friction.

FIG. 56



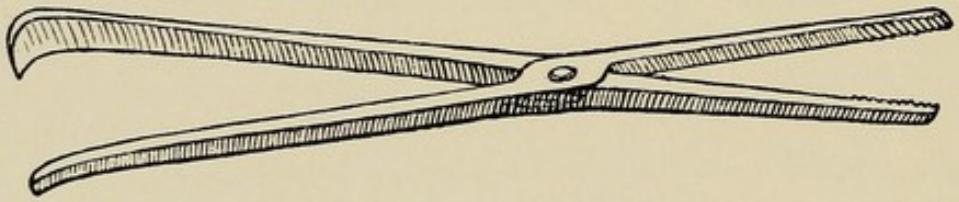
The pelican as represented in Giovanni d'Arcoli's work. Forceps pro extrahendis dentibus pulicanum dicta.

FIG. 57



Dental forceps (Giovanni d'Arcoli). Forcipum pro extrahendis dentibus forma.

FIG. 58



The forceps called "stork's bill," as represented in Giovanni d'Arcoli's work. Forceps pro extrahendis fragmentis quod Rostrum Ciconiæ dicent.

Benedetti recommends that before proceeding to the extraction of a tooth an accurate diagnosis should be made, so that it may not happen that, by mistaking for true odontalgia a pain localized in the gums or in the jaw, a sound tooth be drawn, under the belief that it is the cause of the pain; for, this happening, not only would the pain continue, but there would be, in addition, the loss of a sound tooth, and also the disadvantage of the neighboring ones becoming less firm, for want of support.

This author, too, attributes great importance to dental worms, believing them to be one of the principal and most frequent causes of odontalgia. To kill them he recommends the usual fumigations and several

other remedies, among which the juice of the leaves of the centaury or of the peach tree, but especially applications of aqua vitæ.

When it is thought well to have recourse to opium to calm toothache, he advises this to be used with the utmost prudence; and on this point, he relates having witnessed a fatal case, in the person of a gentleman of Padua, by the incautious use of this remedy.

In extraction Benedetti repeats all the precautionary measures recommended by the ancients, and he, too, advises that recourse should not be had to this operation, if not as a last remedy, that is, when every other means of cure has been found useless.[1]

Giovanni of Vigo. The celebrated surgeon Giovanni of Vigo (1460 to 1520), speaking of abscesses of the gums,[2] says that the abscess must be first brought to maturity by fitting remedies, if it has not ripened spontaneously, then it must be opened with a lancet, and lastly, to cleanse the diseased part and to aid cicatrization, honey of roses or Egyptian ointment must be used. This latter is thus composed of: "℞—Verdigris, rock alum, *ana* two ounces; honey of roses, one ounce; plantain water and pomegranate wine, *ana* two and one-half ounces. The whole to be made to boil, and to be stirred with a small rod, until the mixture is reduced to the consistency of honey."

For the cure of old fistulas he employs not only the above-mentioned Egyptian ointment, but also arsenic and corrosive sublimate.

Giovanni of Vigo is very brief in speaking on the treatment of dental caries, doubtless because he attributed little or no value to the numerous methods of cure recommended by his predecessors. The treatment advised by him is, however, very noteworthy. He says that by means of a drill, file, scalpel, or other suitable instrument, it is necessary to remove the whole of the putrefied or corroded part of the teeth, and then, to preserve it, to fill the cavity with gold leaf.

This clear and simple manner of speaking of gold filling as a cure for caries makes us suppose that Giovanni of Vigo was not at all a stranger to the practice of dentistry, as we must think of many preceding writers, but, on the contrary, that he was not less skilled in dental operations than he was in the other branches of surgery. Again, history tells us that Giovanni of Vigo was surgeon to the Roman court; so it would have been strange, indeed, if the Pope, if the haughty prelates, accustomed as they were to all kinds of refinement and comfort, should have intrusted the care of their teeth to lowborn barbers and quacks, whilst they could dispose of the services of so eminent a surgeon.

[1] Alexandri Benedicti Veronensis de re medica opus, lib. vi, de affectibus dentium.

[2] Opera domini Joannis de Vigo in chyrurgia. Lugduni, 1521, lib. ii, tract. iii, cap. xiv, fol. 40.

It may, however, be seen from the very book of Giovanni of Vigo,[1] that in his days doctors and surgeons were, in general, little skilled in dental matters. Speaking of the extraction of teeth, he says: "For this operation there is need of a practised man, and, therefore, many medical and surgical authorities have expressed an opinion that this operation should be left to expert barbers and to the itinerant quacks who operate in public places. He, therefore, who desires to perform this manual operation in the best manner will derive great advantage by frequenting men who are expert in performing it and by seeing and impressing well on his memory their manner of operating."[2]

[1 The editions and translations of Vigo seem to have been endless. A French translation of his treatise on the wounds caused by firearms is said to have fallen into the hands of Paré, and had an inspiring influence upon the barber's boy.—C. M.]

[2] Lib. v, cap. v, De doloribus dentium, fol. cxvii to cxix.

PART III.

THIRD PERIOD—MODERN TIMES.

CHAPTER X.

THE SIXTEENTH CENTURY.

We have now arrived at the sixteenth century. The middle ages, that is, the period of transition between ancient and modern civilization, has now come to an end. Events of the highest importance, such as the invention of printing (1436), the taking of Constantinople by the Turks (1453), with the consequent emigration of many Greek men of letters and science, who took up their residence in the West and especially in Italy, and lastly, the discovery of America (1492), marked the beginning of a new era, and are the most essential factors in bringing about the revival of art and science.

In the midst of the vigorous intellectual life which characterized the sixteenth century, dentistry, too, like many other branches of science, made very notable progress; we, therefore, in this period shall have to record many important facts and many important names.

It is, indeed, in the sixteenth century, and, to be more precise, about the year 1544, that we meet for the first time with a monograph, in which dental affections are spoken of independently of general medicine and surgery. The book we allude to, by Walter Hermann Ryff, is also noteworthy because it is not written like the preceding works, in Latin, the customary language of the learned, but, instead, in German, that is, in a living tongue.

As we are now mentioning the first German author on Dentistry, it may be permitted us briefly to glance at the beginning of medicine and dental art among the German peoples.

Among the Germans, as in other nations, the first to practise the healing art were priests, priestesses, and wise women. To cure disease they used partly empirical remedies, and partly witchcraft and superstitious means of every kind. Thus, to facilitate dentition, it was thought an excellent thing to pass a thread through the eyes of a mouse and then to

tie the blood-covered thread around the neck of the child. It was held, besides—and this prejudice has left even until now some traces—that the putting of the milk teeth, when they fall out, into the nest of a mouse assures the cutting of new teeth.

We must here mention, with regard to the origin of dentistry among the Germans, a very important fact related by Joseph Linderer,[1] a fact which shows that even among the ancient Germans recourse was had to the application of artificial teeth.

We here reproduce the very words of the said author, translated literally:

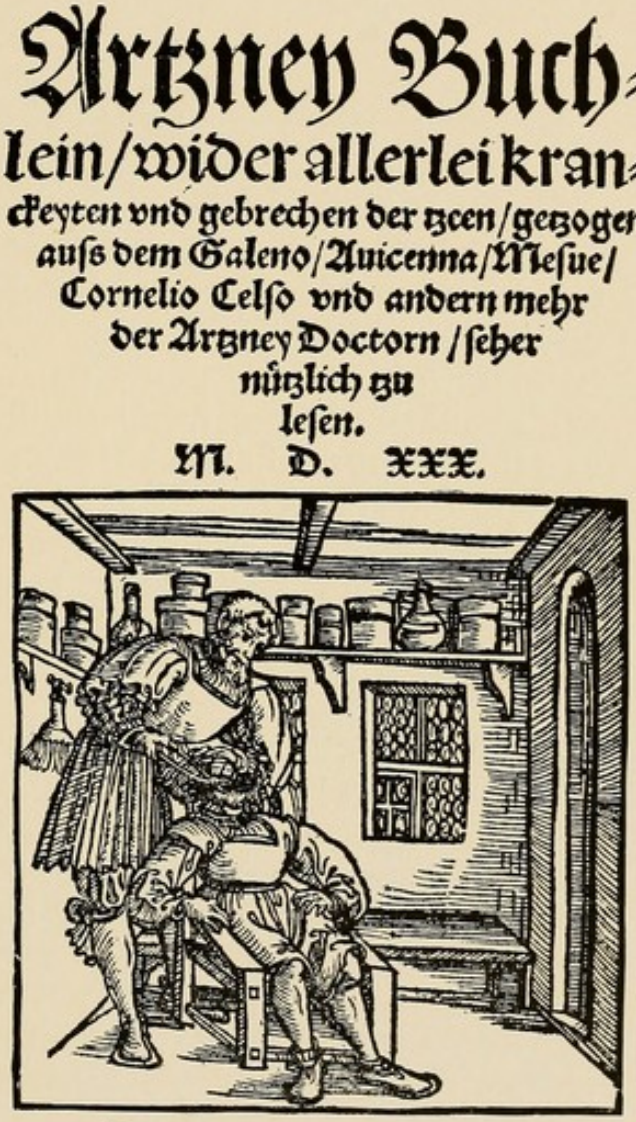
"Being by chance a few years ago at Dresden and visiting the Museum of Antiquities, my attention was attracted, in the last room, to two osseous pieces, which with other objects were enclosed in a glass case, with the written inscriptions: *Comb-shaped osseous pieces, found in ancient German urns.* As soon as I had observed them, I saw at once that they were artificial teeth; but as I had to be contented with examining them through the glass of the case, it was not possible for me to decide whether these pieces were really of bone, as they seemed to be, or of another substance. Taking into account their antiquity, their whiteness is very notable. Every piece is composed, if I remember rightly, of five teeth, that is, of a canine and four incisors; the chief difference of these pieces from the prosthetic pieces in ivory still in use (the author is writing in 1848) consists in this, that the pieces of which I speak have not at all a broad base, designed to rest on the gums, the base having instead the same thickness as the rest. The five teeth are well separated from one another. Besides, the canine makes the proper angle with the incisors, and at each side of the piece is found, in a convenient place, a hole, which shows that these teeth were fastened to those of the subject by means of a metallic or other kind of thread. As the above-described pieces are white, we must infer that they were removed from the mouth of the respective individuals before the body was burnt, and afterward put into the urn with the ashes, just as they used to put in coins, bits of arrows, and the like."

For many centuries dental surgery—which, however, was still in a very primitive state—was practised in Germany, as in many other countries, principally by barbers. These in certain places, and at certain periods, formed corporate bodies, whose members were legally authorized to extract teeth and to practise minor surgery in general. But besides barbers, there were various kinds of individuals, unfurnished with any authorization—tooth-drawers, charlatans, wandering story-tellers, necromancers, Jews, and even hangmen—who invaded the field of medical practice,

[1] Handbuch der Zahnheilkunde, Berlin, 1848, ii, 406.

in spite of its being forbidden them, except in fairs, to administer medicaments and to perform surgical operations.[1]

In 1460 there appeared in Germany a book on Surgery by Heinrich von Pfolsprundt, Knight of the Teutonic Order.[2] The author had acquired great experience as surgeon in the military expeditions of his order, and we see from his book that he was very skilled in the cure of wounds and fractures. On the other hand, he shows himself hostile to every bloody operation with the exception of rhinoplast. Pains of the teeth and gums were cured by him by means of beverages.[3]


Artzney Buch-
lein/wider allerlei kran-
cheyten vnd gebrechen der tzeen/gezogen
auſs dem Galeno/Auicenna/Meſue/
Cornelio Celſo vnd andern mehr
der Artzney Doctorn/ſeher
nützlich tzu
leſen.
M. D. XXX.

Title page of Zahnarzneybuchlein.

[1] Geist-Jacobi, Geschichte der Zahnheilkunde, p. 80.

[2] A religious order of knights, established toward the close of the twelfth century, viz., during the third crusade. The original object of the association was to defend the Christian religion against the infidels, and to take care of the sick in the Holy Land.

[3] Geist-Jacobi, Geschichte der Zahnheilkunde, p. 82.

[The accompanying reproduction of the title page and two text pages from an edition of *Zahnarzneybuchlein*, printed by Michael Blum, in Leipzig, 1530, and translated below, is of interest in connection with the history of the use of gold-foil as a filling material, in that a marginal note refers to Mesue as the author from whom the three methods of treating caries has been derived, one of these methods being the filling of the carious cavity with gold-foil.

Mesue was Surgeon to the Caliph Haroun al Raschid, who flourished 786-809. If the reference to Mesue is correct, it would, therefore, indicate that the filling of teeth with gold was known to the Arabs as early as the latter part of the eighth century. Examination of the writings of Mesue has thus far failed to bring to light any record therein of the treatment of caries by gold filling, although in his work previously referred to (see page 138) the other methods quoted by the anonymous author of *Zahnarzneybuchlein* are fully set forth.

Das Funfft Capittel.

Von den gelöcherten vnd holen Zenen.

Corrosio iſt eine kranckheit vnd vehel der zen wenn ſie löcherigk vnd hol werdē welchs am meiſten den backzenē geſchicht vornemicklichen ſo einer iſt vnnd ſie nicht von der anhangēde ſpeiſe reiniget/welchs faul wirdt/ vnd macht darnach böſe ſcharffe feuchtigkeit die ſie aus friſt vñ etzet/ vnd ymmer all melich vberhant nymmet baſs ſie auch gantz vnd gar die zen verderbet / vnnd darnach nicht ane ſchmertzen müſſen ſtückicht wegk faulen.

Meſue vt ſup. capite pprio.

Diſs wirt als der Meſue ſchreibet vornemicklich dreyerley weyſe curirt vñ entnomen. Zū erſten mit purgirung als oben berürt / Zum andern mit reſoluirung der materien die ſie aus holet vnd wegk friſt/ alſo das man koche ratten das im korn ader weytz wechſt/mit eſſige vnd im munde halde/aber mit eſſige do cappres wortzel mit Jngwer inne geſotten iſt/vnd der gleichen andere remedia mehr.

Zum

[*Translation.*]

FIFTH CHAPTER.

ON CARIOUS AND HOLLOW TEETH.

Corrosion is a disease and defect of the teeth when they become carious and hollow, which most often happens in the molars, especially if one does not clean them of the

adhering food which becomes moist and consequently produces bad, sharp [acid] moisture that eats and corrodes them, always gradually increasing, until it spoils the teeth entirely, which afterward must fall away in pieces not without pains.

"*Mesue ut supra capite proprio.*" This, as Mesue writes, is chiefly cured and removed in three ways. First, by purging as treated upon above. Second, by dissolving the material which renders them hollow and eats them away; also by boiling cockles that grow in barley or wheat, in vinegar and holding this in the mouth. In this vinegar the root of caper and ginger and other similar remedies must have been previously boiled. Third, by removing the decay, which is done in two ways. First, by scraping and cleaning the hole and the carious part with a fine chisel, knife, or file, or other suitable instrument, as is well known to practitioners, and then by filling the cavity with gold leaves for the preservation of the other portion of the tooth. Second, by using suitable medicine, such as oak apples or wild galls, with which the tooth is filled after having been cleaned.

Zum dritten das man die ausholung wegk nimmet/welchs auch auf zweyerley weyse geschicht/ Zum ersten das man das loch vnd die aufsfressunge mit einem subtilen meisselchen oder messerchen veilchē/ oder mit einem andern instrument darzu bequemicklich/wegk schabe/vnd reinige/ als dy practickanten wol wissen/vnd darzu erhaldung des andern teyles des zanes das löchlichen mit golt blettern zu fullet. Zum andern das mann gebrauche ertzney darzu dinlich welchs geschiet mit Galles epffel vnd wilder galgen so der zan nach der reinigung darmit wirdt gefüllet.

Nim pilsen samen mit dem gumē storacis vormischt / reuche darmitte durch einen trichter den gelöcherten zan.

Galbanum ist ein gummi gleich dem olibano auff die ausgeholte zen gelegeth lindert den schmertzen.

So die holen zene mit opopannaco gefullet werden stillet ehr den schmertzen.

Corellen zustossen vnd in die holen zen gelegt macht sie ausfallen.

The following editions of *Zahnarzneybuchlein*, besides the Basle and Mayence editions noted by Dr. Guerini at page 166, were issued and copies thereof are preserved in the libraries of the several collectors as stated. Edition of 1530, printed by Michael Blum, Leipzig, in collection of Edward C. Kirk. Edition of 1536, printed by Chr. Egenolff, Frankfurt a/M, in collection of William H. Trueman. Edition of 1541, printed by Chr. Egenolff, Frankfurt a/M, in *Dental Cosmos* library and collection of E. Sauvez. Edition of 1576, printed by Chr. Egenolffserben, in collection of H. E. Friesell.—E. C. K.]

The book, therefore, lacks importance from a dental point of view, except in the sense that it shows how little skilled in the cure of dental affections were the German surgeons of those days

It is worthy of note that this author, also, speaks of anesthetic inhalations; he, however, only translates, almost to a word, what Guy de Chauliac says on this subject.

Toward the end of the fifteenth century and in the first half of the sixteenth there were published in German, by anonymous authors, some short translations and compilations on dental subjects, taken especially from Greek and Arabian authors.[1] Of these writings, the first one known, taken from Galen and Abulcasis, was printed at Basle in 1490; and another—one of the best—saw the light at Mayence in 1532. These works were perhaps due to intelligent barbers, or perhaps—and this seems to be the most probable—they were written, through the initiative of enterprising printers, by doctors and surgeons, who wished to remain unknown, on account of the special subject treated; for, owing to the fact that the diseases of the dental system were generally left in the hands of barbers and other unprofessional persons, the doctors and surgeons of those days would have been ashamed to interest themselves in such things.

Walter Hermann Ryff, of Strasburg, was born in the beginning of the sixteenth century, and died about 1570. He was a rather mediocre doctor and surgeon, and a man of the worst morals, so much so that many cities expelled him from their midst.[2] He wrote many medical works, in which, however, there is very little original matter. Their principal merit consists, perhaps, in the fact that they were written not in Latin, as then was universally customary, but rather in the vernacular of the author and in a popular style; so that Ryff may be looked upon as the first who endeavored to diffuse among the people useful medical and hygienic knowledge.

Among Ryff's books there are two which are very important to us. One is his *Major Surgery*, and the other is a pamphlet entitled *Useful Instruction on the Way to Keep Healthy, to Strengthen and Reinvigorate the Eyes and the Sight. With Further Instruction on the Way of Keeping the Mouth Fresh, the Teeth Clean, and the Gums Firm.*[3]

Of these books, there now only exist some extremely rare copies; so much so that neither Albert von Haller nor Kurt and Wilhelm Sprengel, who rendered such great services to the history of surgery, ever had the pleasure of examining them. Dr. Geist-Jacobi has been more fortunate

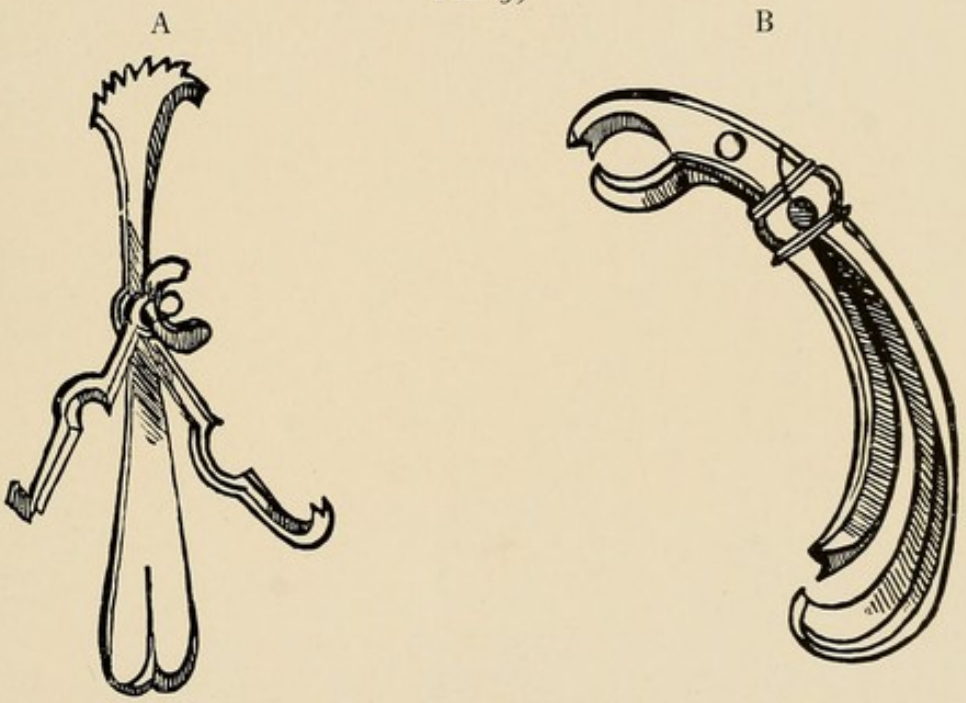
[1] Geist-Jacobi, p. 88. [2] Albert von Haller, Bibliotheca chirurgica, i, 190.

[3] Nuetzlicher Bericht, wie man die Augen und das Gesicht schaerfen und gesund erhalten, die Zaehne frisch und fest erhalten soll. Würzburg, 1548.

than they, and has therefore been able to give us some very interesting information about their contents.

The *Major Surgery* is a mere compilation which does not contain anything new of importance. It was published in part in 1545, and in part in 1572, after the death of the author. The work is illustrated with very beautiful wood engravings; and it is just this which gives the principal value to this book. Some of the illustrations contained in the first part of it—that is, in that published in 1545—represent dental instruments, notwithstanding dental surgery is not treated in this part of the book. The author gives notice that he will treat all that concerns dental affections in the latter part of this book, in a special chapter. Unfortunately, this chapter was never written, because death prevented Ryff from completing the second part of his work.

FIG. 59



Pelican and dental forceps (Walter Hermann Ryff).

The dental instruments represented in his *Major Surgery* are many in number. Among them, first of all, are found the fourteen dental scrapers of Abulcasis, then the "duck-bill"—designed for the extraction of dental roots and broken teeth—various kinds of pelican (Fig. 59 A), the "common dental forceps" (Fig. 59 B), the "goat's foot," and many other kinds of elevators, among which, observes Geist-Jacobi, may be seen instruments even now in use, and even some which are said to have been recently invented.

Ryff's other book is especially noteworthy because, as we have already mentioned, it treats, for the first time, of dental matters, independently

of general medicine and surgery. This pamphlet, printed at Würzburg about the year 1544, is made up of sixty-one pages, and is divided into three parts, the first of which is dedicated to the eyes, the second to the teeth, and the third to the first dentition. It is written in popular style, and the author certainly intended it for the instruction of the public, and not for professional men; so true is this, that in it he does not speak of the technical part of the extraction of teeth, or of gold filling—a method already known for a long time—or of dental prosthesis.

The first part, relative to diseases of the eyes and the manner of curing them, has no importance for us. The second part begins with the following paragraph:

"The eyes and the teeth have an extraordinary affinity or reciprocal relation to one another, by which they very easily communicate to each other their defects and diseases, so that the one cannot be perfectly healthy without the other being so too."[1]

This last statement is absolutely false, as a disease of the eyes may very well exist with a perfect condition of the teeth, and *vice versa*. However, Ryff has the merit of being, perhaps, the first who has noted the undeniable relation which exists between the dental and ocular affections.

After a rapid glance at the anatomy and physiology of the teeth, the author enumerates the causes of dental disease, which, according to him, are principally heat, cold, the gathering of humors, and traumatic actions.

The prophylaxis of dental diseases is beyond any doubt one of the best parts of the book; however, the ten rules counselled by Ryff for keeping the teeth healthy—rules which Dr. Geist-Jacobi has made known to us in full—are reproduced, almost to a word, from Giovanni d'Arcoli's work; therefore, the author has no other merit than that of having translated them into the vulgar tongue, thus diffusing the knowledge of useful precepts for preventing dental diseases. We refrain from reproducing the aforesaid rules here, as they are, with slight variations, identical with those which we gave when speaking of Arculanus.

Nor can any credit be given to Ryff for the rules which he gives in regard to the diagnosis of dental pains, as this part of his work is also taken wholly from the Italian author just mentioned.

After these diagnostic rules Ryff, continuing to translate from the book of Giovanni d'Arcoli, adds:

"If the pain comes from the gums, extraction is of no use; if it comes from the tooth, extraction makes it cease; when, lastly, it is in the nerve, sometimes extraction removes it, and sometimes it does not, according as the matter obtains or not a free exit."

[1] See Giornale di Corrispondenza pei dentisti, 1895, xxiv, 289.

The barbers and tooth-drawers, he says, must well remember this rule, in order to avoid extracting, thoughtlessly and with no benefit, sound teeth, since then the pain persists in spite of the operation. Also, it must be borne in mind that, in case of violent pain, it is necessary to operate as soon as possible, so that the patient may not faint or be attacked by the falling sickness, if the pain should be communicated to the heart or brain.

The idea that violent dental pains could give rise to syncope or to epilepsy (in regard to which we only observe that even very recent writers enumerate dental caries among the causes of the so-called reflex epilepsy) is also found in Giovanni d'Arcoli, who expresses himself in regard to this in the following terms: "Such very violent pains are sometimes followed by syncope or epilepsy, through injury communicated to the heart or brain."[1]

"The most atrocious pain," says Ryff, "is when an apostema ripens in the root;" literal translation of words written about a century before by Arculanus: "Fortissima dolor est, qui provenit ab apostemate, quod in radice dentis maturatur."

Likewise taken from Arculanus is the observation (already made, however, by much more ancient writers) that "when the cheeks swell, toothache ceases." Arculanus, however, expresses himself in a less absolute manner, and therefore more corresponding to the truth, since he says "the pain generally ceases" (secundum plurimum dolor sedatur).

Even in regard to the therapeutics of dental pains, Ryff does not tell us anything new. Dr. Geist-Jacobi gives this author the merit of having made, in regard to the cure of dental pains, a distinction between *cura mendosa* (that is, imperfect, palliative, tending simply to calm the pain) and *cura vera* (that is, directed against the causes of the disease). But this very important distinction is also taken from Arculanus, who in his turn took it from Mesue. In fact, after having spoken of the general rules relative to the cure of dental diseases, Giovanni of Arcoli adds: "As to the particular therapy, it is divided into *cura mendosa* and *cura vera*, as may be found in Mesue. And the *cura mendosa* is so called because it calms the pain by abolishing sensibility, not by taking away the cause of it. Such is, for the sake of example, the cure, consisting in fumigations of henbane, made to reach the diseased tooth by means of a small tube, adapted to a funnel."

The third part of Ryff's pamphlet has as its title:

"How the pains of the gums should be calmed or mitigated in suckling infants, so as to promote the cutting of the teeth without pain."

This part, as Geist-Jacobi informs us, is very brief, not taking up more

[1] Joannis Arculani. Commentaria, Venetiis, 1542, cap. xlviii, De dolore dentium, p. 192.

than a page and one-half of print. Neither does it contain anything of importance. To render the cutting of teeth easier, Ryff advises that infants should have little wax candles given to them to chew and the gums anointed with butter, duck's fat, hare's brains, and the like. The tooth of a wolf may be hung around the neck of the child, so that it may gnaw at it. It is also recommended that the head of the child should be bathed with an infusion of chamomile.

From what has been said, one may see very clearly that the aforesaid book is, from the scientific point of view, entirely valueless, because the best part of it is merely copied from the work of Giovanni d'Arcoli. However, the author has the indisputable merit of having endeavored to diffuse the knowledge of useful precepts of dental hygiene. His book, besides, we repeat, has great historical value, for from it dates the beginning of odontologic literature, properly so called.

On this point we believe it is necessary to correct an error into which Dr. Geist-Jacobi has fallen. At the beginning of his very valuable article on Walter Hermann Ryff[1] he says: "In the fifth century of the Christian era, the iatrosophist Adamantius of Alexandria published an exclusively odontalgic work, of which, however, we only know the title." The same he repeats in his *History of Dental Art* (pp. 55 and 56), without, however, giving us any proof of his statement. "Of the odontologic treatise of Adamantius," he says, "unfortunately the title alone is known to us, and even that has reached us indirectly, that is, by means of Ætius; it is of the following tenor."

Now, whoever takes the trouble to translate these Greek words will easily perceive that they do not constitute one title, but two distinct ones (which even Dr. Geist-Jacobi has had to unite by the conjunction *and*). These, however, are nothing more than the titles of two chapters of the *Tetrabiblos* of Ætius, as anyone may see for himself by turning over the pages of this work either in the Greek original, or in the beautiful Latin translation of Giano Cornario (Venice, 1553). In this great composition of Ætius dental diseases are treated of in Chapters XXVII to XXXV of Sermo IV, Tetrabiblos II; and the two Greek titles above referred to are the titles of Chapters XXVII and XXXI.

In the translation of Giano Cornario they read as follows:

Cura dentium a calido morbo doloroso affectorum, ex Adamantio sophista (cure of teeth affected by warm, painful disease, according to Adamantius the sophist).

Cura dentium a siccitate dolore affectorum, ex Adamantio sophista (cure of teeth affected by pain from dryness, according to Adamantius the sophist).

[1] "The first dental book in the German language" (see Giornale di Corrispondenza pei dentisti, loc. cit.).

The work of Adamantius, from which Ætius took the contents of the chapters thus entitled, is lost to us, but we have no reason, and not even the least indication, for supposing that this work was a treatise on dental diseases, and not one on general medicine. It is absurd to consider the above-mentioned titles as belonging to an odontological monograph, on the one hand, because, admitting for a moment the existence of such a work, it should have had but one title and not two, and on the other hand, because it is by no means to be supposed that a great and wise physician, such as Adamantius undoubtedly was, should have had the whim to write a book, not on dental disease or on dental pains in general, but only and exclusively on dental pains caused by heat or by dryness. What reason would there have been for not extending the treatment of the subject to those cases of odontalgia resulting from humidity or from cold, that is, from causes as common and, according to the ideas of that time, very frequently associated with one of the first two (as humidity with heat, and cold with dryness)?

Besides, if the titles of the two chapters spoken of be compared with those of the others, in which Ætius treats of dental affections, such analogy will be noticed between the various titles as to make us consider that they have been formulated by Ætius himself, even when the contents of these chapters are taken from other writers. So that the two aforesaid titles not only do not belong to any dental work, but probably they have never existed, even as simple titles of chapters, in the medical book of Adamantius, from which the contents of the two chapters of Ætius above mentioned have been taken.

In order that every one may easily be convinced that the two titles made so conspicuous by Dr. Geist-Jacobi have nothing particular about them, but are, instead, perfectly analogous to the titles of various other chapters of Ætius, we give here the translation of the titles of five chapters, all concerning dental maladies, that is, the two chapters in discussion and other three:

Chapter XXVII: Cure of teeth affected by warm, painful disease, according to Adamantius the sophist.

Chapter XXIX: Cure of teeth affected with pain from humidity.

Chapter XXXI: Cure of teeth affected by pain from dryness, according to Adamantius the sophist.

Chapter XXXII: Cure of teeth affected by pain from heat and humidity.

Chapter XXXIII: Cure of decayed teeth, according to Galen.

It appears very clear, therefore, from the great analogy existing between the headings of all the above-mentioned chapters, that the titles referred to by Geist-Jacobi have not at all the historical importance and significance that he attributes to them, and that the same have been formulated

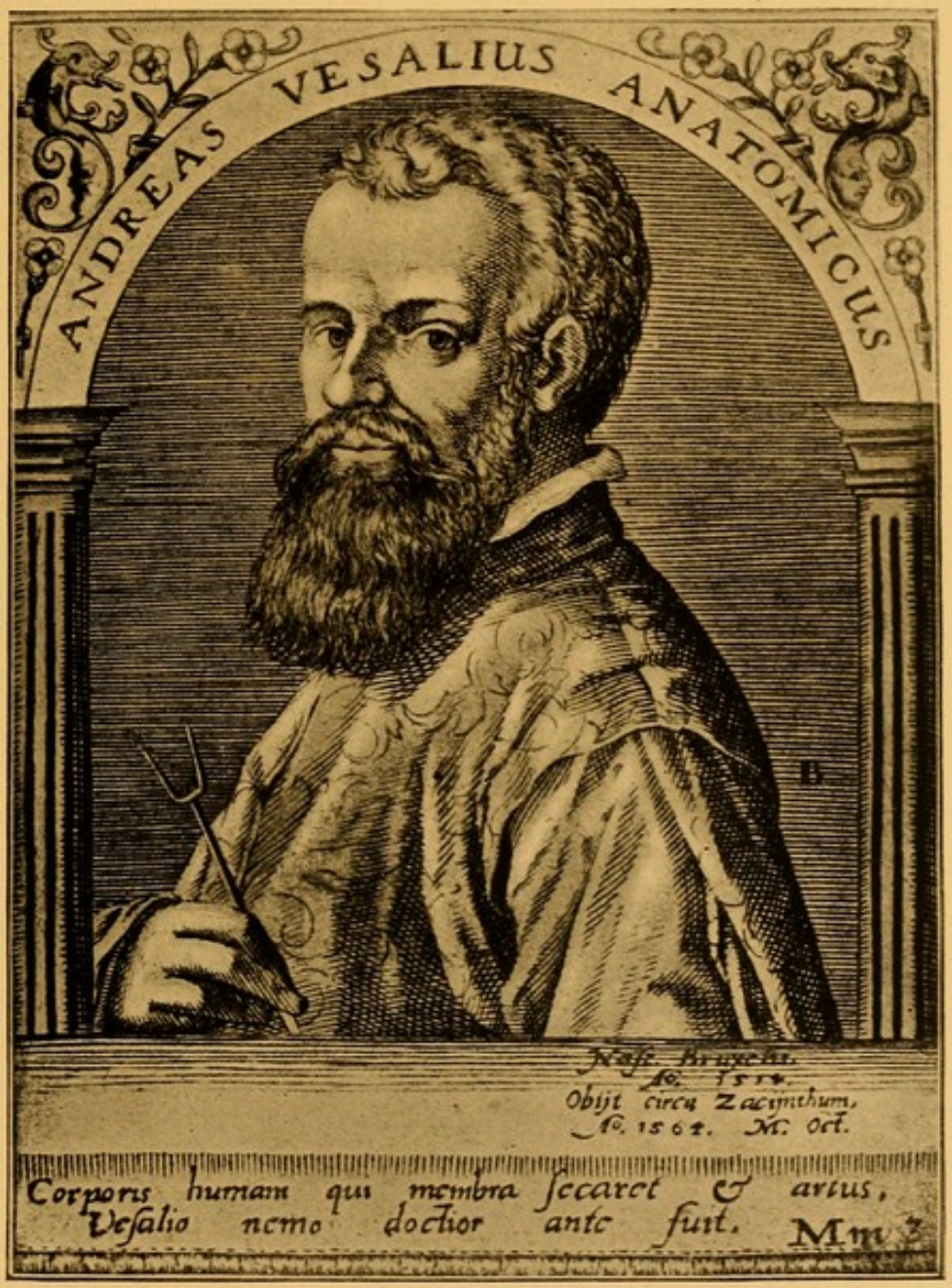
by Ætius himself. To argue from such titles that Adamantius was the author of a book on dentistry is not only inadmissible, for all the reasons already given, but also because if it were allowable to reason with such lightness, it might also be stated—by arguing from the title of Chapter XXXIII—that Galen was the author of a monograph on the treatment of dental caries; a thing which is absolutely untrue. Consequently, the beginning of odontologic literature cannot be traced back to Adamantius, but, as Dr. Geist-Jacobi would have it, to an author much less ancient, that is, to Walter Hermann Ryff, or, if it is preferred, even to the anonymous writers of the odontologic compilations which appeared in Germany at the end of the fifteenth century.

Andreas Vesalius. We must now speak of Andreas Vesalius, an extraordinary man, who by his genius infused new life into medical science, and who, although he gave but little attention to dental matters, yet fully deserves a place of honor in the history of dentistry; for this, like every other branch of medicine, received great advantage from his reforming work, which broke down forever the authority of Galen, thus freeing the minds of medical men from an enslavement which made every real progress impossible.

Andreas Vesalius was born at Brussels, December 31, 1514. He studied at Louvain and then at Paris, where at that time great scientists taught, and among others the celebrated anatomist Jacques Dubois, generally known by the Latinized name of Sylvius.[1] The latter, a great admirer of Galen, whose anatomical writings served as texts for his lectures, became jealous of the young Belgian student, who was his assistant, and who gave undoubted proofs of great genius, and of extraordinary passion in anatomical research. Vesalius often defied the greatest dangers in order to obtain corpses either from the cemetery of the Innocents or from the scaffold at Montfaucon. He soon surpassed his most illustrious masters, and at only twenty-five years of age published splendid anatomical plates, which astonished the learned. He acquired also great renown as surgeon, and in this capacity he followed the army of Charles V in one of his wars against France. After having been professor of anatomy in the celebrated University of Louvain (Belgium), he was invited by the Venetian Republic to teach in the University of Padua, which, through him, became the first anatomical school in Europe. Yielding to the requests of the magistrates of Bologna and Pisa, he also taught in those famous universities, before immense audiences.

Before Vesalius, Galen's anatomy had served as the constant basis for the teaching of this science. Although even from the end of the fifteenth century dead bodies were dissected in all the principal universities, the

[1] A Latin translation of the French name *Du bois*.


ANDREAS VESALIUS ANATOMICUS
Nasc. Bruxellis.
An. 1514.
Obijt circa Zacynthum.
An. 1564. M. Oct.
Corporis humani qui membra secaret & artus,
Vesalio nemo doctior ante fuit.

teachers of anatomy always conformed, in their descriptions, to those of Galen, so that the authority of this master, held infallible, prevailed even over the reality of facts.

Vesalius, for the first time, dared to unveil and clearly put in evidence the errors of Galen; but this made him many enemies among the blind followers and worshippers of that demigod of medicine. Europe resounded with the invectives that were bestowed upon Vesalius. Among others, there rose against him Eustachio at Rome, Dryander at Marburg, Sylvius at Paris, and this last did not spare any calumny that might degrade his old pupil, who had become so celebrated. In spite of this, the fame of Vesalius kept on growing more and more, so much so that Charles V called him to Madrid, to the post of chief physician of his Court, a place which he kept under Philip II, also after the abdication of Charles V. The good fortune of Vesalius, unhappily, was not to be of long duration. In 1564 a Spanish gentleman died, in spite of the care bestowed upon him by Vesalius, and the illustrious scientist requested from the family, and with difficulty obtained, the permission to dissect the body. At the moment in which the thoracic cavity was opened the heart was seen, or thought to be seen, beating. The matter reached the ears of the relations of the deceased, and they accused Vesalius, before the Inquisition, of murder and sacrilege; and he certainly would not have escaped death except by the intervention of Philip II, who, to save him, desired that he should go on a pilgrimage to the Holy Land, as an expiation. On his return, the ship which carried Vesalius was wrecked, and he was cast on a desert beach of the Isle of Zante, where, according to the testimony of a Venetian traveller, he died of hunger, October 15, 1564.

Vesalius left to the world an immortal monument, his splendid treatise on Anatomy,[1] published by him when only twenty-eight years of age, and of which, from 1543 to 1725, not less than fifteen editions were issued. The appearance of this work marked the commencement of a new era. The struggle between the supporters of Galen and those of Vesalius rendered necessary, on both sides, active research concerning the structure of the human body, so that anatomy, the principal basis of scientific medicine, gradually became more and more perfect, and, as a consequence of this, as well as of the importance which the direct observation of facts acquired over the authority of the ancients, there began in all branches of medicine a continual, ever-increasing progress, which gave and still gives splendid results, such as would have been impossible under the dominion of Galenic dogmatism.

In the great work of Vesalius the anatomy of the teeth is unfortunately treated with much less accuracy than that of the other parts of the body.

[1] De humani corporis fabrica, libri septem.

However, his description of the dental apparatus[1] is far more exact than that of Galen, and represents real progress. The number of the roots of the molar teeth (large and small) is indicated by Galen in a very vague and inexact manner, since he says that the ten upper molars have generally three, sometimes four roots, and that the lower ones have generally two, and rarely three. Vesalius, having examined the teeth and the number of their roots in a great number of skulls, was able to be much more precise. In regard to roots, he makes, for the first time, a very clear distinction between the premolars next to the canine (small molars) and the other three, and says that the former in the upper jaw usually have two roots, and in the lower, one only, whilst the last three upper molars usually have three roots and the lower ones two. As everyone sees, these indications are, in the main, exact.

Other important facts established by Vesalius are as follows:

The canines are, of all the teeth, those which have the longest roots. The middle upper incisors are larger and broader than the lateral ones, and their roots are longer. The roots of the last molars are smaller than those of the two preceding molars. In the penultimate and antepenultimate molars, more often than in the other teeth, it sometimes happens that a greater number of roots than usual are found, it being not very rare to meet with upper molars with four roots, and lower ones with three. The molars are not always five in each half jaw; sometimes there are only four, either on each side, or on one side only, in only one jaw or in both. Such differences generally depend on the last molar, which does not always appear externally, remaining sometimes completely hidden in the maxillary bone, or only just piercing with some of its cusps the thin plate of bone which covers it; a thing which Vesalius could observe in many skulls in the cemeteries.

In regard to the last molar, the author speaks of its tardy eruption and of the violent pains which not unfrequently accompany it. The doctors, he adds, not recognizing the cause of the pain, to make it cease have recourse to the extraction of teeth, or else, attributing it to some defects of the humors, overwhelm the sufferer with pills and other internal remedies, whereas the best remedy would have been the scarification of the gums in the region of the last molar and sometimes the piercing of the osseous plate which covers it.

This curative method, of which no one can fail to recognize the importance, was experimented by Vesalius on himself, in his twenty-sixth year, precisely at the time that he had just begun to write his great treatise on anatomy.

[1] De humani corporis fabrica libri septem, cap. xi, De dentibus, pp. 40 to 42 (complete edition of the works of Vesalius, published at Leyden in 1725).

The existence of the central chamber of the teeth appears to have been unknown to Galen, as he does not allude to it in the least. Vesalius was the first to put this most important anatomical fact in evidence. He expresses an opinion that the central cavity facilitates the nutrition of the tooth. He says, besides, that when a hole is produced in a tooth by reason of acrid corrosive humors, the corrosion, when once the internal cavity is reached, spreads rapidly and deeply in the tooth, owing to the existence of the said cavity, and sometimes reaches even the end of the root.

In the chapter in which Vesalius treats of the anatomy of the teeth (Chapter XI, p. 40), two very well-drawn figures are found, one of which represents a section of a lower molar, showing the pulp cavity and its prolongation into the two root canals. The other represents the upper and lower teeth of the right side, in their reciprocal positions, and shows very clearly their general shape, the length of their roots, and the number of these.

The changes which take place in the alveolus, after the extraction of a tooth have not escaped the notice of Vesalius. He says that after an extraction the walls of the alveolus approach one another, and the cavity is gradually obliterated.

Aristotle had affirmed that men have a greater number of teeth than women. Vesalius declares this opinion absolutely false—although, after Aristotle, it has been repeated by many other ancient writers—and says that anyone can convince himself that the assertion of Aristotle is contrary to the truth, as it is possible for everybody to count his own teeth.

In spite of this, we find the above-mentioned error even in writers subsequent to Vesalius; for example, in Heurnius (professor at Leyden toward the end of the sixteenth century), who expresses an opinion that rarely do women have thirty-two teeth, like men.

We find but little in Vesalius concerning the development of the teeth. He, indeed, made some observations and researches on this point, but these, from their insufficiency, led him to quite mistaken conclusions. The teeth of children, he says, have imperfect, soft, and, as it were, medullary roots; and the part of the tooth which appears above the gums is united to the root, so to say, as a mere appendix, after the fall of which there grows from the root the permanent tooth. This error arose in the mind of Vesalius from observing that when children lose their milk teeth, these have the appearance of a kind of stump, as if the root had actually remained in the socket. Besides this, he had observed with what facility the milk teeth fall out; and he here calls to mind that, when about seven years old, he himself and his companions used to pluck out their loosened teeth, and especially the incisors, with their fingers, or with a thread tied around the tooth. The softness of the dental roots in children, the easy fall of the milk teeth, and the want of the lower part of the roots in these,

must have raised the idea in his mind that the roots of the milk teeth remained in the socket, and that the upper part of the temporary teeth, instead of being a continuation of the root, was joined to this as a simple appendix, and in a very weak way, as though designed to remain in place for a limited length of time only.

In Vesalius[1] is found a dental terminology—Latin, Greek, Hebrew, and Arabic—which affords some interest. The incisors are called in Latin *incisorii*, *risorii*, *quaterni*, *quadrupli;* and the two middle incisors have been denominated by some authors *duales*. The canines are called in Greek kynodontes, which means the same as the Latin *canini*, dog's teeth. In Latin they have been also denominated *mordentes*, and by some also *risorii*, a name which by others is given to the incisors, as we have already seen. The molars have also been called in Latin *maxillares*, *paxillares*, *mensales*, *genuini*.[2] But some authors give this last name only to the last molars, or wisdom teeth, *dentes sensus et sapientiæ et intellectus*. These teeth have also been called *serotini* (that is, tardy), *ætatem complentes* (that is, completing the age, the growth), and also, in barbaric Latin, *cayseles* or *caysales*, *negugidi*, etc.

In the rebellion against the authority of the ancients, Vesalius had a predecessor whose name, deservedly famous, may be recorded here. Paracelsus (born in 1493 at Maria-Einsiedeln, Switzerland), on being nominated, in 1527, Professor of Medicine and Surgery at Basle, inaugurated his lectures by burning in the presence of his audience, who were stunned by such temerity, the writings of Galen and Avicenna, just as Luther, seven years before, had burnt in the public square of Wittenberg the papal bulls and decretals. The sixteenth century, in its exuberance of intellectual life, was undoubtedly one of the grandest centuries in history; human thought in that glorious epoch shattered its chains, and declared its freedom both in matters of science and of religion.

Paracelsus, a man of powerful genius, but not well balanced in mind, of corrupt morals, and of an unlimited pride, had, notwithstanding these undeniable defects, the merit of beginning a healthy reform in the science and practice of medicine, by substituting the study of nature for the authority of the ancients and by giving a great importance to chemistry, both for the explanation of organic phenomena and for the cure of disease.

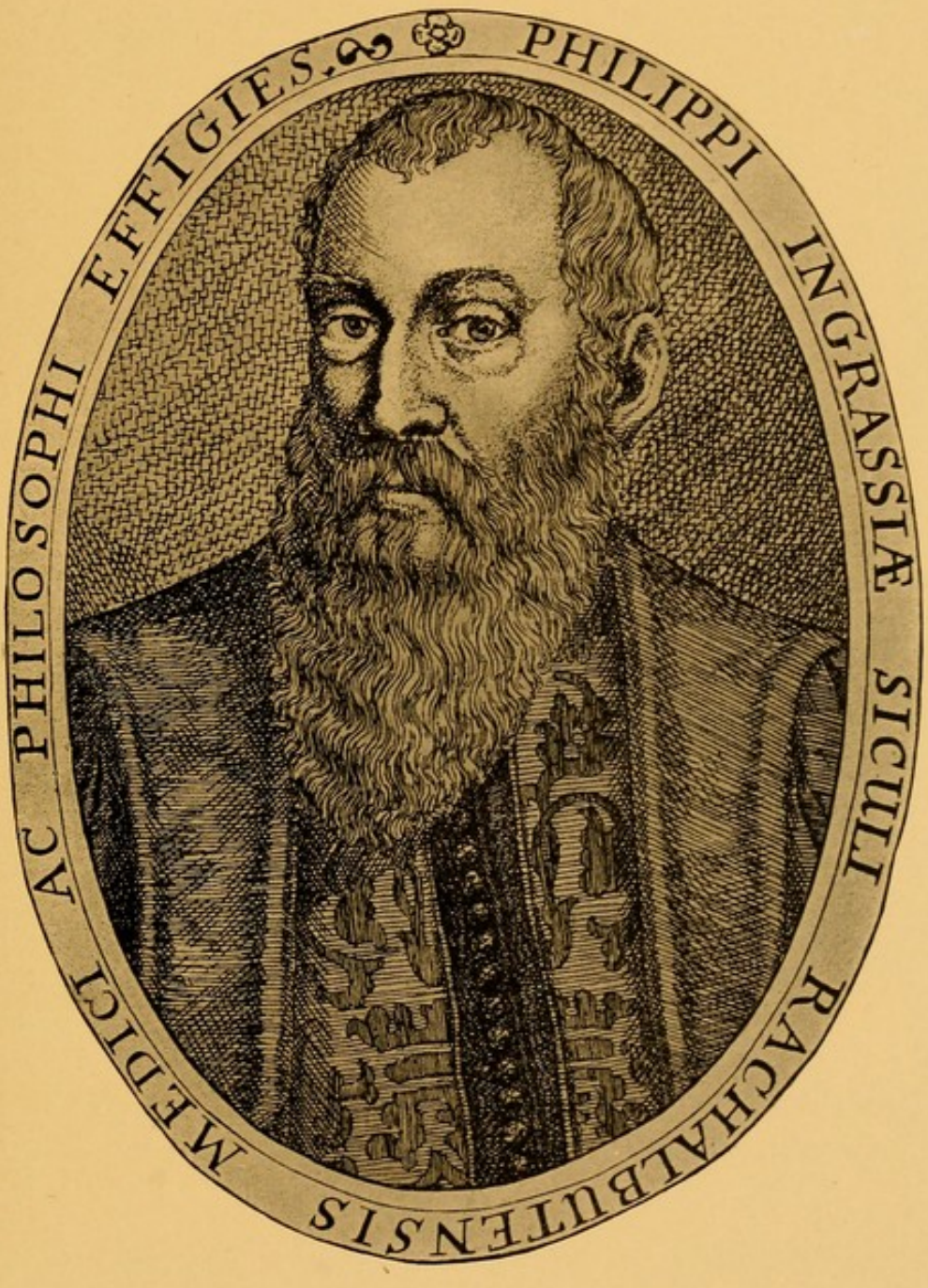
It is to be lamented that this man of genius did not contribute in any way to the progress of dentistry. His works have no importance for us. As a matter of mere curiosity we only record here that Paracelsus considered the too precocious development of the teeth as a great anomaly, and regarded as monsters those children who were born with teeth.[3]

[1] Lib. i, cap. xlii, p. 141.

[2] From *gena*, a cheek.

[3] Blandin, Anatomie du système dentaire, Paris, 1836, p 19


PARACELS.
AVREOLVS
PHILIP.
THEOPHRA.
Hic est cuj magni mysteria cognita mundj:
Et dare qui potuit de salis arte salem.


PHILIPPI INGRASSIÆ SICULI RACHALBUTENSIS MEDICI AC PHILOSOPHI EFFIGIES.



GABRIEL FALOPIUS
CELEBERRIMUS MEDICUS ET ASTROLOGUS
IN VENET. ET PADVA.
ÆT. S. LXXIII.

Gian Filippo Ingrassia (1510 to 1580), a distinguished Sicilian anatomist, was one of the first who spoke of the dental germ. He says that the existence of the tooth properly so called is preceded by that of a soft dental substance enclosed in the bone, and which he considers almost as a secretion of the latter.

Matteo Realdo Colombo, of Cremona, a pupil of Vesalius and his successor in the professorship of Anatomy at Padua, added but little, as regards the teeth, to what his master has taught. He combated the erroneous idea that the teeth were formed in the alveoli shortly before their eruption. Having dissected the jaws of many fetuses, and having always observed in them the existence of teeth, he could affirm with every certainty that the teeth begin to be formed in intra-uterine life.

Like Vesalius, Realdo Colombo believed that the permanent teeth were developed from the roots of the milk teeth; and, therefore, he advised the utmost caution in extracting these, since, if the whole root were removed, the tooth would not grow again.[1]

Gabriel Fallopius (1523 to 1562), the eminent anatomist of Modena, also a disciple of Vesalius, carried out accurate and successful researches in regard to the development of the teeth, and made them known in his book, *Observationes anatomicæ*, published at Venice in 1562, the year in which he died.

His investigations enabled him to show the falsity of the opinion held by Vesalius, that the permanent teeth are developed from the roots of the temporary ones. He was, besides, the first who spoke in clear terms of the dental follicle.

The teeth, says Fallopius,[2] are generated twice over, that is, the first time in the uterus, after the formation of the jaws, and the second time in extra-uterine life, before the seventh year. The first teeth are, at the time of birth, still imperfect, without roots, completely enclosed in their alveoli, and formed of two different substances; the part with which they must break their way out is osseous and hollowed; the deeper part, instead, is soft and humid and is seen covered with a thin pellicle, a thing which may also be observed in the feathers of birds when they are still tender. In fact, the part of the feather which comes out of the skin is hard and corneous, whilst the part which is embedded in the wings is soft and humid and has the appearance of coagulated blood or mucus. So also in the fetal teeth, the part corresponding to the future root presents itself like coagulated mucus. Little by little this soft substance hardens and becomes osseous, thus constituting the root of the tooth.

[1] Portal, Histoire de l'anatomie et de la chirurgie, tome i, p. 545.

[2] Observationes anatomicæ, p. 39, et seq.

Fallopius' reference to the analogy between the development of teeth and that of feathers was highly important, as a point of departure for embryological researches which showed clearly the real nature of teeth, thus destroying the mistaken idea—held by Galen and many other authors—that these organs were bones.

On coming to speak of the teeth generated in extra-uterine life, that is of the permanent teeth, Fallopius relates having observed that they have their origin in the following manner: A membranous follicle is formed inside the bone furnished with two apices, one posterior (that is to say, deeper down, more distant from the surface of the gums), to which is joined a small nerve, a small artery, and a small vein (*cui nervulus, et arteriola, et venula applicantur*); the other anterior (that is more superficial), which terminates in a filament or small string, like a tail. This string reaches right to the gum, passing through a very narrow aperture in the bone, by the side of the tooth which is to be substituted by the new one. Inside the follicle is formed a special white and tenacious substance, and from this the tooth itself, which at first is osseous only in the part nearest the surface, whilst the deeper part is still soft, that is, formed of the above-mentioned substance. Each tooth comes out traversing and widening the narrow aperture through which the "tail" of the follicle passes. The latter breaks, and the tooth comes out of the gum, bare and hard; and in process of time the formation of its deeper part is completed.

The author says that his long and laborious researches into the development of the teeth were carried out with great accuracy, and he is, therefore, in a position to give as absolute certainties the facts exposed by him. Indeed, the observations of Fallopius were, for the most part, confirmed by subsequent research. As to the "tail" of the dental follicle, it is identical with the *iter dentis* or *gubernaculum dentis* of some authors. Fallopius described it as a simple string, but later on this prolongation of the dental follicle has been considered, at least by some, as the narrowest part or neck of the follicle itself, that is, as a channel through which the tooth passes, widening it, on its way out, and precisely for this reason it has been called *iter dentis* (the way of the tooth) or *gubernaculum dentis* (helm or guide of the tooth).

Bartholomeus Eustachius, another great anatomist of the sixteenth century, occupied himself in the study of teeth with special interest, and wrote a very valuable monograph on this subject. He was a native of San Severino, Marche (Italy), and a contemporary of Vesalius, Ingrassia, Realdo Colombo, and Fallopius; he died in 1574, after having immortalized his name through many anatomical discoveries and writings of the highest value.

His book on the teeth, *Libellus de dentibus*, published at Venice in 1563,



BARTOLOMEUS EUSTACHIUS

is the first treatise ever written on the anatomy of teeth, and represents a noteworthy progress in this branch of study.

In this little book—divided into thirty chapters, forming in all ninety-five pages—the author treats with great accuracy and in an admirable manner all that concerns the anatomy, physiology, and development of the teeth.

Eustachius not only treasured up what ancient authors had written on this subject, but he himself made very long and patient researches and observations on men and animals, on living individuals as well as on corpses, and not only on adult subjects, but also on children of every age, on stillborn children and on abortive fetuses.

The macroscopic anatomy of the teeth was brought by him to a high degree of perfection. Very wonderful, among other things, is the accuracy with which he studied and specified in several synoptical tables the number of the roots of molar teeth, and all the variations occurring not only in their number, but also in their form, length, etc.

In Chapter IV, speaking of the means by which teeth are held in their sockets, Eustachius mentions in quite explicit terms the ligaments of the teeth. He begins by saying that the perfect correspondence between the dental roots and the alveoli, both in shape and in size, is one of the elements which contribute to the firmness of the teeth, since the alveolus, being exactly applied, on all sides, to the root or roots of the tooth, causes the latter, by this simple fact, to be fixed in a determined position. Also, the nerves inserted in each single tooth contribute, as was already the opinion of Galen, to the stability of these organs. "There exist besides" —Eustachius continues—"very strong ligaments, principally attached to the roots, by which these latter are tightly connected with the alveoli" (*adsunt præterea vincula fortissima radicibus præcipue adherentia, quibus præsepiolis arctissime colligantur*). Lastly, says the author, the gums, too, embracing the teeth at their exit from the alveoli, contribute to their firmness. And here Eustachius notes that in the joining of the gums to the teeth there is great analogy to that of the skin with the finger nails; a very proper observation, which makes us almost suppose that the perspicacious mind of Eustachius may have guessed the kindred nature of nails and teeth.

In Chapter XV are related the researches made by the author to ascertain at what period the development of the teeth begins. Here is a passage of this chapter, almost literally translated:

"Hippocrates, before anyone else, wrote that the first teeth are formed in the uterus. Wishing to assure myself thereof, I dissected many abortive fetuses, and by very careful observations I found it to be true that the teeth have their origin during intra-uterine life. Wherefore, the opinion of those who consider that the first teeth are formed from the milk,

and those of the second dentition from food and drink, must be declared entirely false. In fact, by opening both jaws of a stillborn fetus, one may find, on each side of each jaw, the incisors, the canine, and three molars, partly mucous and partly osseous, and already sufficiently large and entirely surrounded by their alveoli. Then removing, with a skilful hand, the incisors and the canines, there may be observed a very thin partition only just ossified; and if this be removed with equal care, an equal number of incisors and canines, almost mucous and very much smaller, appear, which, enclosed in special alveoli behind the first, would exactly correspond in position each with its congener, if in both jaws the canine were not resting for the greater part on the next incisor so as almost to hide it."

As to the molars (by which name also the bicuspids are here meant), Eustachius says that he found but three on each side, and no trace whatever of the others. Nevertheless, he considers it quite probable that the germs of the latter should also exist in the fetus, although so small as to escape observation. He gives many ingenious reasons in support of his mode of thinking, and comes to the general conclusion, that not only the temporary teeth but also the permanent ones have, all of them, their origin during fetal life; a false conclusion simply because too general, and which shows once more how, in biological science, one runs great risk of falling into error whenever one tries to draw too free deductions from observed phenomena.

The researches of Fallopius and Eustachius confirm and complete each other. These two eminent anatomists, who gave great glory to Italy by their immortal discoveries and works, were the first to shed a brilliant light upon the development of the teeth, and thus opened up the way to all subsequent research on odontogeny.

In settling the period in which the formation of the teeth begins, Fallopius was still more successful than Eustachius. His patient investigations showed him that the development of the teeth commences partly in the uterus and partly after birth, which is perfectly true, as was made clear by later embryological researches. Fallopius found in each fetal jaw twelve teeth.[1] In this he agrees perfectly with his contemporary, Eustachius, who, as we have seen a short while ago, found in fetusus, only just born, the incisors, the canines, and three molars for each side of each jaw. Eustachius, however, observed in the fetus the germs of the permanent incisors and canines as well, a thing not noted by Fallopius.

It is not to be wondered at that some discrepancy should exist between

[1] *In utero duodecim dentes formantur in malis, et totidem in maxilla* (in the uterus are formed twelve teeth in the upper jaw and as many in the lower). Fallopii Gabrielis observationes anatomicæ, Venetiis, 1562, p. 39.

the observations of these two eminent anatomists. The researches of which we are speaking are sufficiently delicate and difficult; and even much more recent authors are far from agreeing perfectly, as far as regards the period, in which the development of the teeth begins. Serres, in his *Essai sur l'anatomie et la physiologie des dents* (Paris, 1817), sustains the view that in the fetus he has observed the germs of all the teeth, both temporary and permanent, while Joseph Linderer (*Handbuch der Zahnheilkunde*, Berlin, 1842) says that, although he has followed the preparative method indicated by Serres, he could never discover in the fetus the germs of all the teeth. Perhaps, he adds, the time when the development of the teeth begins varies considerably in individuals, just as we remark differences in the time of eruption.

In Chapter XVII of his book, Eustachius speaks of the process of formation of the teeth, which he studied in abortive fetuses, in stillborn children, in children a few months old, and also in kids.

On dissecting a fetal jaw, there may be found on each side, as we have already seen, the incisors, the canines, and three molars, still soft and imperfect, separated from one another by very thin osseous partitions. Each of these teeth is enclosed within a follicle or little bag of a grayish white color, rather more mucous and glutinous than membranous, and in form somewhat like the pod of a vegetable, with the only difference that it shows an opening at one of the extremities, from which the tooth somewhat protrudes, as if it were germinating. The more recent and softer the tooth, the more its follicle has a mucous appearance and differs from the nature of membranes. As it does not adhere to the underlying tooth, it is easy to separate them. As to the tooth, it is at that period of its development partly osseous and partly mucous, since that part which later on projects from the gum soon becomes transformed into a white thin and concave scale, which gives the idea of one of the little cells of a honeycomb. This scale is harder and more conspicuous in the incisors, since these, at this stage, are better formed; the canines are less advanced in development, and the molars still less; and among these latter, those are less developed which are more distant from the canines. The deeper part of the tooth consists of a mucous and tenacious substance, harder, however, than the substance of the follicle, and of a whitish color with a tendency to dark red, translucent, and somewhat brilliant.

Thus, says Eustachius, the teeth present themselves in a human fetus; but he who cannot obtain a human fetus may observe the same things in a kid.

Although the author does not express himself very explicitly, he seems to consider the follicle of the tooth substantially identical with its ligament. "This is at first mucous, but afterward, becoming more consistent,

causes the tooth to adhere to the socket and gum very firmly, as if it were glued."

"As the part of the tooth which comes out of the gum projects from the aperture of the follicle like a gem from its bezel, so—says Eustachius—some believe that the crown of a temporary tooth is a mere appendix, and that the follicle comes out of its concavity through a dividing line which they imagine to exist between this supposed appendix and the remaining part of the tooth. But assuredly those who assert such things show that they have studied the anatomy of the teeth so carelessly that, by this one error, they make manifest their great ignorance together with their great temerity.[1] The line which is observed on the tooth on the part corresponding to the adhesion of the gingival margin and of the dental ligament is very superficial, and after having scraped it away, there does not remain any trace of a division. But apart from this everyone can very easily observe, even in infants, or in kids, that the tooth when ossified does not present any line of division and that the still mucous follicle envelops it freely, and may be easily separated from the tooth; which would not be the case, if the follicle issued from between the tooth and its supposed appendix."

Thus, Eustachius declares entirely false the opinion already expressed by Celsus, that the permanent tooth grows from the root of the milk tooth. He affirms clearly and decisively that between the external and the radical part of a milk tooth no real division exists, and that the ossification of the tooth, beginning from the crown, proceeds without any interruption right down to the end of the root. If it were true, says he, that in children only the imaginary epiphysis or appendix falls, and that the new tooth is substantially represented by the remaining part of the first, it could never happen, as instead it often does, that the new tooth appears before the first one falls. Besides, between the lower part of the first tooth and the upper part of the second no correspondence exists either in size or shape, as ought necessarily to be the case if the two parts were joined together. This is not all; the lower part of the temporary tooth is perforated, and receives in its interior bloodvessels and nerves, whilst the upper part of the permanent tooth is quite massive and imperforated. How, then, could this second tooth transmit bloodvessels and nerves into the cavity of the first? Again, how could the continuity of these bloodvessels and nerves with their respective branches be possible, if an imperforate body, such as the crown of the permanent tooth, were really interposed?

But what is the use of so many arguments? exclaimed Eustachius.

[1] This sharp reproof and accusation of ignorance are made for the benefit of the immortal anatomist Andreas Vesalius, to the number of whose adversaries Eustachius likewise belonged. What unjust fury of party passion!

To remove even the slightest doubt and to put an end to any controversy on such a point, only one fact is sufficient, which is revealed to us by anatomical dissection, and that is, that the teeth which appear about the seventh year are not only not united to those which fall at the same period, but cannot even be in contact with them, owing to the presence of a thin osseous partition.

In the following chapter[1] Eustachius speaks of the central cavity of the teeth and of the substance contained in it. In young teeth, he says, the dental cavity is very large, in proportion to the size of the tooth. According to some anatomists, the central cavity of a tooth is coated by a very soft and thin membrane, formed by a tissue of very small vessels and nerves; and besides, this cavity is filled with marrow, like hollow bones. The observations of the author, however, do not agree with these statements. The dental cavity does not contain any fatty substance analogous to the marrow of bones. As to the above-mentioned membrane, Eustachius doubts its existence. The large hollow existing in children's teeth contains, he says, a mucous substance, somewhat hard, and very smooth at its surface—almost like a cuticle—but which has rather the appearance of a concretion than of a membranous tissue. At any rate, adds Eustachius, if the substance alluded to is made to dry up in the shade, it acquires an appearance not unlike that of a membrane. It is certain, however, that at an early age the substance contained in the dental cavity does not adhere to the walls of the latter after the manner of a periosteum, but is found in simple contact with the same, and can, therefore, be separated from them with the greatest ease.

As years pass by, the dental cavity becomes narrower and narrower, because the substance contained inside the tooth gradually becomes ossified at the surface, adhering to the dental scale previously formed, in the very same manner as the internal or woody part of a tree adheres to the bark. Of the two hard substances which make up a tooth, the outer one is white, tense, and dense, like marble, the underlying one, instead, is somewhat dark, rough, and less compact. To observe accurately the above-mentioned facts, the author advises searching for them, first, in the molar teeth of the ox or the ram, and then in human teeth, and likewise, first in children or in recently born animals, and then in adults.

Chapters XIX and XX are, comparatively speaking, of little importance. In the former the author undertakes especially to examine the opinions of Galen on dental bloodvessels and nerves, and discusses whether it were known to him that these vessels and nerves penetrate into the internal part of the teeth. In the latter, Eustachius speaks of the great

[1] Chap. xviii, p. 54.

difficulties that are encountered in dissecting dental bloodvessels and nerves, and reproves those who, by inaccurate illustrative figures, convey the erroneous idea that these parts are very clearly and easily observable.

In Chapter XXI the author goes on to speak of the best mode of proceeding in order to make successful observation of the small nerves and vessels going to the roots of the teeth. These researches are much more easily made in large animals than in man; and therefore such things as cannot be observed well in the latter must be studied in the former.

In the first place, it is necessary to dissect the lower jaw; and after having done so several times, with all the accuracy required in making researches of this kind, one may proceed to study the dental nerves and vessels of the upper jaw, which is much more difficult. Having opened up the inside of the lower jaw, one observes a cavity full of marrow, and within this a nerve enclosed entirely in its own sheath. Having removed the marrow, and opened the sheath lengthwise, one perceives that the nerve therein enclosed is constituted (analogous to what may be observed in the large nerves of the limbs) by several nervous strings, and that among these runs a comparatively large artery, besides small vascular branches of minor importance. If one then removes the sheath from the bone, together with the nerve and the vessels contained in it, raising it very gently, one sees, issuing therefrom, some very slender fibers, on the nature of which it is, however, difficult to pronounce; and, considering their thinness, one can hardly conceive that they are composed of three different elements, that is, of small nervous, arterial, and venous twigs. At any rate, the author admits that this may be so. On arriving at the lesser teeth, the nerve and the artery that accompanies it divide into two branches, one of which traverses the opening presented by the bone at that point (*mental foramen*), and is destined to the lower lip; the other directs its course toward the roots of the incisors. The small twigs which penetrate into the roots of the incisor and canine teeth are less slender than those which enter the roots of the molars, and are easily to be seen not only in large animals, but also in man. If the tooth of an ox or that of a ram be split through the middle, the mucous substance contained in the interior is seen to be traversed by small bloodvessels; and one perceives, besides, certain fibers, which are probably nerves. All these things, says Eustachius, I have observed many times in different animals, in some cases more, in others less distinctly. But it is an exceedingly difficult thing to follow the single twigs, of which we have spoken, from their origin to their insertion, or, *vice versa*, from their insertion to their origin. And so, adds the great anatomist, being able to observe but a small part of the things I should like to see, I find myself compelled, in my perplexity, to supply by the aid of ratiocination the deficiency of the senses. I therefore maintain that the interior part of a tooth is susceptible

of experiencing pain accompanied by a feeling of pulsation (a fact already mentioned by Galen), because a nerve and an artery penetrate into it. In the ox the penetration of bloodvessels into the roots of the teeth can be more readily ascertained than in man. It may be admitted that the same occurs in the human teeth; and this, for the reasons already given, and also because only by admitting the existence of an artery within the cavity of the tooth can be explained the copious flow of florid red blood from a decayed tooth, which has, in some cases, been known to imperil the life of a patient. And I myself, says Eustachius, have observed with my own eyes an accident of this kind.

The author then passes on to speak of the eruption of the teeth,[1] but the data with which he furnishes us are neither very precise nor very exact.

Eustachius, without declaring himself for or against it, cites, in this chapter, the opinion of those who believe in the possibility of a third dentition in old people. He returns to this subject in the last chapter but one of his book, which treats of dental anomalies: "Ali," says he, "testifies to old persons having had all their teeth renewed. This has been derided as chimerical by medical men of later date, or at least only admitted under the condition that such teeth be of a nature completely different from the first."

Our teeth, says the author, grow old together with us, and toward the term of life they abandon us, a fact which also distinguishes them from the other bones. When, however, it occurs, through illness, that the teeth are extracted or fall out spontaneously before the period of old age, the alveoli become filled up with a bony substance; and in addition the two osseous scales of the maxillary bones approach one another and unite together in such a manner as to form a sharp margin, every vestige of a cavity being obliterated.

Speaking of the nutrition and growth of the teeth,[2] Eustachius says that—given the existence of the dental nerves and bloodvessels—it is not difficult to explain how the teeth are nourished, grow, live, and feel. He therefore rejects the opinion of those who held that the teeth of the lower jaw derived their nourishment from the marrow contained within this bone, and that those of the upper jaw received it from a humorous substance similar to marrow, existing in the large cavity of the upper maxillary bone. Against the supporters of this opinion Eustachius raises, among others, the following objections, viz., that the marrow of the inferior jaw does not in any way touch the teeth, so that such a mode of nourishment cannot be imagined, and that it is completely erroneous that the large cavity of the upper maxillary bone contains a humor

[1] Chap. xxii, p. 65.

[2] Chap. xxiii, p. 70.

similar to marrow. This passage of Eustachius' book gives clear evidence that he was well acquainted with the maxillary sinus, described a century later by the English anatomist, Highmore, who gave it his name. The existence of this cavity was, besides, already known before the time of Eustachius.

The author also says that those who believe that the internal cavity of the teeth contains marrow, and that this serves to nourish them, are grossly deceived.

In the same chapter, Eustachius confutes an opinion, at that time generally diffused and put forward for the first time by Aristotle, viz., that the teeth grow throughout a whole lifetime. In the senile age, he says, the teeth become impaired still earlier than the other organs. They become thinner by deficiency of nourishment, and, at the same time, discolored; the incisors and canines, as they waste away, come to be also less sharp than they were; and the molars, losing their tubercles or cups, become levelled down and smooth. If, notwithstanding the evident wearing out of the teeth, they seem sometimes to grow longer, this appearance is not to be trusted, for it happens not unfrequently that the teeth appear to have grown longer simply by atrophy of the gums, or also because some humor or other morbid substance pushes them outward.

As to the sensibility of the teeth,[1] Eustachius is of the opinion that these organs possess, besides the sensibility to pain, two other species of sensibility; for, following the ideas of Galen, he also holds that the teeth together with the tongue partake in the sense of taste; and he further considers the disagreeable sensation known as *setting on edge of the teeth*, as a species of tactile sensation peculiar to these organs.

But in which part of the tooth does the faculty of feeling reside?

Among the authors previous to, or contemporaries of, Eustachius, some affirmed that the sensibility of the tooth resides in the pellicle which lines its inside cavity, others in the membrane which, like periosteum, clothes the root of the tooth, others in both these parts. Eustachius does not show himself more partial to the one than the other of these opinions; he is, however, firmly persuaded that the hard substance of the tooth is also endowed with sensibility. Though it is not easy to explain how this may be, he considers it probable that the nerve, fraying itself out inside of the tooth in minute filaments at the time when the substance of the tooth is still soft and mucous, intermixes intimately with it, thus communicating to it the faculty of feeling, which then persists in it, even after the ossification of the tooth. Such an hypothesis is certainly worthy of the lofty intellect of Eustachius, and has in itself, so it seems to me, something of truth.

[1] Chap. xxv, xxvi.

In the two following chapters,[1] the author speaks in a masterly and admirable manner of the functions of the teeth and of their utility.

Among many other true and interesting observations, he remarks that by the loss of their teeth even the most powerful dogs become cowards.

Besides what concerns the human teeth, excellent notions of comparative anatomy, above all in what regards the monkey, the dog, and the ruminants, are to be found in this little but most precious book of Eustachius.

The teeth, says he, are not equally hard in all animals, and many ancient authors have affirmed that ferocious animals have much harder teeth than tame ones.

Chapter XXIX, relating to dental anomalies, is one of the most interesting. We here quote the greater part of it.

"Some historians relate that Pyrrhus, King of Epirus, Eurifeus, of Greece, and many others, had, instead of teeth, a continuous bone, furrowed by somewhat deep vertical lines, in no way different from what one sees in the multiple molars of the goat. It has never happened to me, says Eustachius, to witness a similar union of all the teeth; I have, however, sometimes observed continuity between three or four molars, precisely in the same manner as in sheep. It also once happened to me to observe in the case of an old man, a fellow citizen of mine, that the teeth were covered up on every side by a hard and almost stony substance, and no longer exhibited any trace of separation, offering instead the appearance of a single bone."

"One reads that Timarchus, of Cyprus, had two rows or series of teeth and Hercules three."

The author never had any opportunity of observing any such anomalies; notwithstanding, he refers to cases of the kind observed by other anatomists of his time, and, in a particular manner, to the case of a triple dental series in a youth who died at the age of eighteen. As the truth of the fact was testified to by highly respectable medical men, Eustachius lends faith thereto. "Neither can it be said"—he adds—"that in the case we are speaking of the new teeth erupted from other sockets before the temporary ones were shed, for there would then have been only a double and not a triple series; indeed, the series would not even have been double along all the line, but only along the line of the temporary teeth; and besides this, the double series would not have been maintained up to eighteen years of age—the time of the death of the subject—but only until the shedding of the deciduous teeth."

"That teeth are sometimes cut in the palate is a fact attested to by Alessandro de Benedetti and others. It has also occurred, within my own experience, to observe this in the person of a Roman woman, who had a

[1] Chap. xxvii, xxviii.

tooth in the roof of the mouth, near the opening which is in proximity to the incisors,[1] and at Gubbio there is, in the monastery of the Trinità, a nephew of the distinguished jurisconsult Girolamo Gabrielli, who at the age of eighteen cut a tooth in the middle of the palate."

"Pliny and Solinus tell of individuals born with all their teeth. Other authors, that Pheretes was without teeth all his life."

"I hold it to be a fable that some women lose a tooth for each child they bear."

"In some cases it has happened that the falling out and renewal of the teeth has not taken place before the age of thirteen or fourteen. In other cases, the same teeth were shed and renewed twice, that is, once after the seventh year, and again after the fourteenth year. It ought also to be mentioned that in some young persons of twenty, the last molar, or wisdom tooth, having been drawn, it was renewed during the same year. Lastly, it is also to be noted that in strong and healthy young persons, one of the other molars being extracted, it is sometimes renewed."[2]

In the last chapter[3] the author alludes to some dental affections. In referring to the fluxions to which teeth are subject, he says he has observed more than one case in which such a quantity of matter resembling chalk was collected in the alveoli, that these gradually being filled thereby, all the teeth became loosened and dropped out little by little.

Speaking of dental diseases requiring surgical intervention, the author remarks that dental surgery was, in his days, a most abject calling, notwithstanding its having had, according to Cicero, a very high initiator—Æsculapius, the god of medicine.

Ambroise Paré. Whilst the anatomy of the dental system was illustrated by the researches of Fallopius and Eustachius, the celebrated French surgeon Ambroise Paré was contributing in the highest degree to the progress of practical dentistry.

Ambroise Paré (Latinized Paræus) was born at Bourg-Hersent in the year 1517. His father and one of his brothers were box-makers; another brother was a barber. We have no very precise information about the early years of his life; so much is certain, however, that Ambroise Paré

[1] The inferior orifice of the foramen incisivum.

[2] It is superfluous to say that these cases are unreal and simply dependent upon erroneous observations; for instance, in the case of the second molar being extracted before the erupting of the third, the second molar figured as, and supposed to be, the latter, when, finally, the wisdom tooth appeared, it was believed to be the last molar renewed. It is no rare thing, also, in these days, not only for unprofessional persons, but also for medical practitioners, to fall into errors of this kind, especially because, in similar cases, the wisdom tooth, having but a limited space in which to erupt, is in the habit of filling the void left by the second molar, where it meets with less resistance.

[3] Page 93.


Humanam AMBROSII vere hæc pictura PARÆI
Effigiem sed Opus continet Ambrosiam.

did not enjoy any of those advantages deriving from a good literary education, and after having received some instruction from a chaplain, whose disciple and servant he was at one and the same time, he was bound over as apprentice to a barber, who also taught him the art of bleeding. Toward the age of sixteen we find him in Paris in the employ of a *chirurgien-barbier*. After this he practised minor surgery for some years in the Hôtel-Dieu. But having undertaken the study of surgery without literary preparation and without any knowledge of Latin, he was obliged, especially for the latter reason, to contend with great difficulties, so that, although he had acquired in a few years sufficient practice in surgery to enable him to pass from the Hôtel-Dieu to the sanitary service of the French army, it was only in 1554, that is, at thirty-seven years of age, that he was permitted to take the examination required for becoming a member of the College of Surgeons of Paris. Within the short space of five months he was successively named Bachelor, Licentiate, and Doctor in Surgery. His reputation, which had already become extraordinary even before he had any academic degree, procured him introduction to the Court of France as surgeon in ordinary. In 1562 he became chief surgeon to the Court and occupied this post under the reigns of Charles IX and Henri III. Ambroise Paré was a Protestant, and it is said that in the massacre of St. Bartholomew's night, he owed his escape to the king, Charles IX, who, to save his life, hid him in his wardrobe. He died full of honors, in the year 1592.

In his works this great surgeon treats the subject of dental maladies and their cure very thoroughly; this may be in part attributed to the circumstance of his having first been simply a barber (and, therefore, also a tooth-puller) and afterward a surgeon-barber, which placed him in very favorable conditions for acquiring vast experience in the practice of dentistry.

In Chapter II, Book IV, of his works,[1] Ambroise Paré speaks of the anatomy and physiology of the teeth. It must, however, be confessed that Vesalius and, still more so, Eustachius treat of dental anatomy with much more exactness than he does.

After having spoken of the incisors and the canines, he says that the ten upper molars generally have three roots, and very often four, whilst the ten lower ones have only three; this is because the lower jaw is harder than the upper, and also because the lower molars, *estant assises sur la racine, et non suspendues, comme celles de la mandibule d'en haut, n'avoient besoin de tant de racines pour leur stabilité asseurance.*[2]

[1] Œuvres complètes d'Ambroise Paré, accompagnées de notes historiques et critiques, par J. F. Malgaigne, Paris, 1840, vol. i, p. 231.

[2] The lower molars, being seated on the roots and not suspended like those of the upper jaw, are not in want of so many roots to assure their stability.

Ambroise Paré, too, admits that the teeth grow throughout the whole lifetime, and that the wearing away consequent on reciprocal friction and mastication is compensated in this way.

Galen had already affirmed, and Ambroise Paré also held erroneously, that the exquisite sensibility of the teeth aids the sense of taste.

In speaking of the development of the teeth, Ambroise Paré says only that they are already solid and osseous before birth, he himself having observed this in dissecting the jaws of a child who had died immediately after birth.

In Chapter VII, Book XIII,[1] Paré treats of fracture of the lower jaw. The method of cure he proposes is altogether identical with that of Celsus. With regard to the teeth, he says that "*si elles sont divisées, ebranlées, ou separées hors de leurs alvéoles ou petites cavités, elles doivent estre reduites en leurs places et seront liées et attachées contre celles qui sont fermes, avecques un fil d'or ou d'argent, ou de lin. Et les y faut tenir jusques à ce qu'elles soient bien affermies, et le callus soient refait et rendu solide.*"[2]

Toothache, says Paré,[3] is, of all others, the most atrocious pain that can torment a man without being followed by death. It depends, in many cases, on a humorous fluxion of a hot or cold nature which flows into the alveolus, forcing the tooth outward, loosening it, and causing the patient so much pain on the slightest pressure being exercised on it, that he cannot dare to bite with it in the least. If, however, the tooth is corroded, hollowed out, or pierced to the root, the pain is so strong, when the patient drinks—particularly if the liquid is cold—that he seems to have had a stab with a stiletto inside the tooth.

If the pain is acute and pungent, like that produced by needles being thrust into the diseased tooth; if the patient complains of a strong pulsation at the root of the tooth, and in the temples; if the application of cold remedies calms the pain, all these signs indicate that the cause of the evil is heat. Instead, the cause of the pain may be held to be cold when the patient complains of a great heaviness in the head, emits a quantity of saliva, and finds relief in the application of hot remedies. In the treatment of toothache one must fulfil the following three indications:

1. Regulate fittingly the mode of living.

2. Evacuate or dissipate the morbid humors; this may be effected by various means, namely, by purgatives, by bleeding, by gingival

[1] Vol. ii, p. 307.

[2] . . . if they are divided, shaken, or separated from their alveoli or little cavities, they must be reduced into their places and should be bound and fastened against those that are firm with a thread of gold, silver, or flax. And they must be held thus until they are quite firm and the callus is formed and have become solid.

[3] Lib. xv, ch. xvi, vol. ii, p. 443.

scarification, by the application of leeches on the site of the pain, by cupping on the back of the neck, or on the shoulders.

3. Applying in each single case the medicaments best adapted for calming the pain.

The author here goes through a long enumeration of anti-odontalgic remedies that offer no particular interest, as they are not at all new.

When a decayed tooth becomes the seat of excessive pain, and this does not yield to any remedy, one must either have recourse to extraction or cauterize it; this can be done either with potential caustics—such as oil of vitriol, aqua fortis—or with the actual cautery. By cauterizing, Paré adds, one burns the nerve, thus rendering it incapable of again feeling or causing pain.

Erosion or caries[1] is the effect of an acute and acrid humor, that corrodes and perforates the teeth, often to their very roots. To combat this morbid condition, even when it is not accompanied by pain, one must also have recourse (besides general treatment) to cauterization either with oil of vitriol, with aqua fortis, or with a small actual cautery.

If, as often happens, that the seat of the erosion lies in such a manner between two teeth as to make it impossible to apply caustics or other medicaments, one must file just sufficiently between the healthy and the corroded tooth to render the part accessible, taking care, however, to file more on the side of the affected tooth than on that of the healthy one.

The file may be used, besides, to plane down a tooth that stands out above the level of the others, and for similar purposes.

If one or more teeth have been shaken by a blow or a fall, or have come out of their alveoli altogether, the surgeon should not remove them, but rather reduce them and bind to the neighboring teeth, that they may entirely reacquire their original firmness.

In allusion to this subject, Ambroise Paré refers to the case of a friend of his, who having sustained, through a blow from the hilt of a dagger, a fracture of the lower jaw with almost complete expulsion of three teeth from their alveoli, had the fracture reduced by him; after replacing the teeth and binding them to the neighboring ones, he prescribed astringent mouth washes and liquid or semiliquid nourishment, such as meat juice, *panada*, barley soup, jelly, and such like. The patient was completely cured and able to masticate with the three teeth as well as before.

Also in the case of extraction of a healthy instead of a diseased tooth, Paré recommends replacing it immediately and binding it to the neighboring ones, for, he says, by this means the tooth can take root again.

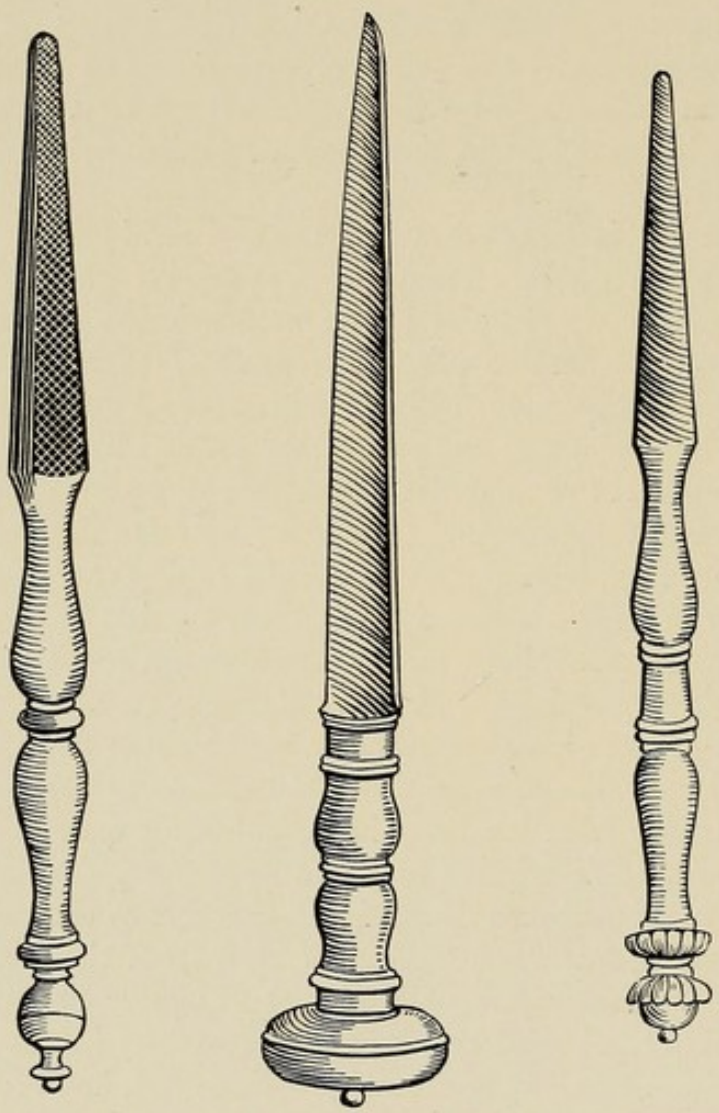
As we have seen, the first author who speaks of replantation is Abulcasis, but to Ambroise Paré belongs the merit of having treated the subject

[1] Lib. xv, cap. xxvii, vol. ii, p. 448.

much more explicity, and of having insisted on the utility of this operation, indeed, on the duty of carrying it out whenever it seems indicated.

Further, he is the first to mention another very important operation, namely, transplantation, albeit he himself had never performed it. The case he refers to has become a generally known anecdote. We give it in

FIG. 60



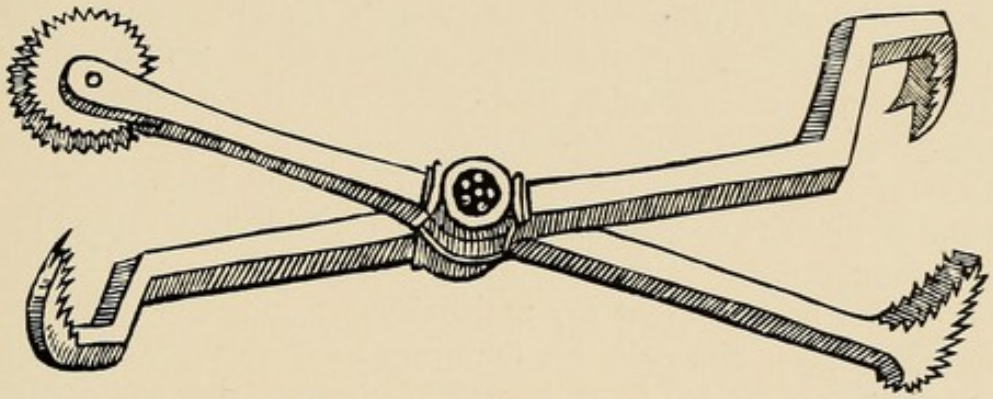
Dental files (Ambroise Paré).

his own words: "*Un homme digne d'estre creu m'a affirmé qu'une princesse ayant fait arracher une dent, s'en fit remettre subit une autre d'une sienne demoiselle, laquelle se reprint, et quelque temps après maschoit dessus comme sus celle qu'elle avoit fait arracher auparavant.*"[1]

[1] A man, worthy of being believed, has assured me that a certain princess having had a tooth taken out, immediately had it replaced by another supplied by one of her ladies, which took root, and after a time she masticated with it as well as she had done with the former one.

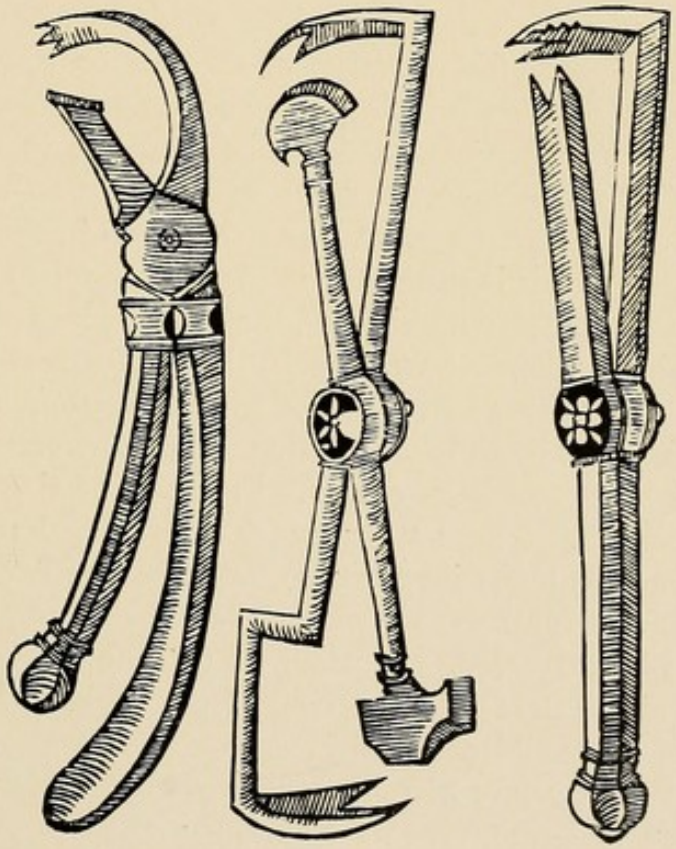
Ambroise Paré has recourse to extraction when a tooth is the cause of very violent pain, or when the existence of a carious cavity and concomitant putrefying processes render the breath fetid, and endanger the healthy

FIG. 61



One of the pelicans used by Ambroise Paré.

FIG. 62



Two other pelicans and a pair of curved pincers (Ambroise Paré).

teeth in its vicinity. If the persistence of a deciduous tooth should cause the cutting of the corresponding permanent tooth outside the line of the dental arch, thus giving rise to deformity, Paré advises laying bare and

then extracting the deciduous tooth; for after this the new tooth may be pressed toward the point before occupied by the other, until it assumes its natural position.

Sometimes, when a tooth is too firmly planted, one prefers, says Paré, instead of extracting it, to break off the crown for the purpose of being able to act directly on the dental nerve with appropriate remedies, or to destroy the sensibility of the nerve entirely, by cauterization. This unreasonable and reprehensible method of cure is also quoted, under the denomination of *deschapellement*, by another French author, a contemporary of Paré—Urbain Hemard—who observes, however, that one rarely had recourse to it; for the pain and shock which are caused by this operation are not less than those caused by extraction.

It very often happens that the patient cannot indicate exactly which tooth it is that gives him pain, his sufferings being so acute as to appear spread over a great part of the jaw. One cannot, therefore, trust too much to the indications given by the patient as to the point of departure of the pain, and must take care not to extract a healthy instead of a diseased tooth.

The extraction of a tooth should not be carried out with too much violence, as one risks producing luxation of the jaw or concussion of the brain and the eyes, or even bringing away a portion of the jaw together with the tooth (the author himself has observed this in several cases), not to speak of other serious accidents which may supervene, as, for example, fever, apostema, abundant hemorrhage, and even death.

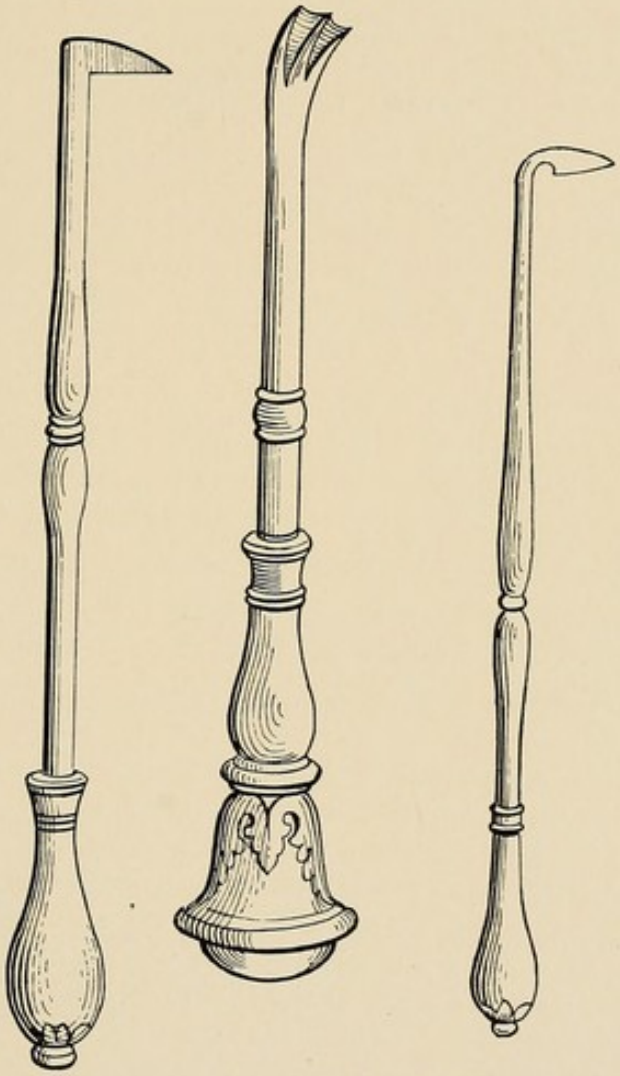
In extracting a tooth it is necessary to place the patient on a very low seat, or even on the ground, with his head between the legs of the operator.[1] After having laid the tooth bare sufficiently, if one sees that it is very loose, one may push it out of its socket with a *poussoir*, that is, with a trifid lever. But if the tooth is too firmly rooted to be extracted with this instrument, one must make use of curved pincers, or else one may have recourse to a pelican. The author notes, however, that much skill is required in using this latter instrument, for otherwise it will almost certainly happen that several good teeth will be knocked out, instead of the one intended to be extracted. In proof of this, he relates the following anecdote, which we relate in the words of the author, that it may not lose anything of its quaint originality:

"Je veux icy reciter une histoire d'un maistre barbier, demeurant à Orleans, nommé maistre François Loüis, lequel avoit par dessus tous, l'honneur de bien arracher une dent, de façon que tous les samedis plusieurs paysans ayans mal aux dents venoient vers luy pour les faire arracher, ce qu'il faisait fort dextrement avec un polican, et lorsqu'il

[1] Lib. xv, cap. xxviii.

avoit fait, le jettoit sus un ais en sa boutique. Or avoit-il un serviteur nouveau, Picard, grand et fort, qui desiroit tirer les dents à la mode de son maistre. Arriva cependant que ledit François Louys disnoit, un villageois, requerant qu'on luy arrachait une dent, ce Picard print l'instrument de son maistre et s'essaya faire comme luy; mais en lieu d'oster la mauvaise dent au pauvre villageois, luy en poussa et arracha trois bonnes.

FIG. 63



Two gum lancets and a trifid lever called "poussoir" (Ambroise Paré).

Et sentant une douleur extrême, et voyont trois dents hors de sa bouche, commença à crier contre le Picard; lequel pour le faire taire luy dit qu'il ne dist mot, et qu'il ne criast si haut, attendu que si le maistre venoit il luy feroit payer les trois dent pour une. Donc le maistre oyant tel bruit, sortit hors de table pour sçavoir la cause et raison de leur noise et contestation; mais le pauvre paysan redoutant les menaces du Picard, et encore apres avoir enduré telle douleur qu'on ne luy fist payer triple-

ment la peine dudit Picard, se teut, n'osant declarer audit maistre ce beau chef d'œuvre; et ainsi le pauvre badaud de village s'en alla quitte; et pour une dent qu'il pensoit faire arracher, en remporta trois en sa bourse, et celle qui luy causoit le mal en sa bouche."[1] Paré adds in conclusion: "Partant je conseille à ceux qui voudront faire arracher les dents, qu'ils aillent aux vieux dentateurs, et non aux jeunes qui n'auront encore reconneu leurs fautes."[2]

But let us now return to our subject. After the extraction of a tooth, it is necessary—says Paré—to leave the wound to bleed freely, so that the part may get rid of the morbid humors; then the gums and the alveolus must be pressed, on both sides, with the fingers, to readjust the socket, which will have been widened and sometimes even broken in extracting the tooth. After this, the patient should rinse his mouth with oxycrate; and when the weather is cold and windy, the patient should take care to avoid fluxion in the other teeth.

The following chapter speaks "*de la limosité ou rouillure des dents, et de la manière de les conserver.*"

After meals the mouth must be rinsed with water and wine, or with water with a little vinegar added to it, and the teeth cleaned from all residues of food, so that their putrefying may not spoil the teeth and make the breath fetid. An earthy yellowish substance, like rust, often forms on the teeth from want of cleanliness and also when they are not used to masticate; this substance corrodes the teeth, just as rust corrodes iron. It is necessary to remove this substance, by scraping the teeth with small instruments suitable for the purpose, and then the teeth themselves must

[1] I will here tell a story of a master barber living at Orleans, named maistre François Louys, who had the honor of pulling a tooth better than any one else, so that on Saturdays many country folks having toothache came to him to have them pulled out, which he did very dexterously with a pelican, and when he had done, threw it on a bench in his shop. Now he had a new servant, Picard, tall and strong, who wanted to pull teeth like his master. It happened that whilst the said François Louys was dining, a villager wanting a tooth pulled, Picard took his master's instrument and tried to do like him, but instead of taking out the bad tooth, he knocked and tore out three good ones for him, who, feeling great pain and seeing three teeth out of his mouth, began to cry out against Picard, but he, to make him hold his peace, told him not to say a word about it and not to shout so, because if his master came he would make him pay for three teeth instead of one. Now the master, hearing such a noise, came out from table to know the cause of it and the reason of the quarrel, but the poor peasant fearing the threats of Picard and still more after enduring such pain being made to pay a threefold fee by the said Picard, was silent, not daring to reveal to the master this fine piece of work of the said Picard; and thus the poor bumpkin went away, and for one tooth that he had thought to have pulled, he carried away three in his pouch and the one that hurt him in his mouth."

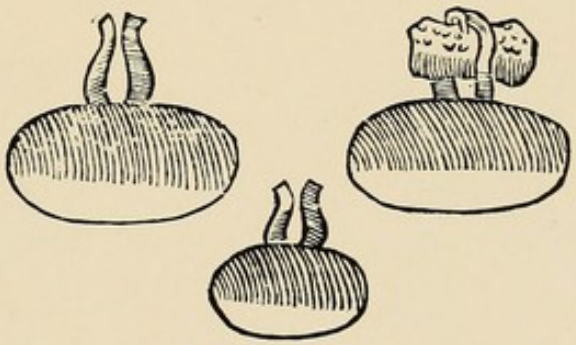
[2] For which reason I advise those who would have their teeth pulled to go to the older tooth-pullers, and not to the younger ones who will not yet have recognized their shortcomings."

be rubbed with a little aqua fortis and aqua vitæ mixed together, to take away what the instruments have not been able to remove. In order to preserve the teeth it is necessary, besides, to rub the teeth frequently with appropriate dentifrices. Among these the author mentions simple bread crust, burnt and reduced to powder.

In Chapter III of Book XVII he speaks of artificial teeth. Sometimes, says Paré, by the effect of a blow, the front teeth are lost; this not only constitutes a deformity, but is also the cause of defects of speech. Therefore, after the necessary treatment, when the gums are hardened, the lost teeth must be substituted with artificial ones made out of bone, ivory, or the teeth of the *Rohart*,[1] which are excellent for this purpose; and the artificial teeth must be tied to the neighboring ones with gold or silver wire.

Chapter IV of the same book is most important, for palatal obturators are therein spoken of for the first time. "Sometimes a portion of the bone of the palate is destroyed by the shot of an arquebus, or by some

FIG. 64



The palatine obturator with sponge of Ambroise Paré.

other wound or by a syphilitic ulcer (*par ulcère de verole*), the patients being thereby disabled from properly pronouncing words and from making themselves understood. To repair this defect we have found an expedient through the help and ministry of our art. It consists in the application of an instrument somewhat larger than the palatal perforation; this is made of gold or silver, of about the thickness of a crown (coin), and has the form of a vaulted roof, to which a sponge is attached; when introduced into the aperture, the sponge, absorbing the humidity natural to such parts, will very soon swell up, and thus the instrument is held firm. In this way, words are better pronounced."

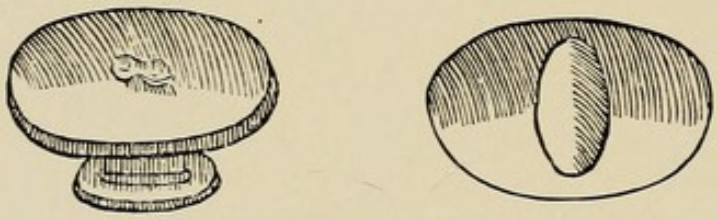
Besides the above instrument, the author gives us the figure of another instrument, *sans esponge* (without sponge), which, taken altogether, is like a large cuff button. The small part, designed to be introduced

[1] An old French word meaning perhaps hippopotamus.

into the aperture of the palate, can be made to turn round from below, by means of a small pair of pincers, so as to fix the obturator.

In the last chapter of Book XVIII, first dentition and the treatment required during this period are spoken of. The cutting of teeth, says Paré, is accompanied by pain, itching, and pricking of the gums; often, as well by diarrhea, fever, epileptic convulsions, which sometimes end fatally. The symptoms by which it may be known that teeth are about to come forth are as follows: The wet-nurse feels the mouth of the suckling infant to be hotter than usual; the gums are swollen; the child is restless, crying often and sleeping but little; it emits a quantity of saliva from the mouth, and frequently puts its fingers in its mouth, trying to rub its gums, and soothe, in this way, the pain and itching which it feels. It is then necessary to treat the nurse as if she had fever, and the infant should be suckled less than usual; some cooling and thirst quenching drinks should be given to it—for a child in such conditions suffers from intense thirst; the nurse should often rub the gums of the little patient with softening and soothing substances, as, for example, oil of sweet

FIG. 65



Paré's palatine obturator without sponge.

almonds, fresh butter, honey, or mucilage made from the seeds of the fleawort or of the quince; the brains of a hare (these may be roasted or boiled) have not only a very soothing action, but also, according to a very ancient belief shared by Paré, possess the occult property of aiding the cutting of the teeth. But oftentimes, neither these nor other remedies are of any use, because the gums are too hard and the teeth cannot cut their way through at all; the tension of the gums then produces very violent pain, fever, and other accidents, death even supervening in some cases. The author, therefore, advises lancing the gums deeply, just above the tooth which ought to appear, thus opening it a way, that it may more easily come out. He relates that he has performed this operation on his own children in the presence of many medical authorities.

Almost as if to show the high value of this operative procedure, Paré tells the case of a child, the son of the Duke of Nevers, who died at the age of about eight months without having cut any teeth. He, together with other doctors, was invited to carry out an autopsy. No lesion whatever was found sufficient to cause death, but the gums were very hard, thick,

and swollen; an incision into them showed that the teeth were ready to come out, if only their eruption had been facilitated by lancing at the right time. Paré and the other doctors were of the unanimous opinion that death was caused solely by the impossibility of cutting the teeth on account of the hardness of the gums.

Among the many strange cases given in Book XIX (*Des monstres et prodiges*), Paré also speaks—trusting to the word of Alexander Benedetti—of the case of a woman, who, after the complete loss of her teeth caused by age, cut them all again at eighty years of age.

Although Paré treats so amply and with such competence all that concerns dental diseases and their cure, he does not make the least allusion to the stopping of teeth, beyond recommending, as had aready been done by Celsus, that when a tooth that is to be extracted shows a large cavity, the latter should be well filled with linen or lead, so that the tooth be not fractured under the pressure of the instrument and so leave the root behind in the alveolus.

A century before Ambroise Paré, Giovanni d'Arcoli had already mentioned the filling of teeth with gold leaf, and, as we have seen already, there is very good reason to believe that the practice of this operation dated back to a still earlier period. How is it, then, that the illustrious French surgeon does not say a word about this? Very probably stoppings were not at all in use among French *dentateurs* and perhaps, even in Italy, this operation was only rarely carried out.

Jacques Houllier (1498 to 1562), a celebrated French physician and surgeon, also known under the Latinized name of Jacobus Hollerius, was the first to stand out, although timidly, against the theory of dental worms. He did not decidedly deny their existence, this having been affirmed by so many illustrious writers; he, however, speaks of them as if the point were a doubtful one: "*It is said* that worms are generated in the teeth, which corrode the teeth themselves, and produce a pain which is not very violent and causes itching with little or no salivation (*vermes ajunt subnasci dentibus, et hos corrodere, à quibus dolor non ita fortis, pruriginosus, nulla aut pauca salivatio*)."

But even while putting in doubt the existence of dental worms, he believes it his duty to enumerate the various remedies, recommended for their destruction. As to fumigations with the seeds of the hyoscyamus, Houllier, declares that what is believed by the common people, and what has been written by doctors of antiquity about worms being killed and seen to fall from the teeth by the effect of these fumigations, is all nonsense. In fact, he says, when the seeds of the hyoscyamus are burnt there fly away from them what appear to be little worms, even if the fumes do not reach the worm-eaten tooth. (*Quod autem vulgus sibi persuadet, et ab antiquis medicis scriptum est de suffumigio è semine hyoscyami, videtur*

fabulosum. Nam inde ajunt manifeste vermes excidere. Re vera, incenso semine, evolant tanqua vermiculi, etiam si non attingit fumus vermiculosum dentem.)

Apart from this, in the works of Houllier, nothing is found that is of interest for the history of dentistry. He repeats several errors and prejudices of the ancients; he says, for example, that men have ordinarily thirty-two teeth, women, twenty-eight; and he, too, believes in the expulsive virtues of the fat of green frogs when applied to a tooth (*adeps ranæ viridis dentem depellit*).

Houllier does not contribute in any way to dental therapeutics, he only enumerates the methods of cure recommended by preceding authors.[1]

Volcherus Coiter (1534 to 1600), of Gröningen, an ardent student of anatomy, and a pupil of Fallopius, Eustachius, and Aranzio, studied with great attention the development of bones, dissecting many fetuses and children of various ages for that purpose. He clearly states his opinion that the teeth are not bones, since they do not pass, like the latter, through the cartilaginous stage, but are derived instead from a mucous substance.[2]

Johann Jacob Wecker, a doctor of Colmar, published in 1576 a valuable medical work composed of synoptical tables, in which is briefly summarized the best of what had been written by preceding Greek, Latin, and Arabic authors.

One gathers from this author that at the time in which he wrote it was considered an excellent preservative against the plague to rub the teeth with theriac, mithridate, angelica, and zedoary. From this it may be perceived that even in those days doctors had understood the importance of the cleanliness and disinfection of the mouth as a prophylactic against infective diseases.

In the above-mentioned book may be found a sufficiently complete exposition of dental therapeutics of that and of the preceding periods. There is nothing, however, which is not already known to us from our examination of the earlier writers. Worthy of notice is the information that, among other things, to facilitate the cutting of teeth rubbing the jaws with turpentine was recommended at that time.[3]

Donato Antonio of Altomare, a Neapolitan physician and philosopher, dedicated a long chapter of his *Ars medica*[4] to the subject of dental pains and their treatment. He classifies these pains with great

[1] Jacobi Hollerii medici parisiensis omnia opera practica, Genevæ, 1635, lib. ii, p. 117, et seq.

[2] Blandin, Anatomie du système dentaire, Paris, 1836, p. 25.

[3] Hoann Jac. Weckerus, medicinæ utriusque syntaxes, ex Græcorum, Latinorum, Arabumque thesauris collectæ, Basilea, 1576.

[4] Donati Antonii ab Altomari medici ac philosophi neapolitani Ars Medica, Venetiis, 1558, cap. xli, p. 190.



VOLCHERUS COITERUS GRÖNINGÂ
Frisius, D. Médicús Chirúrgús et Anatomicus
Excellentissimús, Physicús Reipúbl Noriberg
Ordinariús, Anno Christi 1575 Ætat 43 Obiit A° 1600.

accuracy, taking into account their seat and causes, and pointing out in each single case the method of cure to be followed according to the warm, cold, dry, or humid nature of the pain. In what he says, however, we do not find anything new.

Giulio Cesare Aranzio (1530 to 1589), a celebrated surgeon and anatomist of Bologna, in which city he taught from the age of twenty-six years until his death, is of the opinion that parulides—that is to say, inflammations or abscesses of the gums—and epulides—that is fleshy excrescences of the same—are usually caused by caries or putrescence of the teeth; but that in certain individuals, from a peculiar weakness of the gums, these are easily attacked by inflammation when the wind is in the south.

In the case of parulides, to soothe the pain and to accelerate the suppurative process, emollient substances should be used; afterward it is necessary to open the abscess with a lancet, to wash the mouth with mulse, and to aid the process of cicatrization by using syrup of roses.

As to epulides, these must be made to disappear, by sprinkling the tumor with the powder of gall-nuts, or by moistening them frequently with a decoction of gall-nuts, or with sulphur water. But if they do not yield to these remedies, and are the cause of functional disturbances, the surest and most prudent method of cure would be the use of the red-hot iron.

Giovanni Andrea Della Croce, a celebrated Venetian physician and surgeon, was the author of a most valuable treatise on surgery, which was published first in Latin (*Chirurgiæ universalis opus absolutum*, Venetitiis, 1573), and then in Italian under the title of *Chirurgia universale e perfetta*, Venezia, 1583. According to this author, dental fistulæ are more common to the lower jaw than to the upper one. To cure these fistulæ, it is necessary to extract the diseased teeth from which they originate, even should they ache but little or not at all. To confirm this, he relates in full a very interesting case of a dental fistula, that he cured by the extraction of a tooth which hardly ached at all.

Flajani[1] chose to see in this case a precocious example of the opening of Highmore's antrum through the alveolus. But the description given by Andrea della Croce of his case does not at all warrant this supposition.

At the end of his book Andrea della Croce gives us the figures of many dental instruments, which have, however, nothing new about them.

Gerolamo Capivacci, of Padua, repeats the advice (already given by preceding authors) to avoid, in eating and drinking, the rapid changes from heat to cold, and *vice versa*, since, says he, nature does not tolerate

[1] Collezione d'osservazioni e riflessioni, vol. iii, oss. 84, p. 374.

these rough changes.[1] In the mercurial treatment of syphilis,[2] he recommends the patient, as soon as the action of the remedy manifests itself in the oral cavity, to keep a piece of gold in his mouth, that the mercury, on account of its particular affinity, may unite with the gold and the harmful effects of this strange remedy on the mouth may be thus avoided. A strange method of curing mercurial stomatitis!

Johann Schenck von Grafenberg (1530 to 1598), a celebrated doctor of Freyburg-in-Breisgau, has left us, in his *Observationes medicæ*, a very rich and interesting collection of clinical cases. In this work he refers to many observations upon dental diseases by earlier authors, which, however, have already been noted by us in their time and place. Among other things, Schenck von Grafenberg relates that Cardanus was able, more than twenty times, to calm a violent toothache which tormented him by lightly pressing the sick tooth between the thumb and index finger of his left hand.

Peter Foreest (1522 to 1597), a very famous Dutch doctor of Alkmaar, repeats the very old error—already in decisive terms denied by Andreas Vesalius—that women have only twenty-eight teeth, whilst men usually have thirty-two. To the two central incisors he gives the name of *columellares*. Sugar and all sweet things, says this author, are very harmful to the teeth, and he gives as a proof the fact that apothecaries have, in general, very bad teeth, on account of the frequency with which they taste syrups and the like. Perhaps things are now changed, since I am not aware that chemists in our days are to be distinguished by the bad state of their teeth!

In regard to toothache, Foreest records an important observation which he had made on himself; an aching tooth which a surgeon had not succeeded in extracting, but which was simply loosened, ceased, without anything else being done, from giving him pain, and in a short while became firm again, and he continued to use this tooth for about five years. However, on a renewal of the pain he was obliged at last to have it extracted. On the strength of this observation, the author believes that in certain appropriate cases, recourse may be had to the luxation of a tooth, rather than to its extraction to obtain a cessation of toothache.

This method of cure had already been advised by a still earlier writer, that is, by Avicenna. When a subluxation produces the rupture of the dental nerve, this, in its results is equivalent to a replantation.

Foreest is the first to speak of the violent inflammation of the gums and of the whole mouth, caused by the application of artificial teeth of ivory fixed in their place with gold wire. This cannot at all astonish

[1] Hieronymi Capivacci Patavini opera omnia, Venetiis, 1617, edit. sexta, lib. i, cap. liii; de affectibus dentium, p. 515.

[2] Lib. ii, cap. v, de lue venerea, p. 712.

us when we consider how imperfectly, in those days, dental prosthesis was carried out and how the immobility of the artificial pieces, caused them to be a source of permanent irritation to the neighboring parts, especially on account of the difficulty met with in giving proper care to cleanliness. He, therefore, entirely rejects the application of artificial teeth. He is likewise but little inclined to the use of the pelican, it being very easy to break the teeth with it, and, instead, he recommends the use, whenever it be possible, of another instrument which he calls *pes bovinus*.

Foreest relates several cases of dental fistulæ which he had cured by the extraction of the faulty teeth. In one of these cases, observed in a lady, the fistula had opened between the nose and the cheek, so that a malady of the upper jaw was feared (and, in fact, as William Sprengel observes, it is not improbable that this was a case of affection of Highmore's antrum); he obtained a complete cure in a short time by the extraction of a diseased tooth.

According to Peter Foreest, the existence of dental worms is as certain as is that of intestinal, auricular, and other worms. Even on the pretended efficacy of remedies, capable of making the teeth fall out without pain, he does not throw the slightest doubt.

Foreest attributes to his master, Benedictus of Faenza, the merit of having introduced into therapeutics the trephining of teeth for the cure of certain violent pains not accompanied by any external lesion of the tooth. We know, however, that the invention of this operation dates back to Archigenes. Benedictus trephined the tooth with a very fine drill (*stylo vel terebello subtilissimo*) and then filled it with theriac, using, likewise, as occasion required, other remedies.

To demonstrate the propriety and the necessity of laying bare the neck of the tooth before extracting it, he relates a case in which fracture of the jaw was the result of having neglected this precaution.

Among the sundry causes of the looseness of teeth, he mentions the softening of the dental nerve (*emollitio*), but this erroneous opinion had already been expressed by Galen.

As a means of cleaning teeth and keeping them free from tartar, he advises, among other things, the use of pumice-stone powder. He disapproves, however, of the use of oil of vitriol—unless in very minute quantities of, at the very most, one or two drops.[1]

URBAIN HÉMARD, a surgeon to the Cardinal d'Armagnac, published in 1582, at Lyons, a booklet entitled: *Recherche de la vraye anathomie des dents, nature et proprietez d'icelles, où est amplement discouru de ce qu'elles ont plus que les autres os; avecque les maladies qui leur adviennent, et les remedies.* This is the first dental monograph that appeared in France. The pamphlet is written with much erudition, but its contents

[1] Petri Foresti, Alcmariani, opera omnia quatuor tomis digesta, Rothomagi, 1653.

are almost entirely taken from preceding authors. Hémard indicates by the term *deschapellement* (decrowning) the removal of the crown of a tooth for curative purposes. He speaks of this operation as of a method but recently introduced into therapeutics; but, and very reasonably, too, he shows himself somewhat hostile to such a method of cure.

As to what concerns the anatomy of the teeth, Hémard's book does not contain anything original. The following passage, transcribed by Portal,[1] shows luminously that Urbain Hémard, instead of making researches of his own, has simply copied the Italian Eustachius, translating the latter almost literally. The beauty of it is that Portal had not noticed the plagiarism in the least, since he says that if Urbain Hémard had taken into account the researches of Fallopius and Eustachius as well, his book would have acquired still greater value. But, in truth, he has taken into account, and has valued the researches of Eustachius so much as to palm them off as his own! We here quote, side by side, with a paragraph taken from Hémard's book, the corresponding passage of Eustachius, that our readers may be convinced of the truth of what we have stated:

EUSTACHIUS.

. . . aperta utraque maxilla occurrunt incisores, canini, ac tres molares, nimirum secundus, tertius et quartus; partim mucosi, partim ossei, non obscuræ magnitudinis, suisque præsepiolis undique vallati:

incisoribus autem et caninis docta manu detractis, tenuissimum interstitium vix osseum factum conspicitur; quo pari diligentia amoto, obviam veniunt totidem incisores et canini pene mucosi et longe minores, qui post alios priores in propriis caveis latentes, singuli singulis e regione oppositi collocati essent, nisi utriusque maxillæ caninus magna ex parte proximo incisori incumberet, eumque propterea fere occultaret.[2]

Primorum molarium et genuinorum qui circa septennium ac longe etiam postea oriuntur, fateor me nullum vestigium vidisse.

HÉMARD.

. . . leur ayant ouverte l'une et l'autre mâchoire, j'y ai trouvé seulement les dents incisoyres, les canines, et les trois mâchelieres de chaque cousté de mâchoire; à sçavoir la seconde, la troysième et la quatrième, lesquelles estoit partie osseuses parti mucillagineuses, de médiocre grandeur, garnies à l'entour de leurs petits estuis ou alvéoles. Et depuis ayant tirees dehors lesdictes dents incisives et canines, il se trouve un entre-deux osseux; lequel ayant pareillement osté, il se presente de dessoubs autant de dents incisives et canines, toutes presque mucillagineuses, représentant la substance d'un blanc d'œuf à demy cuite moindres pourtant que les précédentes estant cachées dans les mesmes estuits après les premières.

Quant est des premieres mâchelieres et des gemeles qui à sept ans, ou longtemps après commencent à sortir, je confesse n'en avoir trouvé jamais aucune trace n'y commencement.

[1] Histoire de l'anatomie et de la chirurgie, Paris, 1770.

[2] Hémard has omitted translating this passage, probably because he did not well understand it.

EUSTACHIUS.

Verisimile tamen est, rationique consentaneum, eos perinde ac secundos incisores et caninos rude quoddam, sed minus perspicuum initium ortus in utero sumere; sensimque postea similiter formari et absolvi

HÉMARD.

Toutesfois, il est vraysemblable et raisonable aussi, qu'elles ayent pris dans la matrice, tout ainsi que les incisoyres et canines secondes, quelque petit commencement de naysance et forme, moins apparante toutefois, mais qui depuis se façonne et parfaict tout ainsi que des autres.

At the time when Urbain Hémard was publishing his pamphlet in France, several other monographs were already appearing in various parts of Europe on teeth and their affections. A few years after Ryff had initiated dental literature in Germany, other odontological writings were published in Spain and in Italy.

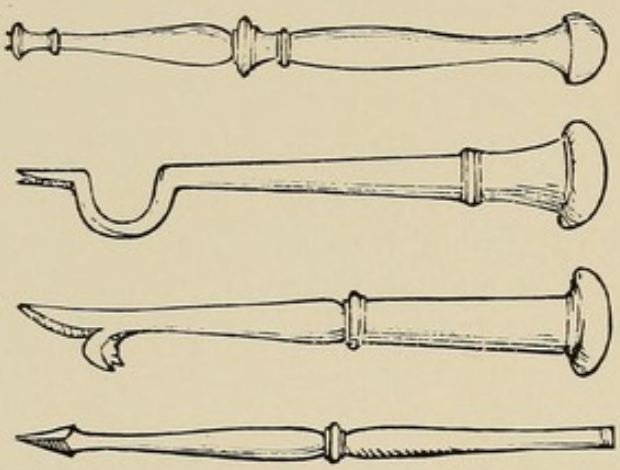
FIG. 66



Title page of Francisco Martinez's book (Valladolid, 1557).

Francisco Martinez,[1] in 1557, gave to the press in Valladolid a *Coloquio breve y compendioso sobre la materia de la dentadura y maravillosa obra de la boca, con muchos remedios y avisos necessarios, y la orden de curar y adreçar los dientes.*

Fig. 67



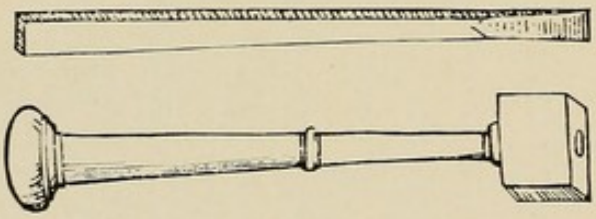
Four of the instruments represented in Francisco Martinez's book.

Fig. 68



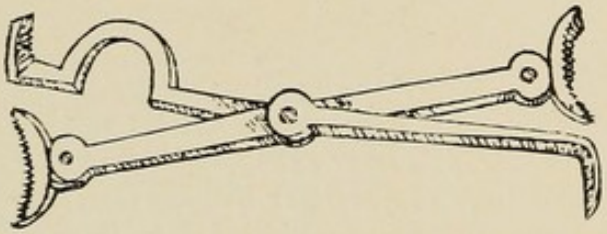
A dental excavator used for ascertaining which one among several decayed teeth was the one causing the pain (F. Martinez).

Fig. 69



A chisel and a mallet for separating teeth (F. Martinez).

Fig. 70



A pelican (F. Martinez).

[1] [For a fuller review of this author see A Dental Book of the Sixteenth Century, by Julio Endelman, Dental Cosmos, 1903, vol. xlv, p. 39.—E. C. K.]



Martia Fabricio iactat se Nomine Roma,
Pendula Fabricium tu quoque gignis Aqua.
Nobilé Fabricio genus, inclita Roma, dedisti;
Pendentem hic contrà Nobilitavit Aquam.

In the same year and city was printed a Latin pamphlet, *De dentione*, by Franciscus Martinus de Castrillo, probably the author of the preceding book. In 1563 was published in Venice the excellent treatise of Eustachius on the anatomy of the teeth (*Libellus de dentibus*). At Frankfort was published, in 1576, the second dental monograph in the German language, *Zahnarzney*, by Adam Bodenstein von Carlstad; and two years later Petrus Monavius published in Basle a Latin pamphlet on dental diseases (*De dentium affectibus*).

FIG. 71

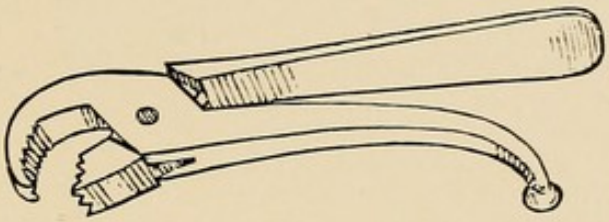
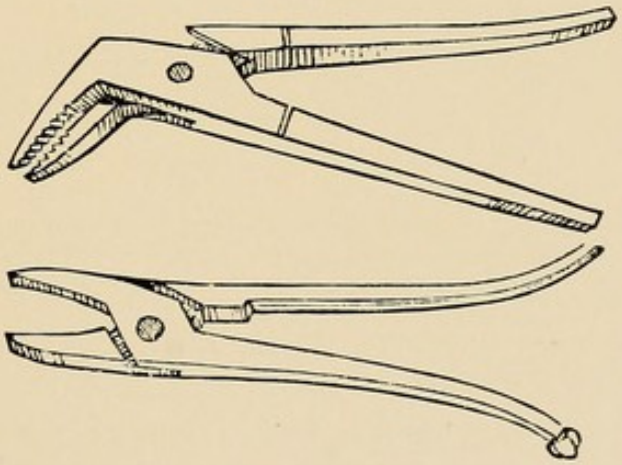


FIG. 72



Different kinds of forceps (F. Martinez).

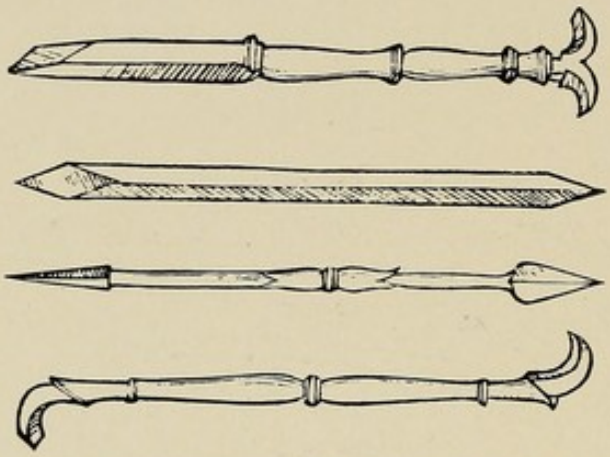
The above-mentioned works, apart from the book of Eustachius, which is, of its kind, a real masterpiece, have but little importance. We have cited them here solely to show in what years and in what countries the very first dental monographs appeared.

GIROLAMO FABRIZIO, of Aquapendente (1537 to 1619), a celebrated anatomist and surgeon, wrote some very valuable works, among which a treatise on surgery, in which the part relative to the affections of the dental system is treated briefly but with great orderliness and clearness, thus giving a very precise idea of what dental surgery was at the end of the sixteenth century.

The principal operations which it is necessary to perform on teeth are, he says, seven in number,[1] viz.:

1. Forced opening of the dental arches in cases of prolonged constriction of the same, so as to prevent the patient from dying of hunger.

FIG. 73

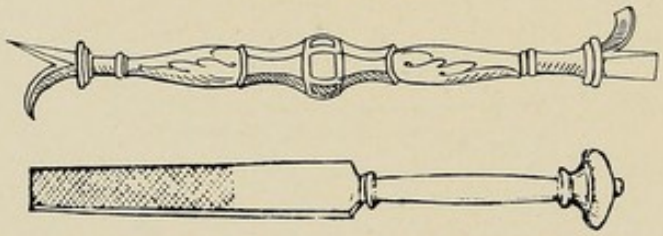


Instruments for removing deposits from the teeth (F. Martinez).

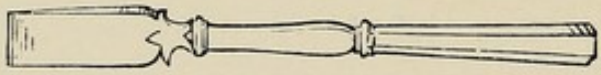
FIG. 74



A dental scraper.



A universal toothpick and a file for sharpening its points.



An instrument for removing sharp corners from the molar teeth (F. Martinez).

2. Cleaning of the teeth.
3. Medication of carious cavities.
4. Filling with gold-leaf.
5. Removal or resection of teeth abnormally situated.
6. Removal of any unevenness or sharpness of the teeth.
7. Extraction.

[1] Hieronymi Fabricii ab Aquapendente opera chirurgica, Lugduni Batavorum, 1723, cap. xxxii, p. 451.

In regard to the first operation, the author first of all examines the various causes of the constriction of the dental arches, and according to the various nature of this, he indicates in what cases it is fitting to have recourse to the forced opening of the jaws by means of appropriate dilators, and in what cases it is best to avoid it. In the latter case one must seek to feed the patient in other ways—that is, either by alimentary

FIG. 75



A figure representing St. Apollonia, reproduced from the last page of F. Martinez's book.

clysters, or by a little tube passed through a space already existing or purposely made by the extraction of one or two teeth; or else by letting a cannula reach down to the pharynx, through the nose, or, lastly, by introducing a cannula into the oral cavity through the free space existing behind the last molars. But in regard to this last method, Fabricius notes that if the constriction is of a spasmodic nature, the spasm may affect not only the elevator muscles of the jaws, but also those that govern

deglutition, including sometimes even those of the tongue itself, and in this case, as the food introduced into the oral cavity could not be swallowed, it is preferable to convey it directly into the pharynx, by means of a cannula passed through the nostrils.

The second of the above-mentioned operations[1] is designed, says Fabricius, to take away the dirtiness of the teeth and the bad odor of the mouth (*dentium immunditiam et oris fætorem tollit*). The dental tartar (*ostracoderma*) must be removed by slender instruments of an appropriate shape, which, for people of high position (*promagnatibus*) shall be made of silver. This advice is sufficient to make us understand that Fabricius, although an excellent surgeon, had no practice in dental operations; otherwise he would have known that the hardness and adhesion of tartar is generally so great that its removal absolutely requires scrapers of tempered steel and not of a soft metal like silver.

To arrest caries, he first drops into the carious hollow, by means of a small silver funnel, some drops of oil of vitriol, or of some other caustic liquid; and then he performs actual cauterization with appropriate instruments; after which the cavity is filled with gold leaf (auro foliato).

When one or more teeth have appeared in an irregular position and offend the walls of the oral cavity or else the tongue, the excision (resection) of the tooth or teeth must be performed with a pair of strong pincers, whose shape must vary according to whether the teeth are situated externally or internally with regard to the dental arches. But as after the resection there will almost always remain some points or sharp irregularities, which by their presence would continue to irritate the soft parts, it will be necessary to remove these irritating prominences by means of the file.

As to extraction, Fabricius of Aquapendente counsels great prudence in performing the operation, and on this point he repeats all the warnings already given by Celsus, an author whom he greatly admires and the study of whose writings he warmly recommends.

It seems that in those times there was more than sufficient reason to inculcate extreme caution in regard to the extraction of teeth. This was not then performed by true dentists, but rather by barbers and by ignorant tooth pullers, or else, in exceptional cases, by general surgeons, very skilful, perhaps, in everything else, but little practised in the operation we are speaking of; besides this, the instruments left much to be desired; and lastly there was not, nor could there be, any idea of asepsis. What wonder, therefore, if the extraction of teeth was frequently the cause of serious injuries! Fabricius relates that it often happened to him to have to extract, in little fragments, half or sometimes a whole jaw, which

[1] Cap. xxxiii, p. 455.

had been attacked by putrefaction, as the result of the extraction of one single tooth. This, adds the author, may easily happen, because, when the jaw is attacked by pus in one point, its very anatomical constitution favors the rapid spreading of the putrefying process to the other parts of the bone, as this latter, apart from its external lamina, is entirely composed of a sponge-like substance.

The instruments which are used for the extraction of teeth, are, says Fabricius, of nine kinds;[1] and the most important among them—generically called *forceps*—are indicated by special names, taken from their resemblance to the mouth or beak of certain animals. Thus, the forceps with which it is usual to perform the extraction of molar teeth are called "pelicans," and of these there are two kinds, according as they are used for the right or the left side, for the upper molars or the lower ones.

A third kind of instrument goes under the name of "beak" (rostrum), and serves for the extraction of the incisors.

A fourth kind is the "crow's beak," or "crow's bill," which is used for the extraction of roots.

Two other instruments are named in Italian "cagnoli," for they imitate the strong bite of the dog (in Italian *cane*) and are used in cases where the pelican is not adapted.

A seventh instrument is called by the Latin term of *terebra* (drill or auger). It is used instead of a lever to separate the teeth from one another when they are too close to each other, and so render their extraction much easier.

The eighth instrument is a "trifid lever" (*vectis trifidus*), so called because it is furnished with three points.

The ninth and last kind of instruments are the *dentiscalpia*, slender, sharp, and oblong tools, with which the gums are separated from the teeth before extraction.

Fabricius also speaks of dental prosthesis, but very briefly. He says that artificial teeth are made of ivory or of bone (for example, from the tibia of the ox) and are fastened by gold wire. One has recourse to this means especially to correct the bad appearance and the defects in speech deriving from the loss of the front teeth.

This author also makes some allusion to palatal obturators,[2] but in very general terms, limiting himself to saying that when a perforation exists in the hard palate, it may be corrected by a piece of sponge or cotton, or with a plate of silver fixed in the palate, so as to close up the aperture (*corrigitur spongia, vel gossypio, vel lamina argentea, quæ palato appendatur, ut foramen obstruat*).

[1] Cap. xxxiv, p. 456; *de instrumentis extrahendis dentibus idoneis.*

[2] Cap. xxxv, p. 457.

For epulides and parulides Fabricius advises the same methods of cure that had been recommended by Paul of Ægina.

In the case of flaccidity of the gums accompanied by looseness of the teeth, the treatment must consist, first of all, in superficial cauterization with the red-hot iron, after which the gums must be smeared with honey, the mouth washed with mulse, and lastly astringent powders must be used.

If the gums are much swollen, in near relation to the molar teeth, the use of the red-hot iron, says Fabricius, becomes very difficult from the want of space, and from the close vicinity of the healthy parts, which must not be injured. In such a case, it is necessary to remove, with suitable cutting instruments, as much as is possible of the morbid tissue (*caro crassa et putrida*); then to cauterize the remaining part, making the cautery, if necessary, pass through a tube, so as not to injure the surrounding parts. When, however, the gingival swelling bleeds very easily, and its excision thus might give rise to a profuse hemorrhage, it will be best to perform the operation with cutting instruments heated red-hot.

Fabricius remarks that although other authors do not make any allusion to these large gingival excrescences, he had had occasion to observe several cases, and had also had various instruments especially constructed for their cure.[1]

Johann Heurn, or in Latin Heurnius (1543 to 1601), of Utrecht, in his book on the diseases of the eyes, ears, nose, teeth, and mouth, treats sufficiently at length of dental diseases and their cure, but without adding anything of importance to what had been written by preceding authors. His work is a mere compilation, which would be without any importance whatever if it did not serve to show what credit was still given at that period to all the errors and prejudices which are to be found in the writings of the ancients.

Heurnius, although he wrote a long time after Vesalius, still adheres, in regard to the number of teeth, to the already mentioned opinion of Aristotle; he says, in fact, that women rarely have thirty-two teeth like men.[2]

He warns those who suffer from odontalgia not to have recourse thoughtlessly to tooth drawers, but to recur, instead, to the doctor, who will always treat the affection according to the cause on which it depends.

And here the author repeats the numerous distinctions found in many preceding writers, and especially in Arculanus. The pain may be located

[1] Cap. xxx, de gingivarum chirurgia, p. 450.

[2] Joannis Heurnii Ultrajectini de morbis oculorum, aurum, nasi, dentium et oris, liber Raphelengii, 1602, cap. xi, de dentium et oris passionibus, p. 79.

in the gums, in the dental nerve, or in the very substance of the tooth; and in each of these cases it may depend on warm or cold matter, on dryness, humidity, etc.

The method of treatment must vary in all these cases; and in regard to this the author enters into minute particulars, commencing with dietetic cure—which itself must be varied according to the causes of the affection—

FIG. 76



A Dutch dentist. (From a picture of the XVI century.) By Lucas Van Leyden.

and then treats of all the other therapeutic means—purgatives, blood-letting, revulsives, local narcotic or resolvent medicaments, and so forth. The letting of blood was, it seems, a very favorite method of cure; not only were the veins of the arm opened, but also those of the tongue, of the gums, of the lips, and of the ears!

Another remedy which the author seems to have a predilection for is oil of vitriol. When a tooth shows a carious perforation, he applies

inside it, by means of a split feather, a drop of oil of vitriol, which, says he, causes the fall of the tooth after a few days.

Elsewhere he says that "sometimes worms are produced in carious teeth; to kill them a drop of oil of vitriol is an excellent remedy; and this at the same time cures the decay of the tooth and takes away the sensibility of the nerve."

This passage does not agree very well with the preceding one, according to which oil of vitriol would act much more radically by causing the tooth to fall out altogether. But we will not take exception to so small a matter; so much the more, as the author, if he were still alive, might perhaps show us by some subtle distinction that the contradiction alluded to is only an apparent one!

To free the teeth from tartar, Heurn likewise counsels oil of vitriol, diluted, however, with other liquids.

A tooth must not be sacrificed excepting when it is loose and attacked by incipient necrosis, so as to leave no hope of arresting the putrefactive process. It is then our duty, says Heurn, to remove the tooth without causing much pain. For this purpose, after the tooth has been separated all around from the gums, it must be raised somewhat from the alveolus; then it must be sprinkled with powder of euphorbia, or a paste made with flour and the juice of the tithymalus must be applied around it, taking care, however, to cover the neighboring teeth with wax. After two or three days the tooth will be so loose that it can be pulled out very easily with the fingers or with a pair of pincers.

Dental surgery properly so called has been entirely neglected by Heurn. He was perhaps so persuaded of the efficacy of the above-mentioned remedies as to believe that every other species of intervention was useless. On the contrary, he does not abstain from speaking very seriously of the miraculous virtues of certain remedies (serpent scales, dog's teeth, etc.); and tells us, among other things, that the broth made from a frog, when held for a length of time in the mouth, soothes dental pains, whatever be the causes from which they originate. One would seem to have gone back again to the days of Pliny!

THE STORY OF THE GOLDEN TOOTH.

In 1593 a rumor spread throughout Germany of a great marvel that had appeared at Schweidnitz in Silesia: a golden tooth had erupted in the mouth of a child aged seven years, which, more precisely designated, was the first large molar on the left of the lower jaw.

In our days news of such a kind would be immediately qualified, and universally held to be an imposture. But three centuries ago the

most marvellous and unlikely things were easily believed in, often even by the learned; and, therefore, the fact alluded to was taken into serious consideration, so much so that for a long time many learned pamphlets and dissertations were written concerning it.

Jacob Horst, Physician and Professor of Medicine at the Julius University in Helmstadt, published, in 1595, a very singular book on the golden tooth of the Silesian child.[1] Without raising any doubt as to the reality of the fact, he maintained that the phenomenon was produced from the effect partly of natural and partly of supernatural causes, in relation with the constellation under which the child was born. On the day of its birth, that is, December 22, 1585, the sun was in conjunction with Saturn in the sign of Aries. In consequence of this circumstance the nutritive force had developed marvellously on account of the increase in heat, and consequently, instead of osseous substance, golden matter had been secreted!

After having explained (!) in this way the origin of the phenomenon, Horst passes on to examine what events may be portended by this unheard-of marvel, he not having the least doubt that it—like earthquakes, eclipses, and comets—must be the precursory sign of important events. Supporting his assertions by arguments of various kinds, some of which are taken from the Bible, he concludes that the gold tooth of the Silesian child means neither more nor less than the approach of the golden age! The Roman Emperor would sweep the Turks, the enemies of Christianity, out of Europe, and the Millenium or Golden Age would commence. As the tooth was situated on the left side of the lower jaw, it might be deduced, according to Horst, that heavy calamities would precede the beginning of the epoch of happiness thus predicted. On the other hand, as the golden tooth was the last of the dental series of the child, this was to signify that the golden epoch thus foretold would be the last of the ages of this world before the universal judgment!

Martin Ruland, in the same year, 1595, wrote about the gold tooth.[2] Shortly after, he was answered by Johann Ingolstetter; and the controversy which arose between them in this important subject lasted for a long time, without, however, leading to any definite conclusion.

Balthasar Camindus, a doctor of Frankfort, meanwhile had noted that for some months the marvellous Silesian boy had not lent himself to being examined by the learned, becoming terribly enraged whenever they wished to compel him. From this he inferred that it was a case of nothing else but an imposture, and that the famous tooth could not have

[1] De aureo dente maxillari pueri Silesii, Lipsiæ, 1595.

[2] Martini Rulandi, Nova et in omni memoria inaudita historia de aureo dente, Francofurti, 1595.

anything special about it, save that its crown had been very skilfully covered with a thin plate of gold.

In spite of this the discussions on the portentous tooth continued for a long time; and even one hundred years after, that is, in 1695, a new dissertation appeared on the golden tooth.

The greater number of those who wrote on this subject did not throw the slightest doubt upon the reality of the fact, but only sought to explain in the most varied ways the genesis of this phenomenon.

Duncan Liddel. Among those who had the good sense not to put faith in the thing, and who very decidedly affirmed that this was a mere case of imposture, Duncan Liddel, a Scotchman and professor in a German University, deserves to be recorded.[1]

He had heard that the famous gold tooth was larger than the others, and that the neighboring molar was wanting; from which he argued that this was simply the case of a tooth the crown of which had been covered with a plate of gold. Answering the arguments of Horst, he accused him of gross ignorance in the most elementary notions of astronomy, and this for having affirmed that when the famous child was born, that is, December 22, the sun happened to be in conjunction with Saturn in the sign of the Ram. As the sun does not enter the sign of the Ram until March, if it had been there on December 22 this would have been a greater portent than if the whole body of the child had been formed of nothing else but teeth of gold![2]

[1] Liddelius, Tractatus de dente aureo pueri Silesiani, Hamburg, 1626.

[2] [In the introductory portion of Liddell's work on the "Golden Tooth" is published a number of letters bearing on the case, among others one which gives rather a circumstantial account of the imposture, and of which the following is a translation:

"Herr Balthazer Caminæus sends Greeting:

"For your letter, most kind Herr Doctor Caselius, in which you explicitly desired me to thank (my) colleagues for their good wishes, 'wedding wishes,' and to imform you as to the 'Golden Tooth,' I have long been in debt to you—not that I intended to leave your letter unanswered, but because no messengers presented themselves. Now that I have found one, I announce that I have obeyed your commands. As for the 'Golden Tooth,' I ought not to hide from you that we have more than once marvelled at your shrewdness, in that you are so anxious to ascribe the devices of wickedness and the tricks (fakes) of cunning to Nature. For it was no portent, only a deception and pure cheat, so that unless some Lemnian (Prometheus or Vulcan) should come to their aid, these acute authors will, nay, already are, a by-word to those who are more cautious and not so prone to believe. For the 'Golden Toothed' boy, according to the account brought thither by many persons, both by letter and oral report, some of whom had themselves seen this wonder, hailed from a village near Schwidnitz in Silesia, and had been so trained by his swindling father or master, that, at his will, whenever in any assembly of men, some very simple and illiterate persons desired to see the tooth and had paid the fee, for the rascals made great gains, he would open his mouth wide and allow himself to be touched. But if educated men and those who seemed likely to make more careful scrutiny and experi-

The above-mentioned fact is not the only one of its kind. Serres relates that once there was a great noise made in Poland about the pretended golden teeth of another child who was carried round from city to city for the purpose of making money. A Franciscan monk had sought to explain, in one of his writings, the formation of these teeth. The anatomist Kircher answered him in a pamphlet which had the very suitable epigraph: *O præclare pater, nimium ne crede colori.*[1] In fact, the pretended teeth were only covered with a layer of tartar of golden color. As the falsity of the pretended miracle might be brought to light at any moment with much scandal, a bishop thought it well to put an end in haste to the comedy, by ordering the removal of the deceitful layer of tartar from the teeth of the child, to be performed in public, so that the imposture might be made completely clear.

From the above story we can, at any rate, deduce an important conclusion for the history of dental art, that is to say, that even as early as 1593 there was an artificer (we do not know whether a goldsmith or dentist) who knew how to construct a gold crown, although only for the purposes of deception.

ment on any point, presented themselves, he contorted his countenance, remained silent, and simulated a kind of madness, the idea being that he permitted himself to be examined at stated times only when the conditions allowed. Now, the tooth was covered with a plate, lamina (or layer), skilfully wrought of the best gold, and the gold was let down so deep into the gum that the cheat was not observed. However, as the plate was sometimes rubbed with a touch-stone as a test and was daily worn down by chewing, the real tooth at last began to appear. Of this fact a certain nobleman got an inkling, came to the place pretty drunk, and demanded that the tooth should be shown him, when the young fellow, at his master's word, kept silent, the nobleman struck his dagger into the boy's mouth, wounding him so badly that the aid of a surgeon had to be called, and so the deception was fully exposed.

"Thus the Herr Baron Fabianus, in Crema, at present Rector Magnificus of our University, told me the story in full, and those inhabitants of the place who have scholarly tastes maintain it to a man. The author of the fraud, if I remember aright, was said to have taken refuge in flight, the boy to be in chains.

"Our Pelargus, who is a native of Schwidnitz, can inform you more fully. I have often heard from him the same facts which I am writing. Farewell, and laugh in safety as much as you please at those sagacious authors.

"FRANKFORT, December 31, 1595."

Elsewhere it is stated that the boy who was the possessor of the "Golden Tooth" was born December 22, 1586. As Horst's Treatise appeared in 1595, the Silesian boy was probably not over seven or eight years of age. We also find that the "Golden Tooth" was a lower molar, and upon the left side, and further, that there was no molar posterior to it.—E. C. K.]

[1] Illustrious Father, do not believe too much in the color.—[Virgil, Ec. ii, 16.]

CHAPTER XI.

THE SEVENTEENTH CENTURY.

THE first signs of the separation of dental science from general medicine were to be perceived in the sixteenth century, the period in which, as we have seen, the earliest dental monographs appeared. From that time this separation tended to accentuate itself ever more strongly; dental monographs became more numerous and dentistry progressed ever more rapidly, both in its scientific and practical aspects.

In the seventeenth century, about which we are now to speak, we shall have to call attention to many facts of the highest importance for the development of dentistry, and with regard to literature, it is worthy of note that while the publications on dentistry that appeared in the various countries of Europe during the preceding century only amounted to about twenty (taking also into account several pamphlets on the famous golden tooth!), in the seventeenth century the number was considerably higher, that is, about a hundred. We shall speak of the most important of these, as also of the works on general medicine or on surgery of the same period, that present some interest from the point of view of dentistry.

JOHANN STEPHAN STROBELBERGER, physician to the imperial baths of Carlsbad, published in the year 1630 a very curious book, the title of which, being translated, runs somewhat as follows: *Complete Treatise of Gout in the teeth, or, more properly said, of Odontagra or toothache; in which are set forth, theoretically and practically, for the use of physicians and surgeons, the means of mitigating these pains, as well as the various modes of ably extracting teeth with or without instruments.*"[1]

This book merely presents some interest, because it gives us a clear idea of the pitiful state in which the dental art still was in the first half of the seventeenth century, and shows us most clearly what enormous progress our specialty has made in little less than two centuries. Apart from this, Strobelberger's monograph is of no importance, it being

[1] Joh. Stephani Strobelbergeri, thermiatri cæsarei emeriti, etc., de dentium podagre, seu potius de odontagra, doloreve dentium, tractatus absolutissimus, in quo, tam doloris istius mitigandi rationes, quam dentium sine et cum ferro artificiose extrahendorum varii modi, theoretice ac practice proponuntur, in medicorum ac chirurgorum quorumvis gratiam. Lepsiæ, 1630.

nothing more than a most accurate compilation of all that is to be found on the subject of dental affections in earlier works, especially from the medical point of view; the surgical part of dental therapeutics is treated in a much less complete manner, and prosthesis is entirely excluded from the plan of the work, which, however, is fully in accordance with the title of the book.

Under the generic name of gout,[1] or podagra, are meant, says the author (Chapter I), all the affections produced by diseased humors, falling "by drops" into the articular cavities and the parts surrouuding them. Strictly speaking, however, only gout in the feet is named *podagra*, whilst when the disease is seated in other parts of the body it is indicated by other names, gout in the hands being called *chiragra;* in the fingers *dactilagra;* in the knee, *gonagra;* in the elbow, *pechiagra;* in the shoulder, *omagra;* in the spinal column, *rachisagra*, and so on. When the seat of the evil is in the teeth or in their articulations, by analogy it is denominated odontagra, or odontalgia, an affection which Paul of Ægina was the first to consider as being of a gouty nature (Chapter II).

After having spoken of the sensibility of the teeth (Chapter III), of təh various kinds of dental pains (Chapter IV), of the different causes, external and internal, which produce them (Chapters V to VII), of the signs which make known their special nature in each case (Chapters VIII to X), and of the prognosis (Chapter XI), the author occupies himself very minutely, throughout the rest of the book, with all that concerns means of cure, dedicating to this subject sixty-seven chapters and a long appendix.

If, after the publication of Strobelberger's book, all previous works treating of dental affections had been entirely lost, it would be of inestimable value for the history of dentistry, the author having gathered together in an almost complete manner—citing faithfully the respective authors—all that had been written about dental diseases before him. On the other hand, the book contains almost nothing original; therefore, rather than analyze minutely its contents—which would involve a long repetition of things already noted—we limit ourselves merely to a few observations.

Strobelberger, like Heurnius, is of opinion that for the cure of dental pains it is necessary to have recourse to doctors rather than to *dentispices*, or tooth drawers (Chapter XII); however, he does not consider the calling of the latter absolutely useless; indeed, he expressly advises (page 174) that they should be applied to for the instrumental extraction of the teeth, it not being possible for such operations to be carried out well and without danger except by those who, through great practice, have acquired the necessary skill in the use of the relative instruments. He refers to

[1] In Latin, *gutta*, that is, drop.

the words of Hollerius, already quoted, as to the falseness of the opinion that fumigations made with the seeds of hyoscyamus cause the worms to fall out of the teeth. Notwithstanding, he does not in the least doubt the existence of the worms themselves; and he, like Heurnius, recommends killing them with oil of vitriol or with a decoction made from a frog cooked in water and vinegar (Chapter XXXIII). From this, one clearly perceives that the doubts expressed by Hollerius about the existence of dental worms had not in the least shaken the popular belief in them. Nor, indeed, could it be otherwise when one considers that Hollerius, as we duly noted in another place, had not the courage either decidedly to deny the existence of dental worms, or to formulate in a clear and explicit manner the doubts which had arisen in his mind on this subject. We are, therefore, unable to recognize the merit which Linderer[1] and Geist-Jacobi[2] have attributed to this author, viz., that of having effectually affirmed the non-existence of dental worms.

Among innumerable vegetable remedies recommended by Strobelberger against odontalgia, we will only cite two American plants, the guaiacum and the tobacco-plant (Nicotiana tabacum). Of the decoction of guaiacum (Chapter XXXVI) the author says that, used as a mouth wash, it has the triple virtue of strengthening the gums, of preventing putrefactive processes, and of calming toothache.

The anti-odontalgic virtue of tobacco is mentioned (Chapter XXXVIII) for the first time in this work, but, as we learn from Strobelberger himself, Heurnius has already obtained, experimenting in his own case, the cessation of an attack of toothache by holding in his mouth spoonfuls of tepid decoction of nicotiana for the space of two hours.

The same soothing effects may be obtained, says the author, from the smoke of tobacco; but he attributes this not to the narcotic action of the remedy, but to the fact that it causes the flow of much saliva from the mouth and mucus from the nostrils, through which the morbid humors which provoke the pain are eliminated.

To those suffering from odontalgia, says Strobelberger (Chapter XL), the internal use of certain mineral waters is also of value, and especially that of the waters of Carlsbad (Thermæ Carolinæ). Like many other remedies, they are useful in rendering the secretions more active, favoring thus the elimination of morbid substances from the blood. For the same object of purifying the organism and dispersing the accumulated humors causing the pain, many other means of cure were in usage, such as aperients (Chapter XXV), phlebotomy, and arteriotomy (Chapter XXVIII), leeching (Chapter XXIX), scarification and cupping (Chapter

[1] Handbuch der Zahnheilkunde, Berlin, 1848, ii, 422.
[2] Geschichte der Zahnheilkunde, p. 101.

XXX), blistering and cauterizing (Chapter XXXI), masticatories, viz., substances intended to be chewed for the purpose of exciting salivary secretion (Chapter XXVI), sternutatories, viz., substances which provoke sneezing (Chapter XXVII), and so forth.

Like Arculanus, Strobelberger makes a distinction between the *real* and the *false* cure of odontalgia (*cura vera et cura mendosa*). This latter he also subdivides in *palliative* cure and *vain* cure (Chapter LV). The palliative cure is constituted by the use of narcotics and stupefying remedies (Chapter LVI), whilst the vain cure is represented by certain remedies which he calls "fanatical" or rather "fantastical." The *vain* cure, in its turn, undergoes a new distinction, since it comprises three species of remedies, that is, the wearing of amulets, the superstitious remedies, and the ridiculous remedies. Indeed, this last apellation might also fittingly be applied to the preceding ones!

One would be inclined to believe that the author who qualifies these remedies as vain, fantastic, superstitious, and ridiculous was a thoroughly unprejudiced man; however, this is not so. Strobelberger, too, had to pay his tribute to the dominating prejudices of his century; this manifestly appears from various passages in his book, and especially from the Chapters XVI and XLIV. The first of these bears the following title: "How to procure immunity from toothache," and Strobelberger therein asserts in all seriousness, basing his assertion on the authority of Rhazes, that "if the canine tooth of a lion be suspended to a child's neck before the milk teeth fall out and during the eruption of the second teeth, it will secure the child immunity from dental pains." In Chapter XLIV the author speaks of those animals whose teeth are useful to man as remedies against toothache, and reiterates—lending, as it seems, perfect faith thereto—various prejudices that are found in Pliny and other writers of antiquity.

As to the remedies which Strobelberger recognizes as *vain*—that is, as devoid of real curative virtue—he remarks that they may nevertheless be useful by acting powerfully on the imagination of the sufferer, thus causing, in fact, the cessation of pain (Chapter LVII). This clear and explicit affirmation of the efficacy of suggestion in a book published 270 years ago is certainly not without interest.

If, says Strobelberger, a place is to be accorded, in dental therapeutics, to the *vain* remedies, among these, amulets deserve the preference; and the best accredited amulet is the root of the lepidium, already recommended by Dioscorides, who affirms that if it be hung around the neck of the sufferer it will cause the pain to cease.

One of the *superstitious* remedies to be used aganst this affection (Chapter LVIII), consists in touching the aching tooth with the tooth of a dead person, and afterward greasing it with horse's marrow.

Among the *ridiculous* remedies (Chapter LIX), the author describes one that was especially in use among soldiers. With a piece of chalk or of rubble one writes on a table:

Chiacia	Chiacia	Chiacia
X O X	X O X	X O X

One then pricks the tooth with a knife or an iron toothpick until it bleeds slightly; then thrusting the point of the instrument, to which the blood adheres, into the first cross, then into the second, then into the third, and so on, one asks the patient each time if the tooth still pains him. Before one gets to the last cross the pain ceases! This stolid cure, says the author, has no other value than that of the scarification of the part affected.

Strobelberger held, as did many of the preceding authors, that the extraction of a tooth ought to be the *last* remedy, that is, to be had recourse to when all others, including cauterization, which he considers as the *last but one*, have proved ineffectual. There are cases, however, in which the extraction of a tooth is absolutely indicated, and here, by the way, the author acquaints us with the following poetic aphorism, which expressed the unanimous opinion of doctors:

> Si dens pertusus, vel putridus esse notatur,
> Corrumpens alios, tunc protinus ejiciatur.

That is, if one finds that a tooth is hollow or decayed, and corrupts the others, it must at once be extracted.

Strobelberger, like the greater number of his predecessors, is fully persuaded that diseased teeth may be made to fall out by the use of special remedies; indeed, this clearly appears from the title of the work itself, as, without doubt, the reader will already have observed. Such remedies are called by him "odontagoga," and he describes them at great length in five different chapters (X to XIV) of the second section of his book, dedicated to the surgical care of the teeth.

In regard to *violent extraction* of teeth, Strobelberger shows still greater cautiousness and timidity than Celsus or Abulcasis. He requires that, after the gum has been detached, one should endeavor to extract the tooth with the fingers or by means of a thread; if, however, this does not succeed, one may have recourse to the trifid lever; only at last, that is, when even the lever has failed, does he allow the use of an appropriate dental forceps.

Arnauld Gilles, a Frenchman, in the year 1622, published in Paris a work whose curious title we will here note: *The flower of the remedies against toothache.*[1] We know nothing else about this publication,

[1] Arnauld Gilles, La fleur des remèdes contre le mal des dents, Paris, 1622.



Dit is de schetze van FABRICIVS HILDAAN:
Zyn lighaam schonk hy't graf, na dat hy zo veel iaare
Den kranken, in hun nood, getrouw had hy gestaan
De ziel in 't lighaam zum zyn boeken is gruaaren.
N. V. A

which, however, to judge from its title, cannot be other than a mere compilation.

DUPONT, another Frenchman, in 1633, published an important pamphlet, which I have, unfortunately, not been able to see. I can, therefore, only quote what Sprengel says of it.[1] Dupont recommends, in cases of obstinate toothache, the extraction and immediate replantation of the tooth; which, he says, becomes quite firm again, but will no more cause any pain. In confirmation of this, Denis Pomaret related, a little later, a case in which a healthy tooth having been pulled out by mistake, and immediately put back into the socket and treated with astringent remedies, became perfectly firm again.[2]

Although Abulcasis and Ambroise Paré had already recommended the replantation of teeth, the loss of which had been caused by trauma, and although Peter Foreest had already made known as a result of his own personal experience that the luxation (not, however, complete extraction) of a tooth and its successive replantation is capable of causing toothache to cease, nevertheless, we must recognize that the merit of having elevated replantation in non-traumatic cases to a special method of cure must be attributed to Dupont.

WILHELM FABRY (1560 to 1634), a German, and native of the small town of Hilden near Cologne, better known by his Latin name of Fabricius Hildanus, was chief doctor to the city of Berne, and acquired great fame as well by his extraordinary professional ability as by his works, consisting principally in reports of many hundreds of important and instructive clinical cases. He is rightly considered one of the most illustrious German surgeons. His writings have largely contributed not only to the progress of surgery in general, but also to that of dental surgery in particular.

One of his observations clearly shows the etiological relation frequently existing between a prosopalgia or a supposed hemicrania and a dental affection. The case referred to is that of a lady who had been subject for six months to violent pain in the upper teeth of one side of the jaw. The toothache little by little disappeared, giving place to an obstinate cephalalgia in the same side of the head, which gradually became so intense as to be perfectly insupportable, the patient being particularly subject to it when the weather was cold and damp. After four years of atrocious suffering, and after innumerable remedies had been tried without avail, Fabricius Hildamus—having had the luminous idea of seeking the cause of the evil in the teeth—obtained a complete cure, without further trouble, by extracting four of the patient's teeth, which were decayed.

Nowadays, it is an all-important canon of medical practice, that in

[1] Remèdes contre le mal des dents, Paris, 1633.

[2] Sprengel, Geschichte der Chirurgie, Part II, p. 293.

every case of neuralgia occurring within the region influenced by the trifacial nerve one should give particular attention to the state of the teeth and carefully treat every affection of the same. Notwithstanding—we say it with regret—there are still medical men who ignore or neglect this precept, and prescribe internal remedies or have recourse to injections of morphine when they ought, in the first place, to call in the aid of a dentist. How many patients would have been delivered from slow martyrdom if the example of the clear-seeing physician of Berne had been followed from his days up to the present time!

Fabricius Hildanus relates, besides, many cases of dental fistula, cured by him through the extraction of roots or of decayed teeth. In one such case the fistula dated from fourteen years back. Fabricius Hildanus, contrary to the opinion of many other doctors, extracted a decayed tooth, and by this operation obtained, in a brief period of time, the complete recovery of the patient.

Among the many very important clinical cases cited by Fabricius Hildanus, the following deserves to be recorded: In the year 1590 a woman presented herself to him who had a hard tumor in the space behind the last molar on the right side. The author, after having prepared the patient for the operation by the methods then in use (that is, by aperient medicine, by bleeding, and appropriate diet), destroyed the tumor by the application of escharotic substances. The remaining wound, however, defying all the cicatrizing remedies which the author had recourse to, one after the other, by reason of its being continually disturbed by the movements of the jaws, he then thought of maintaining the dental arches in a determined position, and this he obtained by means of two pieces of wood somewhat hollowed out above and below, which he placed on the right and on the left between the upper and the lower teeth, fixing them to the teeth themselves by brass wires passing through two openings made expressly in each of the two pieces of wood. In this way he succeeded in obtaining the absolute immobility of the jaws and the complete cure of the wound in a few days, during which time the patient was nourished with liquid food.[1]

A very interesting case, inasmuch as it demonstrated the damage and peril which may result from certain absurd means of cure, was reported to this author by Claudio Deodato, physician to the Prince-Bishop of Basle. The case was that of a patient who, after having tried in vain a great number of remedies for a stubborn toothache, finally had recourse to the use of aqua fortis; but this substance, which in those days was in frequent use for dental caries and for toothache, produced most

[1] Guilhelmi Fabricii Hilandi opera omnia, Francofurti ad Moenum, 1646, Centuria I observatio xxxviii, p. 33.

deleterious effects in the patient, that is to say, the loss of almost all his teeth, necrosis of the inferior jaw, with fistulous sinuses and ulceration of the neck, abundant sanious discharge, fever, a cachectic condition, incipient necrosis of the upper jaw, etc.[1] Fabricius Hildanus, consulted by Claudio Deodato about this most serious case, proposed both a local and a general treatment, the result of which is, however, not mentioned in his book.

In the fifth "*centuria* of medical and surgical observations and cures"[2] we find a case of oral surgery, to which it is worth while briefly to refer here. It relates to an epulis situated next to the upper canine of the left side. The tumor, already of ancient date, had at this time reached the size of a walnut, was very hard, livid in color, irregular in form, and adhered somewhat to the upper lip; according to the author, it was of a cancerous nature. After the usual preparative measures, Fabricius Hildanus proceeded to the ablation of the tumor, and to this end he first pierced it with a curved needle and strong thread, in order to get a good hold on it, and he then removed it entirely down to the bone, by means of a curved bistoury.[3]

Fabricius Hildanus, having dissected several abortive fetuses of under four months, was able to verify the exactitude of the assertion made by Hippocrates, afterward luminously confirmed by different Italian anatomists, that the teeth begin to be formed during intra-uterine life. And with reference to this he also relates the following fact:

The wife of a Protestant minister gave birth to a female child which already had a fully developed tooth, a lower middle incisor, equal in size to that of a child of two years old, and which interfered with the sucking by injuring the nipple of the mother's breast and the tongue of the child itself. So it was necessary that it should be removed. But it was found to be so firm that the surgeon sought in vain to extract it with a thread, and was obliged to have recourse to the forceps.[4]

Observation XXXI of the third *centuria* relates a case of rhinoplasty. In the year 1590, when the Duke of Savoy made war on the inhabitants of Geneva, a girl named Susanna N. fell into the hands of the soldiers, who tried to deflower her; enraged at not succeeding in their intent, they cut off her nose. Two years later the girl went to Lausanne, the residence of J. Griffon, an eminent surgeon of that time, who performed the rhinoplastic operation on her in so splendid a manner that one would

[1] Cent. iv, obs. xxi, p. 302.

[2] The most important of Fabricius Hildanus' works consists of six *centuriæ* (hundreds) of remarkable cases, published by the author in successive epochs, and which were afterward reunited under the title of *Observationum et curationum chirurgicarum centuriæ sex*.

[3] Cent. v, obs. xxvii, p. 406.

[4] G. F. Hildani, opera omnia, Epist. ad J. Rheterium, p. 1010.

have taken the new nose for a natural one, not only from its normal appearance, but also because the scar was hardly visible. Fabricius Hildanus, having had occasion to see and examine the patient several times, even up to twenty-one years after the operation, was able to testify to the perfect condition of the nose; in the extreme cold of the winter, however, it was apt to become livid at the point. He does not describe the operative process followed by Griffon, but merely says that the first inventor of this operation was Gaspare Tagliacozzi, of the University of Bologna, and that Griffon had undertaken the reproduction of the same from his own conception of it, based on the information imparted to him in conversation, by an Italian who had been operated upon by Tagliacozzi.

Johann Schultes (1595 to 1645), a physician in Ulm, was the author of a very important work entitled *Armamentarium chirurgicum*, in which are given plates and descriptions of almost all the surgical instruments that had been in use up to that date. As to the part relating to dental and oral surgery, we find the following instruments named in this work:

1. Several kinds of pelicans; an instrument which was so called from its resemblance to the beak of the bird of the same name, and used for extracting the molar teeth.

2. The common dental forceps, then named *cagnolo* by the Italians, because of the supposed likeness to a dog's muzzle.

3. The crow's beak forceps (*rostrum corvinum*), designed for the extraction of dental roots, and, therefore, corresponding to the rhizagra of Celsus.

4. Two special dental forceps, or *dentiduces*, for the removal of teeth which could not be extracted either with the pelican or with the common dental forceps.

5. Bifid and trifid elevators (*vectes bifidi et trifidi*), to be used for the extracting of incisors and canine teeth, as well as roots.

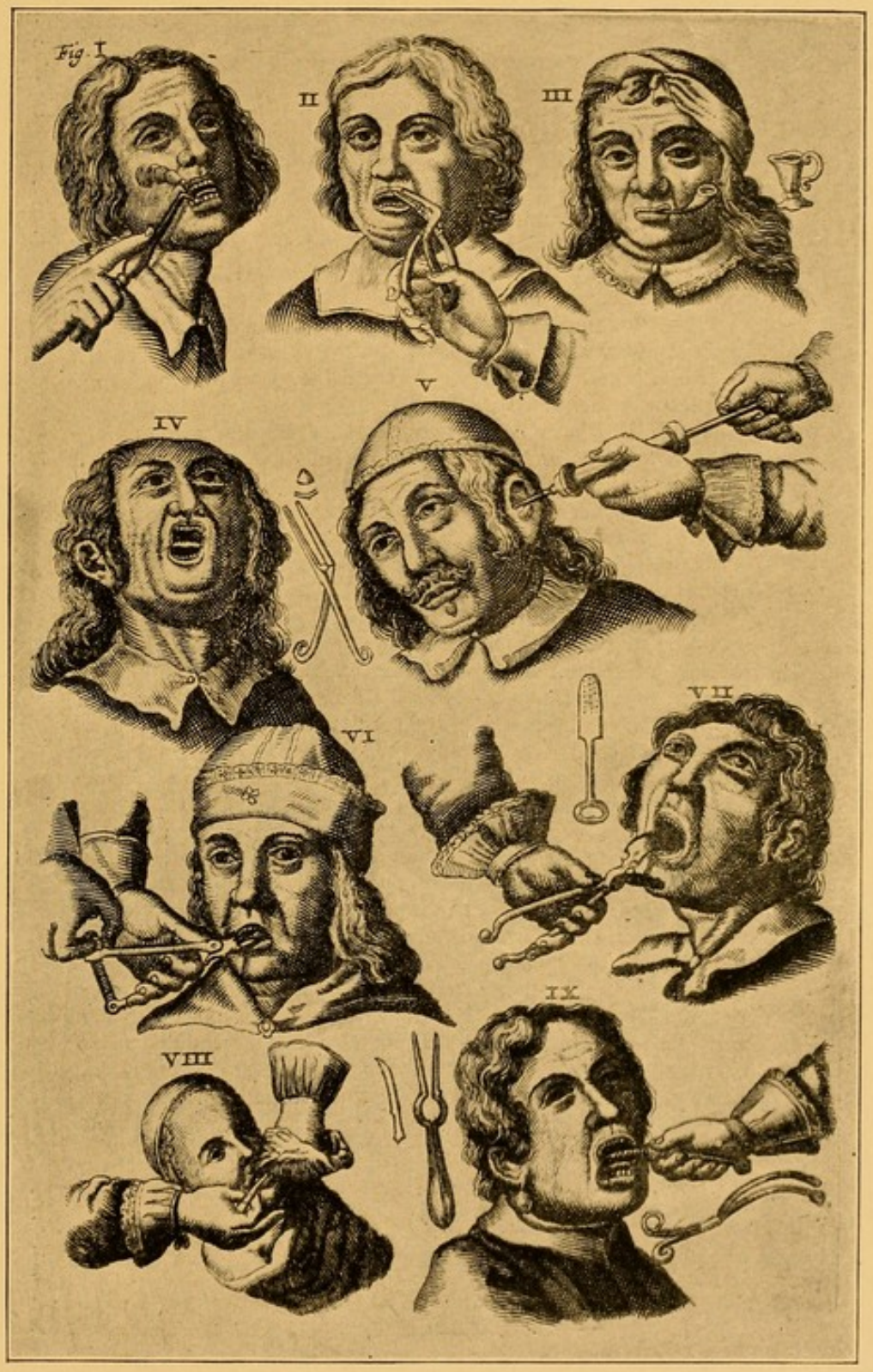
6. *Dentiscalpia* for detaching the gum from the tooth before proceeding to extract it, in order that this may be the more easily accomplished and with less danger.

7. A silver funnel or cannula (*infundibulum seu fistula argentea*), for nourishing patients affected with trismus, by conveying liquid food into the fauces, through the free space behind the last molars.

8. Forceps more or less like in form to the beak of the parrot or the vulture (*rostrum psittacinum et vulturinum*), for the removal or resection of teeth that have grown in abnormal positions.

9. A screw dilator (*dilatatorium cum cochlea*), for gradually opening the dental arches in cases of spasmodic constriction of the jaws.[1]

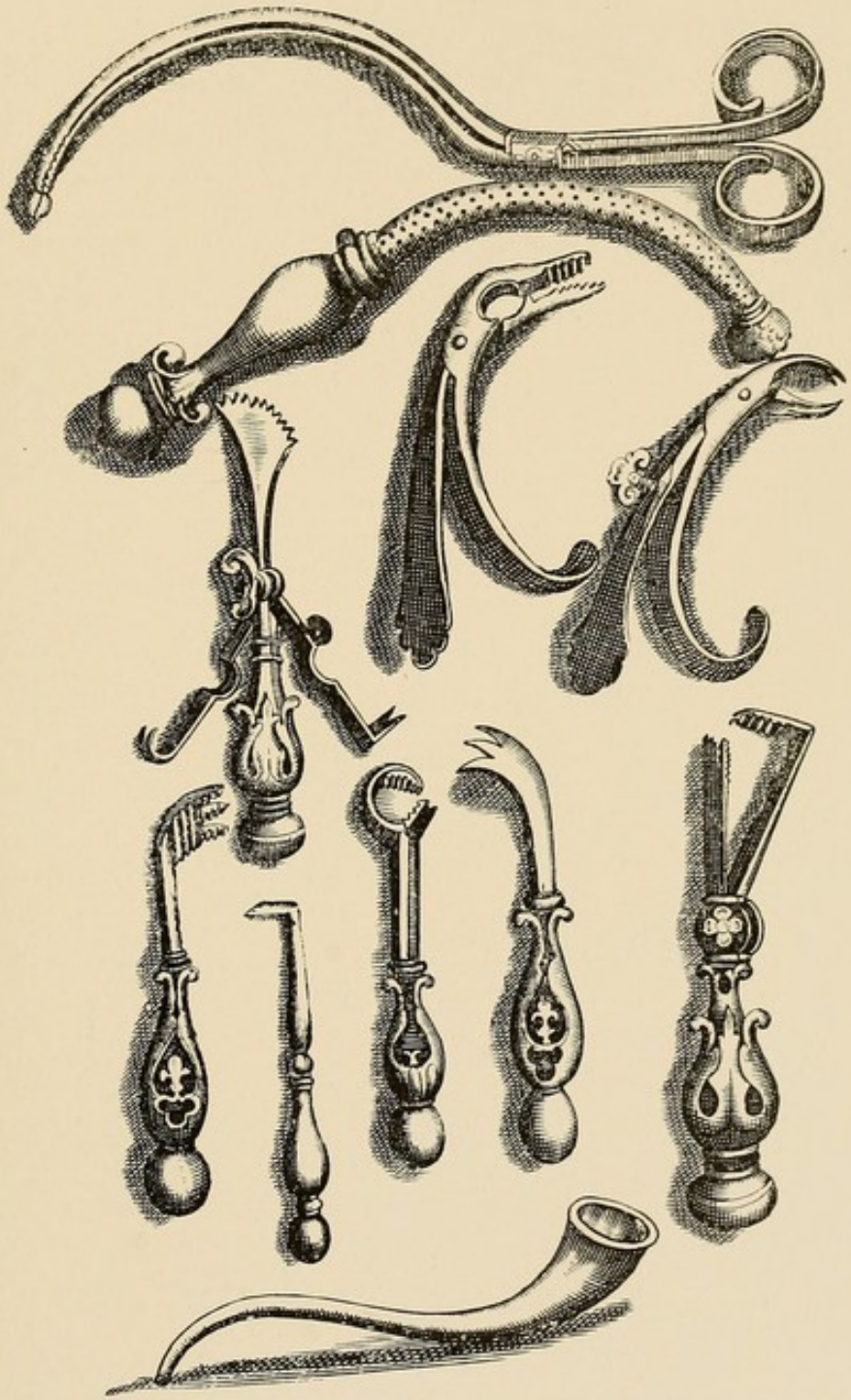
[1] Joannis Sculteti, Ulmensis, armamentarium chirurgicum, Francofurti, 1666, Plates X, XI, XII, XXXII.



A plate of Schulte's "Armamentarium Chirurgicum," showing some dental and other operations.

Marco Aurelio Severino (1580 to 1656), of Tarsia, a celebrated professor of surgery in the Neapolitan University, had a great predilection

Fig. 77



A plate from Schultes' "Armamentarium chirurgicum," showing several dental instruments.

for the use of the cauterizing iron, which he also used very frequently in curing caries and other dental diseases. At times, to effect a cessation of violent toothache, he would have recourse to the cauterization of the

antihelix! Against flaccidity of the gums and loosening of the teeth he also used cauterization, disapproving the use of astringent substances, as these cannot get so far as the roots of the affected teeth. Severino boasts of having cured by cauterization at least two hundred cases of dental diseases.

Lazare Rivière (1589 to 1655), a professor at the University of Montpelier, also known by his latinized name of Lazarus Riverius, treats of dental affections and their cure, in various parts of his works, considering them, however, almost exclusively from a medical point of view.

He speaks first of all of the different causes of odontalgia, and, among these, does not omit to mention worms. These, he says, may be generated in the carious cavities, owing to the putrefaction of substances retained in their interior. Whenever odontalgia is caused by worms, the pain, says Rivière, is not continuous, but ceases and returns at brief intervals; besides, the sufferer perceives at times the movement of the worm inside the tooth!

What one reads in the works of this author as to remedies to be used for odontalgia clearly demonstrates how irrationally dental diseases were treated in the seventeenth century and what tortures were inflicted on the patients. In many cases, and especially when the pain was held to be occasioned by "hot humors," the treatment was begun by bleeding in the arm. The following day an aperient was administered. Afterward, if the pain still persisted, the sufferer was cupped in the region of the scapulæ or of the spine, blisters were applied to the nape of the neck or behind the ears, resinous plasters to the temples; all this without taking into account the remedies which were introduced into the ears, or the various medications or operations performed on the aching part itself, and many other things besides. In fact, in order to cure a toothache, the whole body of the sufferer was seized upon and put to torture, and in the majority of cases they assuredly finished by extracting the diseased tooth! When we reflect on the extraordinary frequency of dental disorders we cannot do less than recognize that the dentists, by the radical change effected in the methods of treatment, have diminished in no small degree the sufferings of humanity!

According to Rivière, the small veins (sic) that nourish the teeth pass through the ear (!); and this would explain how the cessation of a toothache may be obtained by the introduction of certain remedies into the meatus auditorius externus. Relief may be obtained, for instance, by dropping oil of bitter almonds into the ear on the side affected by the pain, or by allowing the vapor of hot vinegar, in which pennyroyal or origanum has been boiled, to penetrate into it. Others, adds the author, pour a little pure vinegar into the ear, which is especially efficacious against

"hot fluxions." When, however, the toothache depends on a "cold fluxion," it calms the pain wonderfully to drop into the ear a tepid mixture of garlic juice and theriac. The same advantage, says the author, may be obtained by introducing a piece of garlic, peeled and cut into the form of a suppository, into the ear.

The author also makes a lengthy enumeration of anodyne and narcotic remedies (among which opium), observing, however, that those remedies, unless the vehemence of the pain obliges the use of them, ought not to have the preference, it being much more rational and much more advantageous to institute a cure which aims directly at the cause itself of the pain (fluxions, worms, etc.).

He informs us that Amatus Lusitanus, a celebrated physician of the sixteenth century, extolled, as a remedy for toothache, a decoction of gum sandarach in wine and vinegar; the said decoction was to be made with an ounce of sandarach in six ounces of wine and the same quantity of vinegar, and ought to be kept in the mouth some length of time, whilst hot.

Rivière further speaks of various masticatories, which were composed of mastich, staphisagria, pyrethrum, henbane, etc.

He also mentions oil of cloves, which even then was used against toothache, by introducing into carious cavities a small piece of cotton-wool soaked in it. Oil of camphor was used in the same manner, but the most efficacious of all, according to the author, was oil of boxwood.

As to worms in the teeth, they may be destroyed by the use of bitter substances!

In the case of a caries penetrating into the inner cavity of the tooth, to effect the cessation of pain, it is necessary to burn the nerve with the actual cautery, or with aqua fortis, or with oil of vitriol. If this be repeated several times, the tooth gradually falls to pieces.

After having enumerated all these remedies, the author speaks of the extraction of the teeth, and of all the precautions with which this must be carried out in order to avoid the various accidents which may result from the operations and may even, sometimes, become a cause of death.

When abundant hemorrhage follows the extraction of a tooth, this may often be made to cease by applying a small, very compact ball of linen into the alveolus and maintaining it there by pressure during one or two hours. Should this not suffice, one can combine with compression the use of astringent substances. Finally, as a last remedy, use may be made of the red-hot iron.

In the case of timid patients, who shrink from an instrumental operation, recourse may be had to eradicating remedies, the author being fully convinced of their efficacy. Indeed, one of these—helleboraster—is said to be so powerful that, when rubbed on the teeth, these fall out

within the space of a few hours; for which reason it is absolutely necessary, in making use of it, to cover over the neighboring teeth with wax, so that the healthy ones may not also fall out, as happened, says the author, in the case of a poor peasant.

The internal use of mercury, and even the use of certain mercurial preparations used by women as cosmetics, is of damage to the teeth and imparts to them a blackish or dirty looking color.

Numerous remedies exist for cleaning the teeth, but according to Rivière the best way of cleaning them consists in rubbing them with a small stick immersed in sulphuric acid (*spiritus sulphuris aut vitrioli*) and afterward drying them with a piece of linen. This remedy not only cleans and renders the teeth white, but it preserves them also from caries! If the teeth are very dirty, the spirit of vitriol may be used pure; otherwise one mixes it with *mel rosatum* or with water.

The great enthusiasm shown by Rivière for the above-mentioned remedy does not, however, derive from a long experience, made by himself or by others, of its advantages, but is based principally on a fact referred to by Montanus, and which,[1] we will here recount, because, from it, one clearly perceives how credulously our forebears accepted general affirmations and formulated therapeutic precepts.

Montanus recounts in one of his writings, how, being in Rome in his early youth, he became acquainted with a woman of about twenty years of age, known by the name of Maria Greca (by the way the author speaks of her, one is led to suspect she was a courtesan); and how, having seen her again, thirty years later, and found her in pretty much the same conditions as formerly, he expressed his surprise at this; whereupon Maria Greca told him that she herself believed that she owed the conservation of her beauty to the habit, already of many years' standing, of using one or two drops of oil of vitriol every morning, as a friction for the teeth and gums. In her youth she had had very bad teeth, but by reason of this cure they had become, and were at the time being, beautiful and perfectly firm; the gums also were in excellent condition; it seemed, therefore, to her that this conservation of health and freshness, in spite of her fifty years, depended precisely on the daily use, in the manner described, of oil of vitriol![2]

Rivière, besides, recommends tobacco ashes for cleaning the teeth, a counsel not yet given by any previous author. He also gives the formulæ for two dentifrice powders, the basis of which is alum; he calls attention

[1] Giovanni Battista Montano (1488 to 1551), of Verona, Professor of Medicine at Padua.

[2] It is marvellous that an intelligent physician should have lent faith to such a story, related, too, by such a woman, never reflecting that the daily use of sulphuric acid for the space of thirty years, that is, about 11,000 applications, instead of curing and beautifying bad teeth, would certainly rather have had the effect of totally destroying the denture of even a mastodon.

to the great importance of taking assiduous care to keep the teeth clean, and advises that after each meal the residues of food be removed from the interstices of the teeth and the mouth well rinsed with wine.[1]

Nicolaus Tulp, in Latin, Tulpius (1593 to 1674), a distinguished physician and anatomist of Amsterdam, contradicts the then prevailing opinion among doctors, that is, that the cure of dental affections and the operations relating thereto were matters to be held in little account. He observes that diseases of the teeth may give rise to the most serious consequences, which can even be the cause of death, and are, therefore, worthy of being taken into equally serious consideration as all the other diseases of the several parts of the human body.

This author relates a clinical case tending to demonstrate how incisions made in the gums, advised in the first place by Vesalius, in order to facilitate the erupting of the last molar, are not always exempt from danger. A young doctor of Amsterdam, by name Goswin Hall, being tormented by insupportable pain caused by the difficult eruption of a wisdom tooth, had the gum lanced above it. But the pain, instead of diminishing, became worse; fever and delirium supervened, followed by death! (Here, however, we must be allowed to observe that nothing demonstrates that the real cause of death was the lancing of the gum, or that without this the case would have had a different termination. An event can occur after another and yet be quite independent of the former and result from quite different causes.)

Among the cases cited by Tulp, the following is also worthy of mention. He relates having arrested a violent and persistent attack of hemorrhage, which came on after the extraction of a tooth, by applying and compressing a piece of sponge inside the alveolus.[2]

The belief that dental caries and toothache could be caused by worms was, at that time, still in full vigor, and it gained still greater force by reason of observations recorded by different scientists, whose affirmations could with difficulty be doubted, for at that period the greater number still swore blindly *in verba magistri*.

Oligerus Jacobaens (1650 to 1701), a Danish physician and anatomist, who taught in the University of Copenhagen, declared that in scraping the decayed cavity of a tooth that was the cause of violent pain, he had seen a worm come forth, which, having been put into water, moved about in it for a long time.

Martin Six, having split some decayed teeth a short time after they had been extracted, asserts that he determined the existence of worms in

[1] Lazari Riverii, opera medica omnia, Genevæ, 1737; Praxeos medicæ liber sextus, cap. i; De dolore dentium, cap. ii; De dentium nigredine et erosione.

[2] Nicolai Tulpii, Amstelodamensis, Osservationes medicæ, Amstelodami, 1685, lib. i, cap. xxxvi, p. 68; cap. xlix, p. 90.

them. (It is probable that this observer, as well as others, mistook the dental pulp for a worm, an unpardonable error, in truth, at a time when the anatomical constitution of the teeth had already been very well studied by several scientists, and especially by the celebrated Bartolomeo Eustachius.)

Gabriel Clauder (1633 to 1691) not only believed in dental worms, but maintained besides that these were the most frequent among all the causes of toothache. In a certain way, to sustain this opinion of his, he relates a case in which a tooth of healthy appearance being the seat of great pain, a tooth-drawer had asserted that there must be a worm in its interior; and, in fact, on the tooth being extracted and afterward split, the little animal whose existence the tooth-drawer had divined, was found to be existing inside of it!

Philip Salmuth asserts that by using rancid oil he got a worm out of the decayed tooth of a person suffering from violent toothache, thus causing the cessation of the pain. The worm, he says, was an inch and a half in length (!) and similar in form to a cheese maggot.

Nicolaus Pechlin (1646 to 1706), professor of medicine at Kiel, testifies to having seen five such dental worms, like maggots, come out by the use of honey, though he does not say whether they issued from several cavities or from one only!

Gottfried Schulz. But all this is nothing compared to what Gottfried Schulz has dared to assert, viz., that by using the gastric juice of the pig, worms of great size can be enticed out of decayed teeth; some of these even reaching the dimension of an earth-worm!

It is not much to be wondered at that these things should have been blindly believed in, if we reflect that only a short time previous to this the story of the golden tooth had been taken seriously by men of great erudition, and that in the very epoch of which we are speaking the illustrious anatomist Thomas Bartholin (1616 to 1680), of Copenhagen, relates having seen a man, at Padua, who had an iron tooth! Besides, the possibility of such a phenomenon was explained in a most curious manner by Thomas Minadous, who explained that in the same way as iron is generated in the macrocosm, that is, in the world, so it is equally admissible that it may be generated in the microcosm, that is, in man![1]

Nathaniel Highmore. In the year 1651 the English physician and anatomist Nathaniel Highmore (1613 to 1684), of Hampton, published a treatise on anatomy (*Corporis humani disquisitio anatomica*, etc.), by which he acquired a celebrity superior, perhaps, to his merits. This work, however, served without doubt to diffuse the knowledge of an

[1] Sprengel, Geschichte der Chirurgie, vol. ii, pp. 294, 299.

anatomical fact of the highest importance, especially from the point of view of dentistry and surgery.

There is no doubt that the existence of the maxillary sinus was already known before Highmore, the celebrated anatomists Vesalius, Ingrassias, Eustachius, and Fallopius having spoken of it very clearly; only through ignorance of the history of anatomy has it been affirmed by many that this cavity was discovered by Highmore, to whom is only due the merit of having described the maxillary sinus, by him called *antrum*, most accurately, and of having made known the possibility of a communication between it and the mouth. Highmore calls attention to the fact that the inferior wall of the antrum often presents small projections, which correspond with the tops of the alveoli, and that the osseous lamina which interposes between these latter and the maxillary sinus is often extremely thin; for which reason, it may easily happen that, in extracting one of the teeth below the cavity, one may bring away together with the tooth the small osseous plate that forms the bottom of the alveolus, thus leaving the maxillary sinus open at its inferior part. With regard to this, he refers to a most interesting case which afterward acquired a high degree of notoriety. It relates to a lady who had suffered from toothache for some years, and who from time to time had had several decayed teeth extracted, without, however, finding relief. The pain only ceased after the patient had had the left upper canine removed. But after this operation an incessant flow of humors from the alveolus of the extracted tooth took place. The patient, in great anxiety at this circumstance and desirous of seeing clearly into the causes of it, herself explored the affected part with a silver probe, the entire length of which penetrated into the cavity, producing in the patient the effect of its having reached the eye. Still more amazed, and urged on by the desire of becoming still better acquainted with the extent of the evil, she now made use of a long feather, which she had previously stripped, and discovered to her painful surprise that this new instrument of exploration entered to so great a distance that it, according to her idea, penetrated into the skull. From this she derived argument for the belief that the morbid phenomenon had its origin in her brain. Believing herself affected with a serious malady, she consulted Highmore, who had the satisfaction of being able to tranquillize her completely by making her understand that the jaw bone is hollow in the inside, and that its cavity had remained open underneath in consequence of the extraction of the canine tooth; and also, that the feather had not penetrated to such a distance as she supposed, but had curved inside the bone. As to the discharge which had given so much trouble and alarm, Highmore considered it quite a natural circumstance, derived simply from the opening of the antrum, as he held that in many cases the maxillary sinus contains mucus, and that this condition was,

therefore, altogether normal. So he did not propose any treatment, and the lady thenceforth supported her infirmity with resignation.

This most interesting case soon became generally known, and contributed, without doubt, not a little to attract the attention of medical men to the anatomical peculiarities which Highmore had pointed out in the upper maxillary bone, thus causing his name to become inseparably associated with the maxillary sinus.

It is evident, however, that Highmore never even suspected to what very important practical applications his description would give rise. He knew nothing about the diseases of the antrum, and believed that, even in perfectly normal conditions, this cavity is often filled with liquid; the idea, therefore, of its being advisable, in certain cases, to extract a tooth and perforate the alveolus in order to give exit to the liquid contained in the maxillary sinus never occurred to him.

About fifty years went by before a rational treatment for affections of the antrum was initiated, the merit of which, as we shall see at its time and place, was due to William Cowper. During that half century maladies of the maxillary sinus continued to be badly diagnosticated and badly treated.

Bernardo Valentini. In the year 1686, that is, thirty-five years after the publication of Highmore's book, Bernardo Valentini, professor at the University of Giessen, described a case of tumefaction and abscess in the cheek, treated by him with emollient remedies, and in which, although according to him caries of the underlying bone did not exist, the separation of a sufficiently large osseous fragment took place. Without doubt the affection of the cheek was derived in this case from some disease of the antrum; however, it would appear that Valentini did not in the least perceive any such casual relation, as he makes no allusion whatever to it.[1]

Antonio Molinetti, professor at the University of Padua, had, however, ten years previously, diagnosticated and cured an affection of the antrum by means of an operation. In his book *Dissertationes anatomico-pathologicæ*, published at Venice in 1675, Molinetti relates that in a case of abscess of the maxillary sinus, which caused the patient great suffering, he performed the operation of trepanning the upper maxillary bone anteriorly, after incision of the soft parts overlying it. In a certain way we may, therefore, consider Molinetti as a precursor of William Cowper.

Having spoken of the very important anatomical fact illustrated by Highmore, we will now also speak briefly of those authors who, in the seventeenth century, occupied themselves with the anatomy of the teeth.

[1] Sprengel, op. cit., p. 297.

Their number is sufficiently large; we will, however, only make mention of such as contributed to the development of this branch of science, or who, at least, expressed some opinion worthy of note.

The celebrated anatomist ADRIAN SPIEGEL (1578 to 1625), better known by the Latinized name of *Spigelius*, wrote nothing noteworthy about the teeth, but he appears to have been the first to affirm that the teeth are more firmly fixed in the alveolus, when their roots are curved after the manner of hooks.[1]

DIEMERBROEK, a Dutchman, relates several cases of dental anomalies, as for example, of teeth being cut in the palate, and which injured the tongue. The author cites his own case, relating that having had a canine tooth extracted when well advanced in years, it was, nevertheless, succeeded by a new one. He relates, besides, that he had seen in Utrecht a woman, aged fifty-six years, who again cut two incisors after having lost the former ones two years previously. Apart from this, Diemerbroeck tells us nothing of interest or importance regarding the teeth, often repeating old ideas, the falseness of which had already been luminously demonstrated. For instance, he says that the permanent teeth are developed from the roots of the deciduous ones remaining in the alveoli; an unpardonable error for an anatomist of the seventeenth century, for which he was afterward taken to task by Duverney.[2]

THOMAS BARTHOLIN, whom we have already mentioned, speaks of a tooth which had made all the round of the alveolar border; that is to say, of a dental arch constituted by a single piece; and the Italian anatomist BERNARDO GENGA makes mention of an analogous case.[3] It is superfluous to add that these authors allowed themselves to be deceived by false appearances, owing especially to an abundant and uniform deposit of tartar on the surface of the teeth and in their interstices, which gave to the dental arch the appearance of one continuous piece.

RINALDUS FREDERICUS, in his erudite dissertation entitled *De dentium statu naturali et præternaturali*, spoke of the dental system with sufficient thoroughness, if we consider the epoch in which he wrote. He commences his work with a long chapter on the importance and dignity of the teeth (*dignitas dentium*). Among other things, he relates that formerly, in certain parts of India, the teeth were so highly valued as to be offered in sacrifice to the gods. He says, too, on the authority of certain authors, that the ancients were led to believe that the teeth served for the resurrection of the body, from the circumstance of their not showing signs of corruption when found in sarcophagi.

[1] Blandin, Anatomie du système dentaire, Paris, 1836, p. 26.

[2] Blandin, op. cit., p. 27; Portal, Histoire de l'anatomie et de la chirurgie, Paris, 1770, vol. iii, p. 495.

[3] Blandin, op. cit., p. 26; Portal, op. cit.

Discoursing of the genesis of the teeth, Fredericus says that "every tooth is at first enclosed within a follicle, that is, in a frail, skin-like membrane, in the same manner as the grain in the wheat-ear." Taking this comparison as his point of departure,[1] he gives to dentition the name *germination*.

This author says that the teeth of the Ethiopians and of the Indians are generally whiter than those of the northern peoples, but that those of the Indians soon lose their primitive whiteness by reason of the widely diffused habit of chewing betel-nuts.

Fredericus refers to an experiment which, according to him, demonstrates the "sympathetic relations" between the teeth and the ear (whilst in reality it only proves the facility with which sounds may be transmitted through solid bodies). "If, by night," says he, "one holds tightly between one's teeth the end of a stick, stuck upright in the ground, one hears the footsteps of a person approaching from afar much more easily."

Through the researches of three great men, Marcello Malpighi, Friedrich Ruysch, and Antoni van Leeuwenhoeck, an altogether new science arose in the seventeenth century, viz., histology, or the anatomy of the tissues, whose revelations contributed not a little to the development of modern odontology.

Marcello Malpighi (1628 to 1694), the celebrated Italian anatomist, was the initiator of microscopic observations on the tissues, and is, therefore, justly considered the founder of histology, within the range of which he made most important discoveries.[2]

Friederich Ruysch (1638 to 1731), professor at Amsterdam, rendered his name illustrious particularly by bringing to a high degree of perfection the processes of anatomical preparations and of embalming.[3]

His magnificent injections, carried out with a method of his own invention, enabled him to trace the most minute vascular ramifications and to demonstrate the existence of capillary vessels in parts where their presence had as yet never been suspected.

Ruysch studied accurately the anatomical constitution of the teeth, and especially their vessels. He called attention to the membrane which lines the maxillary sinus, and discovered in it a number of bloodvessels.

But in addition to his purely anatomical observations, this author also merits our consideration from the point of view of pathology. He confirmed a most important fact to which allusion had already been made by preceding authors, that is, the atrophy of the alveolar parietes as

[1] Totus dens primum inclusus est folliculo seu membrana tenui ac pellucida non secus ac granum in arista.

[2] Bouillet, Précis d'histoire de la médecine, p. 221.

[3] Bouillet, op. cit., p. 222.

following on the extraction or on the falling out of teeth. Ruysch, however, makes the observation that atrophy of the alveolar parietes may also precede the falling out of the teeth, and rather be the cause than an effect of it. In such cases the teeth, before falling out, always become more and more loosened, proportionately to the atrophic process. This pathological condition, against which none of the astringent remedies habitually used are of avail, is mostly considered, says Ruysch, to be owing to scurvy; but, he adds, the accumulation of tartar may also be the cause of it. Substantially, Ruysch affirms the relation existing between the accumulations of tartar and the production of that very frequent disease that was afterward named expulsive periodontitis or alveolar pyorrhea.

This author also relates two cases of polypous affection of the maxillary sinus. In one of these cases, the existence of a polypus in the maxillary sinus was determined by Ruysch while dissecting a corpse. The other case relates to a female patient upon whom two surgeons had performed the extraction of several molar teeth and the extirpation of an epulis believed by them to be of a malignant character. After the operation they cauterized the diseased part to a great depth with a red-hot iron, reaching as far as the maxillary sinus, which remained open, and from which Ruysch afterward extracted with his little finger several polypi.[1]

Antoni Van Leeuwenhoek (1632 to 1723), like the preceding author, a Dutchman, was the first maker of powerful microscopes, by means of which he made many important discoveries; among others, that of the tubular structure of the dentine or tooth bone. This discovery he made known and demonstrated in the year 1678, before the Royal Society in London. In his description of the structure of the teeth, Leeuwenhoek says that 600 to 700 of the dentinal tubuli have hardly the consistence of one hair of a beard.[2]

In the year 1683 he discovered in the tartar scraped from between the teeth a form of microörganism upon which he laid special stress. This observation he embodied in the form of a contribution which was presented to the Royal Society of London on September 14, 1683. This paper is of particular importance, not only because of the careful, objective nature of the description given of the bodies seen by him, but also for the illustrations which accompany it. From a perusal of the text and an inspection of the plates, there remains little room for doubt that the bodies described by Leeuwenhoek were not animalcules, as he believed, but bacteria.[3]

[1] Friderici Ruyschii observationum anatomico-chirurgicorum, centuria, Amstelodami, 1691; Portal, op. cit., vol. iii.

[2] Portal, op. cit., vol. iii.

[3] A. C. Abbott, The Principles of Bacteriology, Philadelphia, 1905, p. 19.

Domenico Gagliardi, professor of anatomy and of medicine at Rome, published an excellent work on the anatomy of the bones,[1] in which he occupies himself not only with the structure of bones, properly so called, but also with that of the teeth. He considers the enamel to be formed by parallel and contiguous fibers, coated, so to speak, by a concreted juice, *sui generis*, which acquires a much greater consistence than that of the bones. Gagliardi says that by rubbing teeth hard together, or striking them with a steel, he was able to extract sparks from them.[2]

Jean Duverney (1648 to 1730), a celebrated French anatomist, wrote a good monograph[3] about the teeth. As different anatomists of the sixteenth century had already done, he examined many fetal jaws in order to study in them the formation of the teeth. In relating his observations, he says that he found in every alveolus a mass of soft viscous matter, having the form of the tooth that is to derive from it, and which may be considered as its nucleus. This nucleus is entirely surrounded by a membrane, which the author likens to that which surrounds the fetus, and to which he gives the name of *choroid membrane*. From the surface of the nucleus a gelatinous juice transpires, which, thickening in layers, forms the enamel and the rest of the tooth. The choroid membrane is abundantly furnished with nerves, and with blood and lymph vessels. Into the interior of the teeth penetrate vascular and nervous branches which serve to maintain its vitality. In fetal jaws one finds, besides the germs of the deciduous teeth, also those of the permanent ones. The "choroid membrane" does not follow the tooth when it issues from the alveolus; it remains instead within the latter, forming the peridental membrane.

Duverney says that in old people the root cavity diminishes in so considerable a manner, and the vessels are so compressed that they almost entirely disappear. It is then that a period of decadence begins in the tooth, it is more feebly nourished, wears away more rapidly than hitherto, and becomes shorter.

The author also speaks of senile atrophy of the jaws, especially of the alveolar processes. With regard to this, he observes that if in old age the lower jaw advances beyond the upper, this depends wholly on the disappearance of the alveolar border, which projected more in the upper than in the lower one.

Duverney admits the existence of direct vascular relation between the gums and the teeth; because in the case of diseases of the gums it is rare not to find the teeth altered as well.

From the point of view of the development and nutrition of the teeth,

[1] Anatome ossium, Romæ, 1689.

[2] Portal, vol. iv, p. 111; Blandin, p. 28.

[3] Jean Guichard Duverney, Mémoire sur les dents, Paris, 1689.

Duverney finds much analogy between the tusks of the elephant, the teeth, properly so called, the feathers of birds, and the hair of mammifera.[1]

Gottfried Bidloo, a Dutch anatomist, expresses the idea that the air contributes, after the eruption of the teeth, to hardening them. He did not, however, give any proof of this opinion of his.[2]

Clopton Havers, an Englishman, wrote a book on osteology, by which he acquired great reputation,[3] and in which he treats as well of teeth and their structure. This author believes the enamel of the teeth to be of the nature of stone, and the ivory of the nature of bone. The dental roots, which, he says, are precisely of a bony nature, are covered over with a periosteum, which is in close relation with the gums and with the periosteum of the jaw bone. Clopton Havers held that the dental follicle no longer furnishes any nourishment to the enamel from the moment that this has reached its perfect formation. On the other hand, he assures his readers that he has observed, through the microscope, nervous threads which, departing from the bulb of the tooth, traverse the ivory through small canals, arriving thus at the periosteum. By this anatomical disposition the sensibility of the teeth may, according to him, be explained.[4]

Having made this passing allusion to the anatomy of the teeth in the seventeenth century, we will now resume the illustration of those facts relating to the pathological and curative part of the science.

Walter Harris, an Englishman, in a pamphlet on acute infantile maladies,[5] recommends again, in cases of difficult dentition, the incision of the gums, a curative practice which had already fallen into disuse.[6]

In the authors of that time we find registered a great number of cases of epulis. Hiob Van Meekren speaks of an enormous tumor of the gum that developed in consequence of a traumatic action which had occasioned the loss of a tooth. Before deciding on the extirpation of the tumor, the author thought well to pierce it with a bistoury, to be able to judge whether its ablation might not possibly give rise to a dangerous hemorrhage. The wound having bled but little, he proceeded to operate; but the tumor was so large that it was necessary to remove it in various portions.[7]

The same author refers to a case of a soft epulis, bleeding easily, that

[1] Blandin, op cit.; Portal, vol. iii, p. 495. [2] Blandin, p. 31.

[3] On Some New Observations of the Bones and the Parts Belonging to Them, London, 1691. The accurate description given by Havers of the canals containing the nourishing vessels of the bone has caused these canals to be known, even up to the present day, by the name of "Haversian canals."

[4] Portal, vol. iv, p. 134; Blandin, p. 31. [5] De morbis acutis infantum, London, 1689.

[6] Sprengel, Geschichte der Chirurgie, vol. ii, p. 298.

[7] Meekren, Observationes medico-chirurgicæ, cap. xv, p. 84.

developed after a badly performed dental extraction. It was to be foreseen that the ablation of such a tumor would give rise to an abundant hemorrhage. This was, however, staunched by simply using astringent powders, without having recourse to the actual cautery, which the operator had held in readiness.[1]

Daniel Major, wishing to remove a large epulis by tying it, was obliged, in order to keep the ligature in position, to pass the thread through a circular incision made at the base of the tumor. He first used a thread of silk, afterward a silver one, and tightened the ligature every day until the epulis fell off.[2]

Johann Acoluthus was obliged, in order to extirpate a large epulis, to previously split the labial commissure. After the ablation of the principal mass of the tumor, he destroyed the remaining part of it by application of the red-hot iron.[3]

One reads of other cases of epulis in Stalpaart van der Wyl, Mercklin, Preuss, Bern, Valentini, etc. This last author even speaks of an epidemic of epulis. However this may be, it is very probable that epulis was much more frequent in past times than it is now, and this probably depended partly on the incongruous modes of treating diseases of the mouth, and partly on the slight attention paid to cleanliness of the teeth.

Kornelis van Soolingen, a celebrated Dutch physician and surgeon, who flourished toward the end of the seventeenth century, speaks contemptuously of dental operations, and especially of extractions. He says that such operations ought to be left to charlatans, used to taking out teeth with the point of the sword, and to doing many other things of like nature! This unjust contempt was at that time widely diffused in the medical class, it resulted, however, substantially, from the great difficulties encountered by doctors and surgeons in general, in performing the operation of extraction, owing to want of practice, and also from the desire to avoid the responsibility of the accidents to which the extraction might give rise; so true is this, that an author of the preceding century, Theodor Zwinger (1538 to 1588), a celebrated Swiss doctor and professor at Basle, had declared with great frankness that the extracting of teeth ought to be left to barbers and charlatans, as it might easily occasion unpleasant accidents, such as fractures of the jaw, laceration of the gums, serious hemorrhage, and the like.

In spite of his contempt for practical dentistry, Kornelis van Soolingen takes the treatment of dental affections into attentive consideration. For the stopping of carious teeth, he recommends a mixture similar to that which Rhazes had recommended many centuries before, that is, a cement of mastic and turpentine; because, says he, when the stopping is made

[1] Op. cit., cap. xxviii, p. 120. [2] Sprengel, vol. ii, p. 298. [3] Sprengel, loc. cit.

with metallic substances, it is never so perfect as to entirely impede the penetration of moisture.

Great credit is due to Kornelis for having first brought into usage the instrument makers' emery wheels for grinding down sharp edges of teeth, thus initiating the practice of trepanning the teeth with sphere-shaped burs.[1]

Paul Wurfbein refers to a case of extensive necrosis of the lower jaw, in which a certain Dr. Bürlin having removed the necrotic portion, regeneration of the bone took place.

Friederich Dekkers (1648 to 1730) refers a similar case, in which, although quite one-half of the lower jaw had been removed, the bone formed again completely.[2]

Benjamin Martin, apothecary to the Prince de Condé, was the author of a pamphlet on the teeth,[3] in which he gave a succinct description of these organs and spoke briefly of their diseases. He shows himself decidedly opposed to the use of the file and to the application of false teeth, because, according to him, both of these things may be the cause of great harm. With regard to the file, he says that nothing so easily tends to loosen the teeth as the use of this instrument, not to speak of various other inconveniences, among which is the danger of opening the interior cavity of the tooth.[4]

Matthias Gottfried Purmann (1648 to 1721), a celebrated surgeon of Breslau, was the first to make mention of models in dental prosthesis. As to the mode in which these models were obtained, some admit as natural that he first took a cast, and formed the model on this; but as Purmann does not hint in the least at such a process, the supposition is altogether gratuitous. Indeed, his description rather excludes any probability that the model was taken from a cast. Here is the literal translation, as nearly as possible, of the passage in which Purmann speaks of artificial teeth and of the mode of applying them.

"The front teeth, or pronouncing teeth, ought, when they are wanting, to be substituted by artificial ones, in order to avoid defects of pronunciation, as well as to obviate deformity of the mouth, and this is carried out in the following manner: One has other teeth made of bone, or of ivory, according to the number, the size, and the proportions of those wanting; for which purpose one may previously have a model executed in wax, reproducing the particular conditions of the teeth and jaws, in order afterward to make and exactly adjust the whole on the pattern of it; then, when the base of these teeth is well fitted on the jaw and small

[1] Soolingen's Manuale operatien der chirurgie, Amsterdam, 1684.

[2] Sprengel, op. cit., p. 300.

[3] Dissertation sur les dents, à Paris Chez Denys Thierry, MDCLXXIX.

[4] Portal, op. cit., vol. iii, p. 361.

holes have been made in the artificial teeth and also in the natural ones next to them, one applies the artificial teeth in the existing void and fixes them as neatly as possible with a silver wire by the help of pincers."[1]

It would appear that the author is here describing a prosthetic method, which he had never practised himself; and this results from the fact of his advising the perforation of the natural teeth for the passage of the silver wire destined to keep the prosthetic piece in its place. Evidently desiring to describe the mode practised by the specialists of those days for fixing artificial teeth, he erroneously imagines that the metal thread was passed through the holes drilled in the natural teeth; this would have been impossible, first, because of the atrocious pain due to the sensibility of the dentine and of the dental pulp, and then because of the pathological consequences to which the perforation of the teeth would have given rise. We may, therefore, surely hold that Purmann is simply describing, and not even accurately, a prosthetic method already in use among the specialists of that period.

On examination of the passage cited above—which, however, is not so clear as might be desired—it would appear that the models of which the author speaks were most probably quite different from those in use now. It is almost certain that the specialists of those days first made a sketch of the prosthetic part to be constructed, using for the purpose a piece of wax which they partly modelled with the hand and partly carved; and after having tried on this model until it fitted perfectly in the mouth, and was in every way satisfactory, they probably passed it on to a craftsman to make an exact reproduction of it in bone or ivory.

In the year 1632 a little book was published in Naples, having for its title, *Nuova et utilissima prattica di tutto quello ch'al diligente Barbiero s'appartiene; composta per Cintio d'Amato.*[2] This pamphlet was reprinted in Venice in 1669, and again in Naples in 1671. We here make mention of it, not for any special importance which it really has as regards the development of the dental art, but because of its being most probably *the first book in the Italian language in which dental matters are spoken of independently of general medicine and surgery.*

Tommaso Antonio Riccio. The edition of 1671 was published under the supervision of Tommaso Antonio Riccio, who was for many years a disciple of Cintio d'Amato, and who greatly eulogizes his master and praises his work. He expresses himself in the following bombastic

[1] Purmann's Wundarzenei, Halberstadt, 1684, Part I, chap. xxxii.

[2] New and very useful practice of all that which belongs to the diligent barber; composed by Cintio d'Amato.

manner: "This book, the offspring of Master Cintio d'Amato, excellent in the Barber's Art, ought to find a place in the bosom of Eternity; because by reason of its having been twice given to the light, it has proved its worthiness to live forever in the memory of men, gaining for itself, by its excellence, immortal glory before all such as are practised in the Art."

The book—which consists of about one hundred and eighty pages, and is illustrated by several admirable engravings—contains, among other things, two pages of verses, written by various authors, viz., by Cintio d'Amato himself, by Giovan Battista Bergazzano, also a barber, and by others. The greater part of these verses are in praise of the two doctors and *Martyrs in Christ, Cosmos and Damianus, special protectors of the Art and of the author.*

The verses of Cintio d'Amato reveal the possession of a literary and poetic culture above the ordinary, in spite of his being only a master barber. As to his book, it may be considered, for the time in which it was written, as an excellent treatise on so-called minor surgery. The author expounds, in a few chapters, the anatomical notions relating to bleeding; speaks at great length of this operation and of everything concerning it; refers with much detail to all pertaining to the use of leeches, cupping, scarification, cauteries, issues, blistering, primary treatment of the wounded, nursing of the sick, etc.; at the end of the book there is also a long chapter on the embalming of corpses.

As regards the treatment of the teeth and gums the author dedicates six chapters thereto, entitled, respectively: "On the relaxation of the gums" (Chapter XXXVII); "Preparation for strengthening the gums and making the teeth firm" (Chapter XXXVIII); "On tartar and spots on the teeth" (Chapter XXXIX); "Another preparation for whitening and preserving the teeth" (Chapter XL); "Mode of burning hart's horn, very necessary in preparations for the teeth" (Chapter XLVII). " 'Water of salt,' which makes the teeth white and is also good for ulcers of the gums" (Chapter XLIX).

Evidently Cintio d'Amato treats of dental matters only within extremely restricted limits. He tells us nothing with regard to the treatment of toothache, nothing about caries, about prosthesis, and, what is still more remarkable, he does not allude even in passing to the extraction of teeth. Now, if in a book treating *of all that which appertains to the diligent barber*, the most important dental subjects are passed over in silence, this shows that, contrary to the generally diffused opinion of today, the dental art was not at that time (at least not in Italy) exclusively, or even in great part, in the hands of the barber. Even at that time there must have been dental specialists, and the proof of this may be found in d'Amato's book itself, in the chapter entitled "Necessity and Origin of the Barber's

Art."[1] The author, after having spoken of the divisions which the practice of the medical art had undergone from the most remote times, and after having alluded to the great number of parts into which Medicine was divided in the time of Galen, adds: "Which may also be seen in our own times, for as many as are the members of the human body, so many are nowadays the various kinds of doctors and of medicines. Some are for the teeth, some are for the ears, some for sexual maladies, others are ordinary doctors, others cure cataracts, others ruptures and stone, some make new ears, lips, noses, and others remedy harelips."

As, under the generic name of doctors, Cintio d'Amato also comprises surgeons, it results from the above passage that in his time, that is, in the seventeenth century, there were surgeons who dedicated themselves specially to the treatment of the teeth; there were, in fact, dentists; and even admitting that the greater number of these were no better than simple tooth-pullers, this cannot be true of them all indiscriminately. Cintio d'Amato's book demonstrates in the most vivid manner that even among the barber and phlebotomist class, that is, among the practitioners of minor surgery, there were, at that time, men of considerable culture. This ought to hold good with still greater reason concerning surgeons, whose professional level was certainly superior to that of barbers;[2] and as dentists belonged to the class of surgeons (whence the denomination still in use of "surgeon-dentist"), it is but natural to admit that besides the ignorant tooth-puller there were even then more or less cultured dentists well capable of treating dental diseases and performing dental operations within the limits permitted by the knowledge of the times.

The six chapters in which Cintio d'Amato speaks of matters referring to the teeth do not contain anything whatever of real importance; notwithstanding this, we will here refer to the beginning of Chapter XXXIX, treating "Of tartar and spots on the teeth," because it is of some historical interest:

[1] The art of beautifying the human body was comprised by the ancients among the many and various parts of the medical art, under the name of *decorative medicine*. The barbers considered themselves members of the medical class, as practitioners of decorative medicine and in a certain degree also of surgery.

[2] In a chapter entitled "Of the Excellence and Nobility of the Barber's Office," Cintio d'Amato speaks of several barbers of that period, who were in great repute by their writings, or by the high offices with which they were invested, or by honors received from princes and sovereigns. Among the writers, Tiberio Malfi, barber of Montesarchio, deserves mention; he published, in 1626, a book entitled The Barber, written in excellent style, and giving proof of solid literary culture, and of much erudition. This work treats of all that concerns the barber's art (decorative medicine, bleeding, etc.). In it, however, there is absolutely nothing about the treatment of the teeth or their extraction; and this constitutes a valid confirmation of our own opinion, that is, that the dental art was not at that time in any way in the hands of the barbers.



A TOOTH-PULLER AT A PUBLIC PLACE IN HOLLAND

From an engraving of the Seventeenth Century.

"It happens in general that owing to vapors that rise from the stomach, a certain deposit is formed on the teeth, which may be perceived by rubbing them with a rough cloth on waking. One ought, therefore, to rub and clean them every morning, for, if one is not aware of this, or considers it of little account, the teeth become discolored and covered with a thick tartar, which often causes them to decay and to fall out. It is then necessary that the diligent barber should remove the said tartar with the instruments destined for this purpose."

We have seen that the practice of the dental art was for the most part in other hands than in the barber's. Nevertheless, the important operation of the removal of tartar was also carried out by him. If, therefore, even the barbers, who were not in the least the true representatives of the dental art of that period, carried out such an important operation, it may logically be argued from this, in support of what we have said before, that the sphere of action of the true dental specialists of those times (especially of the best among them) was not at all so limited as imagined by those who affirm that in past times dentists properly so called did not exist, but only tooth-pullers.

The barbers, however, having become, in a certain manner, members of the medical class, sought to extend their sphere of action, and it is probable that in a later period than that of Tiberio Malfi and Cintio d'Amato they invaded the whole field of dental activity; for which reason, when the barber's art came down to a very low level, the dental art must have degenerated, too, and have been represented for a certain time only by ignorant barbers and tooth-pullers. Vicissitudes similar to these have occurred in different epochs, not only in various parts of Italy, but also in other countries of Europe.

Fleurimond. In 1682 a little book on dental hygiene was published in Paris by a certain Fleurimond, the title of which was: *Moyens de conserver les dents belles et bonnes*. Portal, in his history of anatomy and surgery, makes mention of this pamphlet, and, briefly alluding to certain parts of it, he says: "The author proves by observation that acids act upon the enamel of the teeth. He makes some very just reflections upon dentition. Fleurimond speaks of a tooth powder invented by him, but does not say how compounded."[1]

In fact, it seems that this pamphlet was compiled from a commercial point of view, viz., that of making known the special tooth powder invented by the author. The era of advertisement had already begun!

Anton Nuck (1650 to 1692), a Dutch surgeon and anatomist, who taught most ably in the University of Leyden, devoted great attention to dental surgery and prosthesis. Relative to the extraction of teeth, he

[1] Portal, vol. iii, p. 618.

says that, in order to be able to carry out this most important operation, an exact anatomical knowledge of the alveoli and of the teeth themselves is required. He insists on a principle of capital importance that has only had its full application in the nineteenth century, viz., that the instruments to be used for the extraction of teeth ought to vary according to the tooth to be extracted. For the removal of the incisors, he says, the "goat's foot" should have the preference; the canines ought to be extracted with the common dental forceps, but sometimes, when they are decayed, they may be extracted with greater security with the pelican; for the small molars the straight-branched pelican is to be preferred, for the large molars the curved pelican; as to the extraction of roots or of splinters of bone, this ought to be carried out with the *rostrum corvinum*.

The author counsels never to extract teeth during pregnancy, except under circumstances of the greatest urgency, and especially to avoid the extracting of the upper canines (or eye teeth), this being capable of producing pernicious effect on the visual organs of the fetus!

The best way of obtaining the cessation of a violent toothache without having recourse to extraction is, according to the author, cauterization of the antitragus, an operation which he carried out with a special cauterizing instrument, made to pass through a small tube, the better to localize and to limit the action of the red-hot iron. With regard to this means of cure already recommended by other authors, we may remark that, although it seems ridiculous at first sight, and although no one could be so senseless as to make use of it in our days, nevertheless, for the times of which we are writing, when the curing of toothache was in a great measure effected by indirect means, this remedy might well stand on a level with many others, and was not perhaps altogether inefficacious. It is a sufficiently well-known physiological fact that the application of a strong stimulus in one part of the body may diminish or suppress a painful sensation in another part of the organism. It is an equally well-known fact that it is in no way a matter of indifference, in producing this phenomenon, to what part the stimulus be applied, especially because of the great difference existing in the relations of the several parts of the body with the brain—the centre of sensation. It is, therefore, very possible that the cauterization of the antitragus may really have the effect of causing strong toothache to cease, at least temporarily.

Nuck used a variety of remedies to arrest dental hemorrhage, such as tinder, burnt linen, vitriol, sulphuric acid and the cauterizing iron.

As to the use of the file, far from rejecting it entirely, as does Martin, he holds it necessary in many cases for planing down points and sharp edges of broken teeth, as well as for removing, at least in a measure, the inconvenience and deformed appearance caused by irregular teeth.

He says the file may be used without causing the slightest harm, if one takes care not to approach the inner cavity of the tooth too nearly, and above all not to penetrate right to it, which would give rise to intolerable pain. Such an accident, he adds, may happen much more easily when, instead of using the file, whole pieces of teeth are removed with the excising forceps.

This author acquaints us with a tooth powder, much used in his time, especially by Parisian ladies. The ingredients were powdered cuttle fish, coral powder, cream of tartar, Armenian bole, and powder of red roses.

At that time artificial teeth were generally made of ivory; Nuck, however, observes that it soon becomes yellow by the action of food and drink, and of the saliva itself. He therefore recommends, instead, the use of hippopotamus' tusks, giving the preference to the whitest. According to Nuck, artificial teeth made of hippopotamus' tusks would be capable of preserving their color even for seventy years. In the case of all the teeth of the lower jaw being wanting, the entire dental arch ought to be framed in with a single piece of ivory or tusk of hippopotamus.[1]

Carlo Musitano, a celebrated Neapolitan doctor (1635 to 1714). According to Carlo Musitano, the real cause of toothache consists in the irritant action of saline or acid particles on the extremely thin membrane that lines the alveoli or on the exquisitely sensitive nerves of the teeth. As he believes, these particles have an angular form, sometimes pointed or even hooked, and they reach the sensitive parts either directly from the outside, through the air, the food or drink (especially when the teeth are already decayed), or else through the blood and other humors, which often, by reason of their deteriorated quality, contain great quantities of such irritant particles.

Among the various influences which may be conducive to toothache, atmospheric conditions ought also to be included; thus, says the author, the inhabitants of the Baltic littorals, and other northern peoples, are very subject to toothache, for the reason that in those regions the air contains, in abundance, saline particles of various kinds which penetrate into the organism by the act of respiration. It is said, on the contrary, that in Egypt, where the air is remarkably mild, the teeth are not subject either to pain or to decay.

Musitano, too, believes in worms in the teeth, but does not admit, as preceding authors had done, that they generate spontaneously. He holds instead that they result from the eggs of flies and other insects, which, together with food, are introduced into the carious cavities and there develop by the heat of the mouth.

[1] Antonii Nuck operationes et experimenta chirurgica, Lugduni Batavorum, 1692.

The treatment of toothache ought to differ according to its causes. If the pain be owing to acidity, one uses medicines adapted for tempering the acids; if it be owing to the action of saline substances, one has recourse to remedies which dissolve them; if to worms, to such remedies as destroy them, and so on. Purgatives and bleeding ought, however, never to be used as remedies against toothache; for, far from doing good, they often do harm. As to the other torments usually inflicted on poor sufferers, they are the punishment of their sins, for God often gives the unrighteous into the hands of doctors! (This language will perhaps appear less strange when the reader comes to know that Carlo Musitano was at one and the same time priest and physician!)

After a lengthy enumeration of medicaments to be used against toothache, which we pass over in silence because already known, the author speaks of two remedies which carry us back absolutely to the days of Pliny! He relates us a fact experienced by himself, that, by touching an aching tooth with the leg of a frog completely cleaned of the flesh, the pain ceases altogether. Also, if the aching tooth be touched with the root of a tooth extracted from the jaw of a corpse, the pain ceases, the tooth becomes as cold as ice, and often, after a certain time, it falls to pieces.

As to worms, the best mode of destroying them is by using bitter substances, such as myrrh, aloes, colocynth, *centaurea minor*, etc., but sometimes the use of sweet substances, such as honey, is a good means of drawing them out of the carious cavities!

Musitano also cites a great number of remedies against the setting on edge of the teeth. Among the best of these he mentions urine applied to the teeth whilst still warm! Alkali in general, and particularly lye, such as is used for washing purposes, are good remedies against the setting on edge of the teeth.

The treatment of loose teeth ought to vary according to whether this pathological condition depends on old age, or on scurvy, on syphilis, on superabundance of humors, etc. Sometimes, especially in old persons, it may be useful to bind the teeth with gold wire, in order to prevent their falling out, but this operation must be very ably performed, otherwise it may give rise to inflammation.

Relative to artificial teeth, Musitano says that they are made of ivory or hippopotamus tusks; of these last he does not speak as of a novelty; we may, therefore, deem it probable that hippopotamus tusks were used in Naples for making artificial teeth even before the Dutchman Anton Nuck (contemporary of Musitano) made mention of them in his writings.

In cases of difficult dentition, the best remedy, according to Musitano, for facilitating the eruption of the teeth consists in friction of the gums, once, or at most twice, with blood drawn fresh from the comb of a cock!

If, however, even this remedy fails to produce the desired effect, it will then be necessary to lance the gum at the point where the tooth is to erupt, or to press it hard with the thumb, that the tooth may the easier come through.

The sole merit of this author (as to what concerns our specialty) consists in his having declared bleeding useless, or even harmful in the treatment of toothache, and, besides, in his having recommended, with great warmth and in most impressive terms, cleanliness of the teeth. What is more beautiful, says he, than a mouth furnished with white teeth, similar to so many pearls? And what is more abominable than black or livid teeth, covered with a fetid deposit or with tartar? Unclean teeth spoil the appearance of the person, and nauseate those who behold them.[1]

William Cowper (1666 to 1709). Toward the end of the seventeenth century the celebrated English doctor and anatomist, William Cowper, opened up a new field of action to oral surgery by inaugurating the rational treatment of the diseases of the maxillary sinus. In order to empty Highmore's antrum of deposits and to be able to carry out the necessary irrigations, he extracted in most cases the first permanent molar, and then penetrated through its alveolus into the sinus with a pointed instrument.

James Drake, also an Englishman and a contemporary of Cowper, operated in the same manner; and it was this author who made known in a book of his[2] the operative method of Cowper; for which reason the above-mentioned proceeding is sometimes called "the Cowper-Drake operation." A certain time elapsed, however, before it became generally known. Thus, in a book published by Johann Hoffmann in 1713 there is no mention made of this operation, albeit the author refers therein[3] to the case of a young girl, one of whose canine teeth having been extracted by him, there ensued a considerable flow of whitish pus from the maxillary sinus. In speaking of this case, Hoffmann stigmatizes many of the surgeons of his time who were not acquainted with the existence of Highmore's antrum, and therefore, in cases of patients whose teeth had fallen out as an effect of syphilis, if they happened to penetrate with the sound into the maxillary sinus, believed this to be an accidental excavation of the bone, produced by caries.

However, the honor of having initiated the rational treatment of diseases of the maxillary sinus is not exclusively due to William Cowper and to James Drake; a large share is also due to the celebrated German

[1] Caroli Musitani opera omnia, pp. 121 to 128, Venetiis, 1738.

[2] J. Drake, Anthropologia nova, London, 1707.

[3] J. M. Hoffmann, Disquisitiones anatomico-pathologicæ, Altorf, 1713, p. 321.

physician and anatomist, Heinrich Meibom. The mucous membrane of the maxillary sinus was considered by him as the real point of departure of the diseases which occur in this cavity, it being liable to become inflamed and to suppurate, thus giving rise to much pain and to various accidents. Meibom rejects the operation of Molinetti, that is, the trepanning of the cavity from the front, the lesion produced in the soft parts of the face being likely to give rise to unpleasant consequences. "Some, he adds, try the introduction of medicated vapors into the antrum,[1] but the best way is to *open the maxillary sinus by extracting a tooth, as the pus generally makes its way as far as the roots of the teeth.*"[2] The author says that his father, who was also a physician, had already used the above method with success. He does not speak at all of the artificial opening of the antrum by perforation; but, as is well known, this is not necessary in many cases, so that, even now, the operation is sometimes reduced to procuring the opening of the sinus by the simple extraction of a tooth, as was, in fact, practised by Heinrich Meibom and his father.

Seeing that Heinrich Meibom was born twenty-eight years before William Cowper, and was already known to the scientific world when Cowper was still a child, it is very probable that his operative method, having come to the knowledge of the latter, was only followed up and perfected by him.

Charles St. Yves (1667 to 1733), oculist in Paris, records an interesting case of a secondary affection of the maxillary sinus. The point of departure of the evil was an abscess in the orbit. The suppurative process, after having produced an erosion and the perforation of the orbital plane, had reached by propagation the antrum of Highmore, whence the pus took its way, issuing through the nose. St. Yves had a molar tooth extracted on the affected side (we do not know which side it was), after which, day by day, he made injections of detersive liquids through the orbital fistula, which returned constantly through the alveolus of the extracted tooth. By this means the cure of the patient was obtained.[3]

Christopher Schelhammer (1649 to 1716), who was professor in various German universities, and distinguished himself specially as an anatomist and as an ear doctor, strongly recommends stopping decayed teeth as the best means of causing pain to cease. If, however, the stopping does not hold, by reason of the cavity being too extended, it is then necessary, says Schelhammer, to extract the tooth; this, however, may

[1] Probably through the nose.

[2] H. Meibomii de abscessum internorma natura et constitutione discursus. Dresdæ et Lipsiæ, 1718, p. 114. (This edition was published after the author's death, which took place in 1700.)

[3] St. Yves, Nouveau traité des maladies des yeux, 1722, p. 80.

very well be stopped after extraction, and then replanted, for it will take root again, but no longer be the cause of any pain.[1]

Pierre Dionis, a celebrated surgeon and anatomist of Paris (died 1718), in his *Anatomie de l'homme*,[2] admits the possibility of a double dental series, holding the case, however, to be of very rare occurrence.

Another work of his, entitled *Cours d'operations de Chirurgie*, wherein he treats very extensively of diseases of the teeth and mouth, and their surgical cure, is of much more importance in relation to dentistry. He recognizes the high importance of this part of surgery, but expresses the opinion that one of the dental operations, that is the extraction of teeth, ought to be left entirely to the tooth-pullers, not only because they are, by reason of great practice, better qualified to perform it than general surgeons, but also because the output of force required for this tooth-pulling operation renders the hand heavy and tremulous, and, lastly, because, according to him, it always has something of charlatanism about it. (This is a luminous example of how preconceived ideas can influence the minds even of men of the greatest talent.)

Pierre Dionis, like many of the preceding authors, had frequently occasion to observe cases of epulis. He speaks at great length of the treatment of this affection, as well as of parulis, but says nothing on the subject of sufficient importance to be worth recording.

Dental operations, according to Dionis, are of seven kinds:

1. *The opening of the dental arches in the case of spasmodic constriction of the jaws.* This operation, of the greatest importance for nourishing and keeping patients alive, is carried out by means of a lever and of a screw dilator.

2. *The cleaning of the teeth.* For this, as for the other operations, says Dionis, a certain amount of skill is required. The author advises the use of gold instruments if one be called upon to clean the teeth of persons of rank. This appears rather strange in the present levelling times, but Pierre Dionis lived in the days of Louis XIV, whose doctor he was, that is, in a period of unbridled luxury, when the nobles and those in power would have nothing in common with the lower classes.

3. *Operations for the preservation of the teeth.* These, says Dionis, are of the greatest importance, it being necessary to oppose a barrier to the destructive processes of the teeth. Caries, when so situated as to permit of it, ought to be scraped away; for approximal caries one ought to have recourse to the file; in the case of caries of the triturating surfaces, cauterization should be used, by applying a drop of oil of vitriol with a miniature paint brush. Should the caries, however, be in a very advanced

[1] Sprengel, Geschichte der Chirurgie, vol. ii, p. 301. Carabelli, Systematisches, Handbuch der Zahnheilkunde, vol. i, p. 60.

[2] This work was published in 1690.

stage, it is better to make use of the cauterizing iron. But in cases of intense and persistent pain there is no other remedy than extraction.

4. *Stopping of the carious cavity.* Dionis does not enumerate this operation among those intended for the preservation of the teeth. At that period, this operation was performed solely with a view to preventing the penetration into and the retention within the carious cavity of alimentary substances, and the disadvantages caused thereby. The carious process, says the author, often ceases altogether, and the pain then generally ceases also. However, as the residual cavity often becomes troublesome in various ways, among others by making the breath offensive, it is better to stop it. For this purpose, gold or silver leaf is generally made use of; but this mode of stopping is not durable, because gold or silver in leaf is apt to become loosened and fall out. It is therefore preferable, says Dionis, to make a stopping with a piece of gold or silver corresponding in size and shape to the cavity.[1] Many, he adds, prefer lead as a stopping, on account of its softness, whilst others simply use wax.

5. *The use of the file.* The indications given by Pierre Dionis for using the file do not differ from those we find in other authors. Dionis warns, however, against using the file to level down a tooth which has become lengthened through the loss of its antagonist, for after a certain time it would again project above the level of the others.

6. *Extraction.* This operation, says Dionis, ought not to be performed too lightly, but only in those cases in which it is really necessary; that is, when a tooth is the cause of insupportable pain and its crown is almost entirely worn away; when nothing remains of a tooth but its root; when a tooth is so loosened in its socket as to leave no hope of its again becoming firm; when supernumerary teeth or irregularly planted teeth give rise to inconvenience or deformity; and lastly, to remove deciduous teeth that have become loosened. The opinion that if the loosened milk teeth be not promptly extracted they cause the permanent teeth to grow irregularly, is, however, considered by Dionis to be a prejudice.

Dionis strongly doubts whether a tooth that has been extracted and replanted can really take root again, as had been affirmed by Dupont, Pomaret, and other authors. This shows that Dionis had had no experience on this point.

7. *The application of artificial teeth.* These teeth, says Dionis, are generally made of ivory, but may also be made of ox bone, which is less liable to turn yellow than ivory. He does not mention the use of hippopotamus tusks, but we learn from him that one Guillemeau made arti-

[1] Here one also verifies the absurdities pronounced by those who, not being dentists, but merely general practitioners or surgeons, still risk speaking on dental subjects.

ficial teeth with a composition of his own invention, which was obtained by fusing together white wax and a small quantity of gum elemi, and then adding ground mastic, powder of white coral and of pearls. This fact is, as everyone can see, most important, for it constitutes the first step toward the manufacture and use of mineral teeth. Dionis tells us that the teeth made of Guillemeau's composition never became yellow, and that it was also very good for stopping decayed teeth.[1] It would seem, therefore, that it could be used as cement is now used.

The Guillemeau of whom Dionis speaks is probably Jacques Guillemeau, the author of a book now no longer to be found, which was translated from the French, first into Dutch, and afterward into German. Crowley, in his *Dental Bibliography*, only quotes the German edition, published at Dresden in 1710, the title of which runs thus: *Der aufrichtige Augen und Zahnarzt.*[2]

Jean Verduc, also a Frenchman, relates a case of the surgeon Carmeline,[3] analogous to that of Denis Pomaret, in which a sound tooth which had been extracted by mistake was immediately replanted and took root again, becoming quite firm. However, Verduc does not speak of replantation as a special method of cure, but merely refers to the above case incidentally in speaking of the extraction of teeth. He considers this operation a most dangerous one, and advises not having recourse to it except in cases of utmost necessity. Notwithstanding this, Verduc gives us to understand that teeth were drawn with sufficient ability by most of the operators of the time, and precisely because of this he omits describing the manner of performing the operation. According to Verduc, the drawing of teeth is often of little or no advantage against toothache.[4] In proof of this assertion he relates the case of a hypochondriac, who little by little had as many as eighteen teeth extracted, without, however, getting the better or the wiser; but as this case does not prove anything at all, one is disposed to think that Verduc, in relating it, had the intention of being humorous.

Monsieur de Lavauguyon. To another French surgeon, Monsieur de Lavauguyon, also a contemporary of Dionis, belongs the merit of having declared useless, in the greater number of cases, the practice, at that time general, of separating the gums from the tooth before proceeding

[1] Dionis, Cours d'opérations de chirurgie, Paris, 1716, p. 507 and following.

[2] [The Dresden edition of 1710 of Guillemeau's work contains no reference to the artificial tooth composition as mentioned by Dionis.—E. C. K.]

[3] Carmeline was a most able surgeon-dentist. We learn this from a passage in Pierre Fauchard's book (Le Chirurgien Dentiste, Préf., p. 13). As we shall see, the author praises him very highly and laments his not having written any book making known the results of his long experience.

[4] Sprengel, Geschichte der Chirurgie, vol. ii, p. 305.

to the extraction of the latter. He says that this is only necessary when a tooth, either because broken or because its crown emerges too little above the gum, offers an insufficient hold for the pelican.[1]

Our historical survey has now reached the end of the seventeenth century. Embracing at a glance the whole of this last period of time, we remark, among many facts of minor importance, some events which, in the history of the development of dental art, stand out in strong relief. Such are the replantation of teeth used as a special curative method by Dupont and others; the method of plugging in cases of alveolar hemorrhage, the credit of which is due to Rivière and to Tulpius; the description of the maxillary sinus given by Highmore; the rational treatment of affections of the antrum, inaugurated by Meibom, Cowper, and Drake; the researches into the microscopic structure of the teeth, brilliantly initiated by Leeuwenhoek, who discovered the dentinal tubuli; the use of models introduced by Purmann into the workmanship of prosthetic pieces; the employment of hippopotamus' tusks in making artificial teeth, first recommended by Nuck; and the invention of Guillemeau, which was the first step toward the use of mineral teeth.

[1] Traité complet de opérations de chirurgie, par Mons. de Lavauguyon, Paris, 1696, p. 644.


LAVRENTIVS
D. MEDICIN. ac CHIRVRG.
Natus Francof.
HEISTERVS
PROF. PVBL. HELMSTAD.
ad Moen. An. 1683.

CHAPTER XII.

THE EIGHTEENTH CENTURY.

ALTHOUGH there have been, even from the most remote times, individuals who have dedicated themselves exclusively to the cure of dental maladies, or to repairing the losses of the dental system by artificial means, and notwithstanding the progress gradually accomplished in this branch of the medical art, which progress was especially remarkable during the sixteenth and seventeenth centuries, it is not to be denied that, up to the beginning of the eighteenth century, dentistry was, in great part, considered one with medicine and surgery in general. It is but natural that dental art (and the same may be said of every special branch of medicine) could not assume a real individuality until it had attained to the higher grades of its development. As a matter of fact, dentistry, toward the end of the seventeenth century, was already a true specialty, although it counted but few worthy representatives at that time. The definite separation between the science and art of dentistry and general medicine and surgery, although it may have been retarded, could not fail to take place; and this, as we shall presently see, was effected by the celebrated French dentist Pierre Fauchard.

But, to remain faithful to chronological order, we will first speak briefly of some other writers.

LUDWIG CRON, a barber of Leipsic, in a pamphlet published in 1717, with the title *The barber's apprentice versed in bleeding and tooth pulling*,[1] declares, in a still more emphatic and general way than De Lavauguyon, that it is useless to detach the gum before proceeding to extract a tooth. This barber, strong in his own experience, dares to assert absolutely useless this ancient practice, advised first by Cornelius Celsus, and recommended after him, and in homage to his authority, by many other writers. It is, therefore, possible that even previous to Cron and De Lavauguyon many operators had dispensed with the practice recommended by Celsus, although this had become an accepted canon of the high medical profession.

LORENZ HEISTER (1683 to 1758), of Frankfort-am-Main, one of the most celebrated surgeons of the eighteenth century, wrote a dissertation on toothache,[2] treating besides very extensively of dental affections and

[1] Der beym aderlassen und Zahn-ausziehen Geschickten Barbiergesell, Leipsic, 1717.

[2] De dentium dolore, Altdorf, 1711.

their cure in a masterly work on surgery, published for the first time in 1718, and which went through numerous editions in various languages.

When the caries of a tooth is superficial, Heister advises the removal of the decayed part with the file; or, when the caries is deep down, the cavity ought first to be well cleaned with a toothpick or other like instrument, then filled with heated white wax, or mastic, the stopping being renewed as often as may be necessary. When a molar tooth is decayed, especially in the centre, the best way, says Heister, is to fill it with gold or lead leaf, or with a piece of the latter fitting into the cavity. If the carious cavity of a painful molar cannot be cleaned as it ought to be, the dropping of a little oil of cloves or of cinnamon or of guaiacum into it will be found useful, or even a few drops of spirit of vitriol; for in this manner one obtains at the same time the double advantage of destroying the impurities contained in the carious cavity and of soothing the pain. But if by chance the pain should persist, recourse must be had to the cauterizing iron, or to extraction. Sometimes, however, even the most violent toothache can be made to cease, either by scarifying the gums (a method already recommended by Pliny), by cauterizing the antitragus, or by pressing the aching tooth hard between the fingers, as Schelhammer[1] and some other writers had advised.

Heister writes at length on the extraction of teeth, on the indications and counterindications appertaining thereto, on the instruments with which the operation should be carried out, and so on. Regarding the position of the patients, he thinks it best to place them on a low seat or on the ground, if the tooth to be extracted is situated in the lower jaw, but if an upper tooth is to be extracted, patients should be placed on a chair or on a bed.

Movable prosthetic pieces are mentioned for the first time by this author. Although he is very concise in his manner of speaking of artificial teeth (this indicating that dental prosthesis was considered outside the sphere of action of the general surgeon), we nevertheless learn from him that partial sets of teeth made of ivory or hippopotamus tusks, and without special appliances for fixing them, were then in use, which, when applied in the void between the neighboring teeth, were maintained in position simply by their form. The author advises keeping prosthetic pieces very clean, removing them every evening before going to bed, and not putting them back in the mouth until they have been well cleaned.

Heister also speaks of nasal prosthesis; this was then carried out by applying noses made of wood or of silver, properly painted. In cases of

[1] Schelhammer wrote a dissertation "on the cure of toothache by touch," *De odontalgia tactu sananda*, Kiel, 1701. In the same year and in the same city, another pamphlet, by B. Krysingius, was written on the same subject. (See Crowley, Dental Bibliography, p. 13.)

trismus, this author altogether rejects the forcible opening of the jaws by means of screw dilators and such like instruments, as they act too violently, and, according to him, only aggravate the morbid condition. Even the extraction of a tooth is useless in such cases, as the patient can always absorb a certain quantity of liquid food through the closed teeth. On the other hand, the author expresses himself in favor of the incision of the gums in cases of difficult dentition. According to him, convulsions and the other nervous symptoms which children are subject to during the period of dentition depend wholly on the hardness and strained condition of the gum. It is, therefore, natural that the symptoms should disappear when an incision of the gums, reaching to the tooth that is coming through, has caused the tension to cease.

The author speaks very particularly of the treatment of epulis and parulis; but his views on this subject contain nothing of great importance.

René Jacques Croissant de Garengeot (1688 to 1759), the celebrated French surgeon, speaks very little of dental surgery in his works. He declares himself averse to the carrying out of too many operations on the teeth, and especially disapproves the use of the file, because, according to him, it ruins the enamel.[1] For a long time, especially in France, Garengeot was believed to have been the inventor of the key known by his name; but he merely perfected this instrument. In fact, through a later author, Lecluse, it clearly results that the key existed before Garengeot. "For extracting," writes Lecluse, "one may make use of the pelican that Garengeot has constructed on the English key." In a note, he afterward adds, "that the English key is an instrument used by dentists in England." However, it is not in the least certain that the key is really an instrument of English origin.

Loder, who wrote at the end of the eighteenth century, informs us that the so-called English key was called the German key in England; it is, therefore, not improbable, that this instrument, as some maintain, had its origin in Germany.[2]

Johann Junker (1679 to 1759), professor of medicine at the University of Halle, wrote on dental maladies, not only in a treatise on surgery, published in 1721, but also in three dissertations which were published some time later, and were entitled respectively: *De affectibus dentium* (1740), *De dentitione difficili* (1745), *De odontalgia* (1746). The author, however, for the most part, only repeats things already known; his writings have, therefore, little or no importance for us. He counsels the Cowper-Drake operation in treating the affections of Highmore's antrum; in carrying out the operation, however, he thinks the extraction of the second molar

[1] Sprengel, op. cit., vol. ii, p. 311.

[2] Joseph Linderer, Handbuch der Zahnheilkunde, vol. ii, p. 129.

to be preferable to that of the first. To prevent the formation of tartar on the teeth, he advises assiduous care in keeping the mouth clean, and recommends, among other things, rubbing the teeth with sage. He disapproves having recourse too readily to metal instruments to remove tartar from the teeth, because, according to him, it favors the production of dental caries. He holds it dangerous to extract the upper or lower canines when they are not loose, as, by reason of the depth of their roots an injury to the surrounding nerves may be the result, which not only might cause great pain, but in the case of the upper canines might lead to inflammation of the eye, and even of the dura mater!

When the caries is incipient, Junker advises rubbing the teeth several times a day for some time with common salt, in order that this should penetrate into their structure.[1]

Guillaume Maquest de la Motte (1655 to 1737), a distinguished French surgeon and the writer of an excellent treatise (*Traité complet de chirurgie*, Paris, 1722), repeats the advice already given by preceding authors, to which he annexes the highest importance, that is, the opening in time of abscesses of the gums and of the palate even before they be completely matured, in order to prevent the suppurative process from extending and damaging the bone below. This author relates having several times arrested serious hemorrhage following on the extraction of teeth, by applying a little vitriol inside the alveolus, and, on this, graduated compresses, which the patient pressed on the part with the teeth of the opposite jaw.[2]

Johann Adolph Göritz, of Regensburg, in one of his writings published in 1725, disapproves the too frequent recurrence to extraction of the teeth, that is, carrying out the operation when it is not absolutely necessary. He is also averse to the application of artificial teeth. In support of his opinion he relates a case in which, a certain time after the application of an artificial tooth, the natural ones to which it had been fixed became loose, so that it was necessary to proceed to the fixing of all three, that is, the artificial tooth and the two neighboring ones, to the firm teeth beyond them; these, however, became loosened in their turn, and it was at last necessary to extract six teeth. The great space thus created was filled with a prosthetic piece made of hippopotamus tusk; but the author did not believe much good would come of this either. In fact, he is of opinion that the natural teeth should be preserved by every possible means, and that, on the other hand, even in the case of a few being lost, it is better not to resort to substitutes. In the worst case, should the dental void cause too great inconvenience by damaging the pronuncia-

[1] Sprengel, op. cit., vol. ii, p. 367; Carabelli, op. cit. p. 65.

[2] Sprengel, op. cit., vol. ii, p. 310.


Dum dextrâ et scriptis solamina Dentibus affers
Illorum in luto sunt decor atque salus.
Invidiæ spernas igitur, FAUCHARDE, cruentos
Dentes; nam virtus frangere novit eos.

tion, or for some other reason, it may be filled by an "imitation" in soft wood.[1]

If one takes into consideration the by no means slight inconvenience to which fixed artificial teeth gave rise, one cannot but admit the aversion to them, expressed by Göritz and others, to have been justified.

Ernst Ferdinand Gebauer, in 1726, made known a case in which, a tooth having been badly extracted by an incapable surgeon, the upper jaw was so seriously injured that a diffusive carious process ensued, which after many years' suffering brought the patient to the grave.[2]

Johann Bernhardt Fischer (1685 to 1772), a very famous doctor, born in Lübeck, who had the honor of becoming archiater of the Russian Empire, related, in 1726, a case of replantation, similar to those by Pomaret and Carmeline; but Heinrich Bass (1690 to 1754), of Bremen, professor of anatomy and surgery in Halle, endeavored to demonstrate that in these cases the tooth did not really take root, but was rather maintained in position by the contracting of the surrounding gum. One perceives from this that there were still, at that time, discordant opinions on the subject of replantation, and that this operation was far from occupying, in dental surgery, the accredited position it has acquired today.

Heinrich Bass also combats the abuse of extracting teeth inconsiderately, without absolute necessity, and expresses the opinion that this is especially blamable in the case of teeth of the upper jaw, principally because the extraction of either the canine or of the first or second large upper molars might easily produce the opening of Highmore's antrum, and thus give rise to regrettable accidents. He is not, however, averse, like Göritz, to the use of artificial teeth; indeed, he advises the application of whole dental sets, even in the upper jaw, so long as there be two natural teeth existing to fix the prosthetic piece to.[3]

Pierre Fauchard, the founder of modern scientific dentistry, was born in Brittany about the year 1690, and died at Paris in the year 1761. His celebrated work, *Le Chirurgien Dentiste*, was already written in the year 1723, but not published until 1728. It marks a new epoch in the history of dental art. The most renowned physicians, surgeons, and anatomists of the time testified their admiration for Fauchard's work, which was translated into German in 1733, and afterward went through two French editions in the years 1746 and 1786.[4] We have been able to obtain the

[1] Sprengel, op. cit., vol. ii, p. 309.

[2] Sprengel, loc. cit.

[3] Sprengel, op. cit., vol. ii, p. 310.

[4] Le Chirurgien Dentiste ou Traité des Dents, où l'on enseigne les moyens de les entretenir propres & saines, de les embellir, d'en réparer la perte & de remédier à leurs maladies, à celles des Gencives & aux accidens qui peuvent survenir aux autres parties voisines des Dents. Avec des Observations & des Réflexions sur plusieurs cas singuliers. Ouvrage enrichi de quarante-deux Planches en taille douce. Par Pierre Fauchard, Chirurgien Dentiste à Paris.

second edition[1] of this most important treatise, and of this we now intend making use for accurately analyzing the work, as it is probably more complete than the first, whilst the third, having been published after the author's death, is probably merely a reprint.

The work consists of two volumes in duodecimo, in all 863 pages. In the beginning there is the portrait of the author and a long and interesting preface. The portrait, which we here reproduce, has also its historical importance, and this for two reasons, the first of which being that in it Fauchard is revealed to us as a person of very distinguished appearance, and this gives us an idea of the social condition of the surgeon dentists of his time; the second, because there are annexed to the portrait the following Latin verses, by a certain Moraine, in which, whilst eulogizing the writings of the author and his ability in the treatment of the teeth, and in restoring force and beauty to them, he counsels him "to despise the tooth of envy," as it will certainly break against his merit.

Dum dextra et scriptis solamina dentibus affers
Illorum in tuto sunt decor atque salus.
Invidiæ spernas igitur, Faucharde, cruentos
Dentes; nam virtus frangere novit eos.

That Fauchard, in common with all men of rare merit, had to combat all his life against envy, we are able to perceive from what we read at the end of the second volume of his work. The author here says that "the rumor having been falsely set about that he has abandoned the profession; which rumor cannot have been invented otherwise than by those individuals who, sacrificing honor to interest, would attract to themselves the persons who honor the author with their confidence; he therefore finds it necessary to give warning that he still continues the practice of his art in Paris, in the *Rue de la Comédie Française*, together with his brother-in-law and sole student, M. Duchemin."

More than a century and a half has passed by since Fauchard was obliged to defend himself against lies invented and set about to his damage by envious colleagues, but even at the present day, when, given the high grade that civilization has reached, and professional competition ought not to make use of other weapons than intelligence, study, and application, some do not hesitate to have recourse to means equally disloyal, ignoble, and shameless as those practised by some contemptible dentists of the middle of the eighteenth century.

The preface of Fauchard's book is especially important for the notices therein contained regarding the author, as well as the conditions of dental art at that period. And first of all, we find in it the proof of what we have already said elsewhere, namely, that even before Fauchard, there were not

[1] Deuxième edition revue, corrigé et considérablement augmentée, à Paris, 1746.



A CHARLATAN ON HIS PUBLIC STAGE

only tooth-pullers but also dentists properly so called. Indeed, Fauchard makes mention also of the examination that aspirant dentists had to undergo as far back as the year 1700. It may interest our readers if we here give in detail some extracts in which the author speaks on these subjects:

"Although surgery in general," says Fauchard, "has been greatly perfected in these latter times; although important discoveries have been made in anatomy and in the modes of operating, and many learned and interesting observations have been published, nevertheless, dentists nowhere find in works on surgery sufficient aids to guide them in all their operations." These last words should be sufficient alone to prove that the dentists spoken of by Fauchard were not mere tooth-pullers.

"The authors who have written on anatomy, on surgical diseases and operations, have only treated very superficially the part relating to maladies of the mouth and teeth. If some writers have spoken in particular about the teeth and their diseases, as, for instance, Urbain Hemard and B. Martin, they have not done so in a sufficiently ample manner.

"Besides, there does not exist any public or private course of surgery in which the theory of dental maladies is amply taught and in which one can receive fundamental instruction in this art, so necessary for the healing of these maladies and of those of the neighboring parts.

"This branch of the art having been but little cultivated, if not wholly abandoned by the most celebrated surgeons, their negligence has caused it to fall into the hands of persons without theory and without experience, who practise it in a haphazard fashion, guided neither by principles nor method. In Paris, it is only since 1700 that people's eyes have become opened to this abuse.

"In this town, those who intend to become dentists are now obliged to undergo an examination, but although the examiners be most learned and well versed in all the other parts of surgery, I think, if I may be allowed to express my opinion, that as they do not ordinarily themselves practise dental surgery, it would not be amiss on these occasions to admit an able and experienced dentist, who might sound the aspirant as to the difficulties which have come before him in the course of the long practice of his art, and who could communicate to them the means of surmounting them. In this way one would not have to acknowledge that the attainment of the greater part of dental experts[1] is below mediocrity.

"To supply this want of instruction it would have been of great use if some able dentist, for example the late *Monsieur Carmeline*, who, in his day, practised with general applause, had made us acquainted with

[1] *Experts pour les Dents.* This was probably the title which was bestowed in the relative diploma on those who passed the examination in question.

his mode of operating and with the knowledge acquired through the successful treatment of a great number of important cases.

"What this celebrated surgeon-dentist has not done, I today dare to undertake. I shall at least afford an example of what he might have done with greater erudition and better success.

"From my youth I was destined to the surgical profession; the other arts I have practised[1] have never made me lose sight of it. I was the disciple of Alexandre Poteleret, surgeon-in-chief to His Majesty's ships, who had great experience in diseases of the mouth. To him I owe the first rudiments of the knowledge I have acquired in the surgical speciality I practise, and the progress I made under this able man gave me the emulation that has led me to further important discoveries. I have collected among different writers what seemed to me most reliable. I have frequently discussed these matters with the ablest surgeons and doctors of my acquaintance, and have neglected nothing in order to profit by their counsels and by their ideas.

"The experience which I have acquired during an uninterrupted practice of more than forty years has led me insensibly to the acquirement of further knowledge and to the modification of what seemed to me defective in my earlier ideas. I offer to the public the results of my labors and of my studies, hoping that they may be of some use to those who wish to exercise the profession of surgeon dentist."

The reason why dentists before the time of Fauchard published hardly anything concerning their art, was perhaps out of a sentiment of jealousy, which rendered them (that is, the best of the profession and therefore the ones most capable of writing) but little disposed to make known to others the results of their studies and of their experience, lest the fruits of their long labors should be utilized by others and they themselves be materially damaged by competition. That this sentiment of jealous egotism really existed in many dentists may be, in a certain manner, deduced from a few words of Fauchard himself, who, although he has the very great merit of breaking with mean, old-world prejudices, nevertheless expresses the prevalent idea of the time, consisting in the belief that every artificer, every inventor, had not only the right, but also the duty of surrounding his discoveries with secrecy and mystery. These are the words in which, making known a certain improvement in dental prosthesis invented by him, he at the same time expressed his conviction that by so doing he is acting against his own interests:

"I have perfected and also invented several artificial pieces both for substituting a part of the teeth and for remedying their entire loss, and

[1] We have not been able to find any work in which particular records of Fauchard's life are given, and hence do not know to which of the other arts he had dedicated himself.

these pieces substitute them so well that they serve perfectly for the same uses as the natural teeth. To the prejudice of my own interests I now give the most exact description possible of them."

Now, although a man of elevated mind, such as Fauchard, may have been capable of sacrificing his material interests to higher aims, it is not, however, to be wondered at, taking also into consideration the lesser degree of culture and of professional ability of his predecessors, that none among them should have been found sufficiently disinterested to publish the results of their particular studies and experience, besides all those technical details which according to the ideas of that time constituted the secrets of the profession.

In the course of this history, we have seen that the dental art was practised from the most remote times and in the most various countries, remaining, notwithstanding, for centuries in an embryonal condition. It was toward the end of the seventeenth and the beginning of the eighteenth century that, in the midst of the highly advanced civilization of the great French capital, it attained a high degree of development, entitling it to be considered a special branch of the medical art.

It would, therefore, be wrong to believe that the dental art was created, for the most part, by Fauchard, and one clearly perceives, from the perusal of his work, that although he made most important contributions to this specialty, which he cultivated with passion, nevertheless, the greater part of the things therein treated of were already known before his time, although no reference to them is to be found in previous works; and this for the reasons we have already suggested. The highest merit of Fauchard consists, still more than in his inventions and improvements, in his having most ably collected and incorporated in a single work the whole doctrine of dental art, theoretical as well as practical, thus setting in full light the importance of the specialty, and giving it a solid scientific basis.

France is therefore the first country where modern dentistry reached a high degree of development and also the first country where, earlier than elsewhere, that is, about 1700, the dentists began to form a well-defined class, to belong to which it was necessary to pass a special examination. This examination, as we learn from Fauchard, was held before a commission of which no dentist formed a part, and exactly for this reason gave but negative results and responded but little to its intended aim. The greater number of those who were authorized to practise dentistry after undergoing this examination showed a professional ability below mediocrity. Nevertheless, although few in number, good and able dentists were in no way wanting, as clearly appears from the preface to Fauchard's work, and better still from the following paragraph,[1]

[1] Vol. ii, p. 366.

wherein the author speaks of the great perfection reached by dental surgery in Paris:

"The teeth and the other parts of the mouth being subject, as we have seen in the course of this work, to so many important diseases, requiring the aid of the most able dentists, it is strange that the sovereigns of foreign countries, the heads of republics, and also the administrators of our own provinces do not provide for the expense of sending young surgeons to Paris, to be instructed in a part of surgery so essential, and, notwithstanding, so ignored and neglected everywhere excepting in this great city, where it has reached its highest perfection, both as regards the embellishment of the mouth and the cure of diseases, often of a most serious nature. These scholars would, thereafter, form others and would render great services to their nation and to their fellow citizens."

In the first chapter of his work, Fauchard speaks "of the structure, position, and connection of the teeth; of their origin and of their growth." He distinguishes in each tooth a body, a root, and a neck, making the remark, however, that this last is to be considered as forming part of the body. According to the author, the name of "crown" can only be applied suitably to the body of the molar teeth, but not to that of the incisors or of the canines, which has no resemblance with a crown. Although in the adult the number of the teeth is normally thirty-two, it may be that some persons have, nevertheless, thirty-one, thirty, twenty-nine, or even only twenty-eight teeth, and this independently of any eventual loss, but for the simple reason that the wisdom teeth are often cut very late in life (even after fifty years of age), or do not all come forth, or sometimes are never cut at all. The author refers to some cases of a supernumerary tooth situated in general between the two superior central incisors and similar in form to the lateral incisors. He also observed two individuals who had each thirty-four teeth, sixteen in the lower and eighteen in the upper jaw, and in these cases the two supernumeraries were situated behind the incisors. Fauchard declares the popular opinion expressed also by some ancient authors, of the milk teeth having no roots, to be false. The roots of these teeth, he says, are gradually worn away before the latter are shed, when the permanent teeth are just on the point of coming through; however, if it so happens that one or more of the milk teeth be extracted some time before the period in which they are usually shed, their roots are found to be as long and as strong in proportion to the body as those of the permanent teeth. In children one finds, besides the twenty deciduous teeth, the germs of the thirty-two permanent ones, for which reason it may be said that children have in all thirty-two teeth without counting the germs that may sometimes be found at the extremities of the roots of the large molars. As, however, the existence of such germs is an exceptional fact, the twelve large molars, if extracted, are

not ordinarily regenerated. This may be possible, however, if the germs in question exist, and, indeed, the author observed two persons in both of whom a large molar had been regenerated in the place of the one which had to be extracted.

Fauchard gives an excellent description of the alveoli and of the roots of the teeth; he alludes to the varieties which these latter may present, and to the importance of the same from the point of view of extraction. Thus, speaking of the molars, he says: "Their roots sometimes touch one another at the points, whilst at the base, close to the body of the tooth, they are far apart. These are the so-called *dents barrés* (barred teeth), which it is so difficult to extract, it being unavoidable to bring away together with the tooth the spongy osseous part occupying the interval between the roots."

In this same chapter the author calls our attention to some anomalies worthy of note. He says that he has observed teeth that seemed to him to be derived from the union of two or three germs. He also relates that a colleague of his showed him a tooth that appeared to be formed by the union of two, between the roots of which was a third tooth whose crown was united to the vault formed by the roots of the first two.

Fauchard describes exactly the pulp cavity and the root canals, and speaks of their gradual restriction, ending in an almost entire disappearance in old age.[1] He treats of the nerves, of the arteries, and of the veins of the teeth in a most detailed manner; then, after alluding to their general structure, he goes on to speak of the microscopic constitution of the enamel, following in this the description given of it in 1699 by the academician La Hire.

In regard to the development of the teeth, Fauchard repeats what Urbain Hémard had previously written. He apparently ignores the researches of the Italian anatomists, from whom, and especially from Eustachius, Urbain Hémard had literally reproduced all that concerns odontogeny.

In the second chapter Fauchard speaks "of the maladies of children at the period of teething and of the remedies best adapted thereto." Among other means of treatment, he advises the incision of the gum when this is red, swollen, and distended and the tooth below it can be felt. For the incisors and canines a simple incision ought to be made in the same curve as the dental arch; for the molars a crosswise incision should be made directly down to the tooth below, taking care not to leave any strips of uncut gingival tissue, lest these, being distended by the emerging tooth, should continue to be the cause of pain and other morbid phenomena.

Although Fauchard does not tell us anything substantially new about

[1] Page 21.

teething maladies and their treatment, he nevertheless treats this subject with much practical good sense, and does not merely make servile repetition of what preceding authors have written about it.

In the three following chapters the author speaks of the utility of the teeth, of the rules to be observed for their preservation, of the modes of keeping them white, and of strengthening the gums.

From a passage in the fifth chapter we learn that tooth brushes were then already in use. Fauchard, however, advises the use of small sponges in their stead. He says: "Those who use brushes of horsehair, or pieces of cloth or of linen for cleaning the teeth, do not reflect that all these materials are too rough, and that the practice of using them frequently and without discretion often exercises a destructive action upon the teeth.[1] Not without good reason, I advise the abandonment of this usage, it being preferable, after having had the teeth cleaned by the dentist, to wash the mouth every morning with tepid water, and to rub the teeth up and down, inside and outside, with a small, very fine sponge wetted in water; and it is still better to add to this water a fourth part of aqua vitæ the better to fortify the gums and render the teeth firm."

Instead of a small sponge, says Fauchard, the end of a root of marshmallow or lucern, which has first been subjected to a special preparation, may be used with benefit for rubbing the teeth. The author gives a long and minute description of this preparation, which we, however, omit, because devoid of historical interest.

As, however, the above means are not always sufficient for preserving the teeth and gums in good condition, it is necessary in many cases, says Fauchard, to make use of some paste, powder, or mouth wash. The author mentions a great number of compositions of this kind, giving the formula for each one—almost always most complicated—and indicating the peculiar advantages of each of them. We will here quote one of the formulæ as an example.

"*A spirituous water, desiccative, balsamic, antiscorbutic, efficacious against many maladies of the mouth:*

"℞—good sarsaparilla, four ounces; aristolochia rotunda, dried rinds of bitter organes, of lemons, and pomegranates, *ana* three ounces; pyrethrum, two ounces; cloves, one ounce; mustard seeds, one ounce; wild rocket seeds, two ounces. Pound well in a mortar and put the whole into a retort with a long neck. Add thereto half a pound of pulverized candied sugar and the same quantity of clarified rose honey. Pour in three pints of good spirit of wine. Cork the retort well and leave all to digest in a cool place for five or six days. Then heat the retort forty-eight hours in the water bath over a slow fire, without letting the liquid come

[1] Pages 73, 74.

to the boil. Afterward, when cold, decant in a glass bottle, to be kept well corked. Pour another three pints of spirit of wine on the residue of the drugs; cork the retort again, replacing it in the water bath for forty-eight hours, and regulating the fire as above. Then, after letting it cool, pour off the liquid into the same bottle. Next remove all the residue from the retort, place it in a thick, white linen cloth, and force the remaining liquid through it, and add to that in the bottle. Put back half of the entire quantity of liquid in the same retort, and add thereto aloetic elixir and *baume du commandeur*, *ana* four ounces; pulverized dragon's blood, three ounces and a half; pulverized gum of guaiac and Peruvian balsam, *ana* three ounces; gum lac, two ounces. Cork the retort again and replace it in the water bath for forty-eight hours, as above. Let cool, decant the liquid in another glass bottle, and cork well. Pour the remaining half of the first liquid upon the rest of the drugs, replace the retort in the water bath for forty-eight hours, let cool, and pour the contents in the last bottle. Filter the liquid well, and pour it into a bottle of sufficient size to be able to add the following liquids: aqua vulneraria and first cinnamon water, *ana* three pints; second cinnamon water, three half-pints; spirit of cochlearia, four pints. Shake the bottle well, filter again, and store in well-corked bottles."

The author adds that the doses of the different drugs may be reduced in proportion to the quantity of liquor to be prepared; and that he prepares so large a quantity at a time because of the great sale he has for it among his clients.

The preparation in question is counselled by the author as a remedy against pathological conditions, and of the gums especially. One makes use of it in the following manner: Pour from seven to eight drops into a wineglass of water; wet the tip of the finger and rub the gums and the teeth well. Or mix seven or eight drops in a good spoonful of water, using a fine sponge to rub the teeth and gums.

The example we have cited suffices to show how much care one took at that time in the preparation of substances destined to be used in the preservation of the teeth, and demonstrates at the same time that Fauchard, inventor of that and many other preparations, besides being an able surgeon dentist, was also exceedingly well versed in dental materia medica.

Chapter VII treats of the general causes of dental, alveolar, and gingival diseases, and contains the complete enumeration of these maladies. The causes of dental affections may be of two orders, viz., internal (general diseases, dyscrasic conditions) and external (the action of heat and cold, mechanical causes, etc.).

After having spoken in particular of various causes, Fauchard adds: "Little or no care as to the cleanliness of the teeth is ordinarily the cause of all the maladies that destroy them."

The author divides maladies of the dental apparatus into three classes, that is:

1. Maladies deriving from external causes and acting, therefore, especially on the crown or uncovered part of the tooth.

2. Maladies of the hidden parts of the tooth; that is, of the neck and root.

3. Symptomatic maladies, deriving from the teeth.

In the first class the author includes 45 pathological states, 17 in the second and 41 in the third, making up a total of 103 morbid conditions. This should be sufficient to give us an idea of the accuracy with which Fauchard studied the maladies of the dental apparatus, especially if one considers that preceding authors had reduced these maladies to a very small number. Fauchard's classification is very complete, for notwithstanding the progress made in succeeding years in this science, the pathological conditions not to be found comprised in it are exceedingly few. Naturally, the 103 diseases enumerated by Fauchard do not represent as many distinct morbid entities. The author, in classifying dental maladies, keeps especially in view the requirements of the practitioner, and therefore makes numerous distinctions in each morbid process. Thus, he distinguishes a great many varieties of caries, viz., the soft and putrid caries, the dry caries, the caries in part dry and in part soft, the caries complicated by fracture, the superficial caries, the deeper and the deepest, the caries of the different surfaces of the crown, and so on. Also in the classification of other morbid processes, Fauchard makes multifarious distinctions.

The passage referring to worms in the teeth deserves to be here reproduced:[1]

"Sometimes worms are to be found in the carious cavities of the teeth, or in the deposit of tartar that covers them, and to these the name of dental worms has been given. Observations recorded by illustrious authors are extant which attest this. Not having ever seen these worms, I neithet admit nor deny their existence. Nevertheless, I conceive the thing nor to be physically impossible, although at the same time I do not believe at all that these worms destroy the teeth or cause them to decay, but rather that the eggs of some insect having been introduced into the carious cavity of the tooth, either through alimentary substances or through the saliva, these eggs thus deposited have developed and produced the worms alluded to. However this may be, as they are not the real cause of the caries, their eventual presence does not require any particular consideration." Fauchard again recurs to the subject of worms in Chapter VIII, in speaking of the particular causes of caries.[2]

[1] Vol. i, p. 131.

[2] Page 142.

"It was, and is still, believed by the vulgar and also by some writers that all toothache is caused by worms, which little by little destroy the tissue of the osseous fibers and the nervous threads. If this were so, the explanation of pains and of decay in the teeth would be very simple. This opinion is founded on pretended experiences relating to these insects, which may, it is said, be made to fall out of the teeth by the smoke of henbane seeds; this, however, has been declared fabulous by Andry, dean of the medical faculty of Paris, as well as other similar facts which he exposes in his book on the generation of worms.[1]

"Andry relates, however, that with the help of the microscope one may succeed in seeing certain worms that form beneath the deposit collected upon the teeth as the effect of want of cleanliness; these worms, he says, are exceedingly small and characterized by a small round head with a small black spot; the body is long and fine, pretty nearly like the worms seen in vinegar through the microscope. He adds that these worms destroy the teeth little by little, causing a bad odor, but not much pain. He believes it an error of the imagination to ascribe violent pains in the teeth to dental worms, and holds that these only produce a very slight, dull pain accompanied by itching.

"I have done everything possible," continues Fauchard, "to convince myself with my own eyes of the existence of these worms. I have made use of the excellent microscopes of Manteville, sworn surgeon of Paris, and have made a great number of experiments with them both on caries in teeth newly extracted as well as on tartar of different consistency accumulated on the same, but have never succeeded in discovering any worms. I am also still less disposed to believe in the existence of these animals, because Hémard declares that he has never been able to find any worms in carious cavities. I am thoroughly convinced of Andry's sincerity; neither do I doubt the truth of the facts he relates; but it is easy to perceive from his own words how little the pretended healers of teeth and their specifics for killing worms are to be held in account; from the moment that, according to this writer, the pains for which one is most obliged to have recourse to remedies are almost always those not proceeding from the cause in question."

In short, Fauchard does not believe at all that dental caries is occasioned by worms; and only from respect for the authority of Andry and other writers does he admit the accidental existence of these little animals in the carious cavities or upon the teeth, refusing, however, to attribute any importance to the same as regards the etiology of caries.

This disease, says Fauchard,[2] is produced by a humor that insinuates itself into the midst of the osseous fibers of the teeth, and displacing the

[1] De la génération des vers dans le corps de l'homme, Paris, 1700.

[2] Vol. i, p. 143.

particles which compose these fibers, gives rise to their destruction. The causes from which these disorders derive may be external or internal. The external causes are blows, violent efforts made by the teeth; the improper use of the file, the application of acids or of other substances that injure the enamel, alteration of the saliva, impressions of heat or cold, and also certain kinds of nourishment. Blows or violent efforts may produce caries, according to the writer, by occasioning the effusion of the liquid contained in the vessels. The author gives analogous explanations for the other external causes. As to the internal causes, they consist, he says, in alteration of the blood and of the humors.

The teeth, says Fauchard, are more subject to caries than all the rest of the bones in the human body, because, their tissues being denser, the vessels are on this account closer together and more easily liable to be obstructed, choked up, and broken. Besides, the position of the teeth exposes them more than the other bones to the immediate action of external causes capable of producing the disorders alluded to; and finally, what demonstrates the dental caries to be produced, for the most part, by external causes, is that false teeth, either human or formed from those of animals, sometimes become carious just in the same way as the natural ones; which evidently happens by the sole action of external causes.

It is undeniable that the ideas expressed by Fauchard on the pathogeny of caries, cannot hold good against criticism. Nevertheless, we owe a great deal to this author for having once for all put an end to the ridiculous theory of dental worms, and for having tried to find a reasonable explanation of the manner in which caries is produced.

The teeth, says Fauchard, have not all the same disposition toward this morbid process; indeed, notable differences are to be observed in this respect. The molars are, in fact, more apt to become decayed than the incisors or the canines; and the upper incisors and canines are more subject to this disease than the inferior ones, because, by reason of their position, they are more frequently uncovered and more exposed to heat and cold, whether in eating and drinking or whether in the mere aspiration or expiration of the air. It is to be observed, besides, that when the eruption of the last molars is considerably delayed they easily decay.[1]

Having very frequently observed the symmetrical decay of corresponding teeth on both sides of the same jaw, Fauchard considers that these cases are not simply accidental, but rather holds that the fact depends on a special cause, which, however, is not easy to determine. He offers, at any rate, a sufficiently good explanation when he says that as certain morbid causes (bad humors, etc.) must affect both sides of the mouth identically, it is but natural that the effects of such causes should be

[1] Page 149.

altogether analogous on the right and on the left, and manifest themselves symmetrically on teeth having the same configuration, the same structure, and the same consistence.

Before speaking of the treatment of caries,[1] Fauchard alludes to the fallaciousness of the many remedies against toothache which were largely sold at his time by charlatans and impostors of every kind.

"Some pretend to cure toothache with an elixir or some special essence; others with plasters; others by means of prayers and signing with the cross; others with specifics for killing the worms that are supposed to gnaw the tooth and so cause pain; others pretend to be so clever that they can cure the most inveterate toothache by merely touching the tooth with a finger dipped into or washed with some rare and mysterious liquid; others finally promise to cure every kind of toothache by scarifying the ears with the lancet or cauterizing them with a red-hot iron."

"I am well aware," adds Fauchard, "that it can be alleged in favor of this last prejudice that the celebrated Italian doctor Valsalva indicates with great precision the point in which the actual cautery is to be applied to the ear, in order to calm toothache. He also determines the size of the iron and the manner of applying it. The authority of so celebrated an author, whose opinion is certainly worthy of respect, should induce me to believe that there may perhaps be some cases in which it is possible to use this remedy with success; nevertheless, I cannot persuade myself that such treatment can be useful in common cases of toothache.

"At Nantes, a city of Brittany, I knew a Turk, a watchmaker by profession, who was renowned for this mode of curing toothache. But I also know that, in spite of the pretended cures, the greater number of those who put themselves into his hands were obliged finally to have recourse to me, in order to find relief for their sufferings. I afterward saw several other persons use the same remedy with no better success.

"There are, besides, an infinity of other remedies vaunted as efficacious against toothache, but the greater number of them are so ridiculous and extravagant that it would be both tiresome and useless to speak of them. We will, nevertheless, give one more mentioned by M. de Brantôme."[2]

The author here quotes a passage of this writer, wherein he says that, having been suffering from toothache for two days, the apothecary of Elizabeth of France, wife of Philip II of Spain, brought him a most singular herb, which when held in the hollow of the hand had the virtue of making the pain cease immediately; and in this way he was, in fact, effectually cured.

And here Fauchard expresses himself of the same opinion as Urbain Hémard, who believes the cure of toothache by means of words, or by the

[1] Chap. ix, p. 154.

[2] Dames illustres, vie d'Elizabeth, p. 179.

touch of paper on which certain signs are written, or remedies held in the hand, etc., to be merely the effect of the force of the imagination, and he opines that the patient, having a vivid belief in the mysterious thing proposed to him remains under the impression of an inward commotion, by the effect of which it may well be that the morbid humor is deviated from the painful part to other parts of the body. The effects of the various passions on the bodily functions are, says Fauchard, very well known. Thus, when under the influence of anger the wounded at times do not feel any pain, and those who suffering from a tormenting toothache go to a dentist to have the tooth drawn are sometimes seized by such great fear as not to feel the pain any longer, and go away, only to return later on renewal of their sufferings; although there have been cases where the pain ceased altogether.

In spite of this explanation, of which we will not here discuss the value, allowing it, however, as satisfactory enough, Fauchard continues by making a most curious consideration, which as it is of a somewhat surprising effect in a scientific work, we will not deprive our readers of it. He believes it to be his duty to give the following warning, namely, that "the modes of cure, by means of certain words, of certain signs, laying on of hands, written charms, etc., savoring much of superstition and of diabolic artifice, are prohibited by the Church as sinning against the first Commandment, as much in him who practises them as him who consents thereto."

After the above preliminaries, the author passes on to treat the important subject of the mode of curing caries.[1] According to him, when caries has not yet attacked the internal cavity of the tooth at all, or only in a very slight degree, there are four modes of curing it: the first consists in the use of files or scrapers, the second in the application of lead, the third in the use of oil of cinnamon or of cloves, and the fourth in the application of the actual cautery. Fauchard expresses most energetically his disapproval of the means of cure recommended by Dionis in cases of caries of the triturating surfaces, which consisted in the cauterizing of the decayed spot with a drop of oil of vitriol applied by means of a miniature paint brush, declaring this to be both dangerous and hurtful because of the destructive and corrosive action of the oil of vitriol and because of the impossibility of limiting its action solely to the affected part of the tooth.

The general method of cure followed by Fauchard is described by him in these terms:

"When a tooth is but slightly decayed, it is sufficient to remove the caries with the instruments of which I will speak hereafter, and to fill

[1] Page 161.

the cavity with lead. If, however, the cavity be rather deeper and occasions pain, one should, after having scraped it, put a small ball of cotton-wool soaked in oil of cinnamon or of cloves into the hollow of the caries every day. This medication must be continued for a sufficient time, taking care to squeeze in the cotton-wool by degrees to accustom the sensitive parts to the pressure. Four or five days later one removes the material from the carious cavity. This treatment sometimes prevents a return of the pain; it produces on the osseous fibers of the tooth a slight but sufficient exfoliation and impedes the progress of the caries. If the pain should not cease after having continued this method for a sufficient length of time, one should then have recourse to the actual cautery and stop the tooth after a certain time, if the form and situation of the decayed cavity permit it; for one sometimes meets with cavities that are not able to maintain the stopping.

"If the caries penetrates as far as the cavity of the tooth, it may give rise to an abscess; and this I have often observed in persons to whom the caries of the incisors or of the canines occasioned great pain. In such cases I introduce the extremity of the sound into the cavity of the tooth in order to facilitate the evacuation of matter. As soon as the pus is evacuated the pain ceases. I then leave these patients in repose for two or three months; after this time, I stop the decayed tooth or teeth to avoid their getting worse."

As anyone may perceive, the methods used by Fauchard against caries left much to be desired, when compared with those now in use. With such imperfect methods it is but natural that one did not always succeed in obtaining the immediate cessation of the pain resulting from caries. The want of additional remedies was, therefore, felt; and, in fact, Fauchard tells us[1] of two with which he had experimented and found most efficacious against toothache. The first is a resinous plaster to be applied to the temples; the other is a paste to be applied, in quantity equal to the size of a small bean, between the gums and the cheek, and which was composed of various ingredients, among others, pyrethrum, black pepper, ginger, stavesacre, mace, cloves, cinnamon, sea salt, and vinegar. After having given the mode of preparation and application of the two above-mentioned remedies, Fauchard adds: "These remedies prove especially efficacious if one takes care to introduce a little cotton-wool or lint into the decayed cavity, soaked in oil of cloves, or cinnamon, mixed with an equal quantity of extract of opium, and if one resorts opportunely to bleeding and purging; which ought never to be neglected in the case of plethoric persons."

Finally, the author speaks of another remedy,[2] and one which we

[1] Page 165.

[2] Page 167.

never should have expected to find in his book; but he assures us that by it many persons who had almost all the teeth decayed and suffered very often from toothache found great relief.

"It consists in rinsing the mouth every morning and also in the evening before going to bed with a few spoonfuls of one's own urine immediately after it has been emitted, always provided the individual be not ill. One is to hold it in the mouth for some time, and the practice ought to be continued. This remedy is good but undoubtedly not pleasant, except in so far as that it procures great relief. Some of those to whom I have recommended it, and who have used it, have assured me that in this manner they were relieved of pain to which, up to then, they had continually been subject. It is rather difficult in the beginning to accustom one's self to it; but what would one not do to secure one's self health and repose."

In order to explain the virtue of the urine as a remedy, the author pauses to speak of its chemical composition, and then adds:

"The rectified spirit of urine[1] could be substituted for the human urine. One should then take two drams of this substance and mix it with two or three ounces of aqua vitæ, or water of cresses or of cochlearia. Sal volatile[2] has the same virtues. Those who wish to make use of it should dissolve fifteen to thirty grains of it in the same quantity of the above liquid."

Fauchard then passes on to speak of trepanning of the teeth when they are worn away or decayed and cause pain.[3] He begins by saying that most varieties of pain caused by the canines and the incisors when worn away or decayed cease after the use of the trepan. He, however, understands the term trepanning in a very wide sense, comprehending therein the use of any instrument whatever (even a needle or a pin) with which one penetrates into the inner cavity of the teeth.

In interstitial caries of the canines and incisors one ought, says Fauchard, first to enlarge the interstice with a small file of a convenient shape, then to scrape the decayed cavity, and finally to open up the canal or inner cavity of the tooth with a perforator or with a small trepan.

"In this way the pus or other humors that may have collected in the tooth can easily find their way out, and the pain will cease at once or in a short time."

The author describes with much minuteness the manner of trepanning, and then adds:

"After this operation one should let a few weeks pass without doing anything to the affected tooth, and afterward, in order to impede further decay, one must put a little cotton-wool into it soaked in oil of cinnamon

[1] Liquid ammonia. [2] Subcarbonate of ammonia. [3] Chap. x, p. 169.

or of cloves. The tooth must be left in this state for some months, taking care to renew the cotton-wool. It is necessary to observe that in beginning to put in the cotton-wool this should be done with lightness and without pressing it down much, so that if pus should gather again it may be able to make its way through the cotton-wool, the principal object of this being to hinder the penetrating of alimentary substances into the tooth, which would be the cause of further decay. If the cotton were pressed into the tooth from the beginning, the pus, not being able to find an exit, would accumulate, and might cause much pain, if the nervous parts of the tooth were not yet dried up or destroyed. The same thing might happen after the application of a lead stopping, and one would be obliged to remove it and let considerable time pass before putting it in again."

Further on the author says that while the trepanning of incisors or canines almost always causes the pain to cease, by opening up an exit to the morbid matter retained within the cavity of such teeth, the same is not the case with the molars, these having several roots and several cavities, of great variety, which lend themselves but little to accurate trepanning. "Hémard," he adds, "judges it necessary to extract these teeth, or at least to break off the crown (*les déchapeller*), in order to give exit to the corrupt matter that is closed up in the cavity; this sometimes causes the pain to cease. He (Hémard) says that he has seen many abscesses in the interior of teeth, which were not externally decayed, and that after having broken off the crown he found within the cavity a corrupt matter of an insupportable smell."

Relative to such cases, Fauchard says that, besides the teeth, also the surrounding parts suffer and are imperilled by these conditions. "The greater part of the violent fluxions deriving therefrom often terminate in abscesses and fistulæ of the gums and of the surrounding parts, and sometimes with considerable and dangerous decay of the bone, as I have related in some of my observations."

One sees that Fauchard was clinically very well acquainted with the grave forms of pulpitis and their possible consequences, although ignoring the true nature of this process, which has only been studied and illustrated much more recently.

Chapter XL (page 177) treats of dental tartar, of its cause, of the harmful effects it produces, and of the prophylaxis and therapy relating thereto. Three illustrations which are added to this chapter represent the different aspects of a mass of tartar of exceptional size formed around the body of a lower molar. The surgeon Bassuel, a friend of the author, had removed this mass of tartar, together with the entire molar, from the jaw of an old woman. The mass itself was almost the size of a hen's egg, the superficies being very irregular; it rendered mastication altogether

impossible and caused the cheek to stand out in such a way as to give the appearance of a tumor.[1]

In the following chapter[2] the author enumerates the various dental operations: "Cleaning the teeth, separating them, shortening them, removing the caries, cauterizing, stopping, straightening crooked teeth, steadying loose teeth, trepanning, simple drawing of teeth, replacing them in their own alveoli, or transplanting them to another mouth, and finally substituting artificial teeth for those wanting." He then adds: "All these operations require in him who carries them out a light, secure, and skilful hand and a perfect theoretic knowledge, by which he may decide on the opportuneness of performing them, of deferring them, or of abandoning them altogether. In fact, one may know perfectly well how to carry out an operation and nevertheless undertake it in a case in which it is not at all proper to operate. Into such an error no one can fall save through sheer ignorance of the cause of the disease or of the right means of curing it. From this it must be concluded that the knowledge required in order to be a good dentist is not so limited as some imagine, and that the imprudence and the danger of placing one's self in ignorant hands is as great as the temerity of those who undertake to exercise so delicate a profession without the knowledge of even its first elements."

Before speaking in detail of all the above operations, the author dedicates a lengthy chapter[3] to describing with the greatest minuteness the position to be given in general, as well as in special cases, to the head and body of the patient, and the manner in which the dentist should place himself with regard to the former, so as to be able to make a proper use of each of his hands. As a rule, Fauchard made the patient seat himself in a convenient arm-chair; in exceptional cases he placed him on a sofa, or on a bed. He draws this subject to a close with the following words:

"It is, indeed, surprising that the greater part of those who practise tooth drawing should ordinarily seat the patient on the ground, this being both indecent and not very clean. This position is not only uncomfortable, but causes sometimes a sense of fear, especially in pregnant women, to whom it may, besides, prove very harmful. But it is still more surprising that certain authors should even nowadays affirm this to be the most convenient position, while it is instead one to be entirely rejected."

In speaking of extraction of the teeth,[4] Fauchard begins by saying that the milk teeth, although destined to be shed, should never be extracted, except in cases of absolute necessity, as, for instance, when being decayed, they give rise to intolerable pain. The alveoli of the infantile jaw are

[1] Page 407.
[2] Chap. xii, p. 183.
[3] Chap. xiii, p. 185.
[4] Chap. xiv, p. 194.

weak, whilst the roots of the deciduous teeth are sometimes firmer and more solid than one would believe, and hence it is that in extracting a milk tooth one runs the risk of injuring the alveolus and even of carrying away a portion of it altogether with the tooth, not to speak of the danger of damaging or even destroying the germ of the permanent tooth lying below. Besides, Fauchard adds, there are sometimes deciduous teeth that are never shed and never renewed. One must, therefore, defer drawing children's teeth as long as possible unless they are loose. When, however, intolerance of pain or a caries endangering the integrity of the neighboring teeth oblige one to recur without delay to extraction, one should carry out the operation with prudence and judgment, so as to avoid the dangers alluded to. It sometimes happens, says Fauchard, that one finds in children a crooked tooth by the side of a straight one; in these cases ignorant tooth drawers have often been known to remove the crooked (permanent) tooth, and to leave the straight, viz., the deciduous one, which afterward falls of itself, the individual thus remaining deprived of one of his teeth for the rest of his life. The rule to be observed in order to avoid a similar error is always to extract the older of the two teeth and to leave the one that has been cut more recently, which is easily recognized by its being ordinarily firmer in the socket and of a better color than the first.

And here the author inveighs against all the charlatans of his day who dared, without being dentists, to perform dental operations, and whose number, it would seem, was ever increasing, so much so that he is led to exclaim: "There will shortly be more dentists than persons affected with dental diseases!" In proof of this he relates the case of a cutler of Paris, who extracted the molar tooth of a young girl because black spots having appeared on it, he believed it to be decayed; but perceiving that he had only removed the crown (it was a deciduous tooth about to fall out), and thinking that he had broken the tooth, proceeded to extract the root, removing, in his gross ignorance, the permanent tooth on the point of coming through.

Returning to the indications for the extraction of teeth, Fauchard says that when a tooth planted irregularly in the mouth cannot be straightened by any of those means to which he afterward alludes, and occasions damage or inconvenience or constitutes a deformity, the sole remedy is its removal. As to decayed teeth and the pain that they produce, when the evil cannot be remedied with oil of cinnamon or oil of cloves, with the actual cautery, or by stopping, one must have recourse to extraction, and this to satisfy four different indications, that is, before all, to procure the cessation of violent pain; in the second place, to prevent the caries from being communicated to the neighboring teeth; thirdly, to remove the fetid smell deriving from the substances that are retained within the

carious cavity, and to impede the teeth on the same side from becoming covered with tartar, as inevitably happens when by reason of painfulness in eating they are forced to be inactive; fourth and lastly, because the dental caries, not infrequently gives rise to other diseases, which ordinarily cannot be cured unless the cause from which it arises be recognized and suppressed.

"Sometimes," continues Fauchard, "such violent and obstinate pain arises in a tooth that we are obliged to extract it, although not decayed nor presenting deformity."

The author combats the old prejudice, that it is not right to draw teeth in cases of pregnant women or of nursing mothers, lest the operation should prove dangerous to the patient or to the fetus, or produce alteration or arrest of the milk secretion. Only the fear arising from this prejudice can, according to the author, cause any of the dreaded contingencies. The dentist ought, therefore, to seek to dissipate the fears of these patients, by persuading them of the innocuous nature of the operation as well as of its short duration, and should represent to them, on the other hand (if the operation be really necessary), the advantages of promptly deciding on it, to avoid the harm and the peril that prolonged suffering and the tortures of sleeplessness might occasion to themselves as well as to the unborn child or to the suckling infant, such as abortion, premature confinement, alteration of the milk, etc.

According to Fauchard, "one should always take the precaution of hiding the instruments from the patient's sight, especially in the case of extracting a tooth, so as not to terrify him."

The author then speaks of cases where it is necessary to open the jaws by force;[1] of the instruments to be used; of the mode of employing them; of all the precautions to be observed under such circumstances; of the necessity that may eventually arise of sacrificing some one tooth when the enforced opening of the jaws has been impracticable; of the advisability of sacrificing preferably in such cases one of the premolars in order to damage as little as possible the masticatory function and the appearance of the face; of the instruments best adapted for carrying out this operation; of the danger it presents and of the best mode of avoiding it; finally, of what it is necessary to do in given cases to keep the mouth open, in order to not be obliged to repeat the operation a second time.

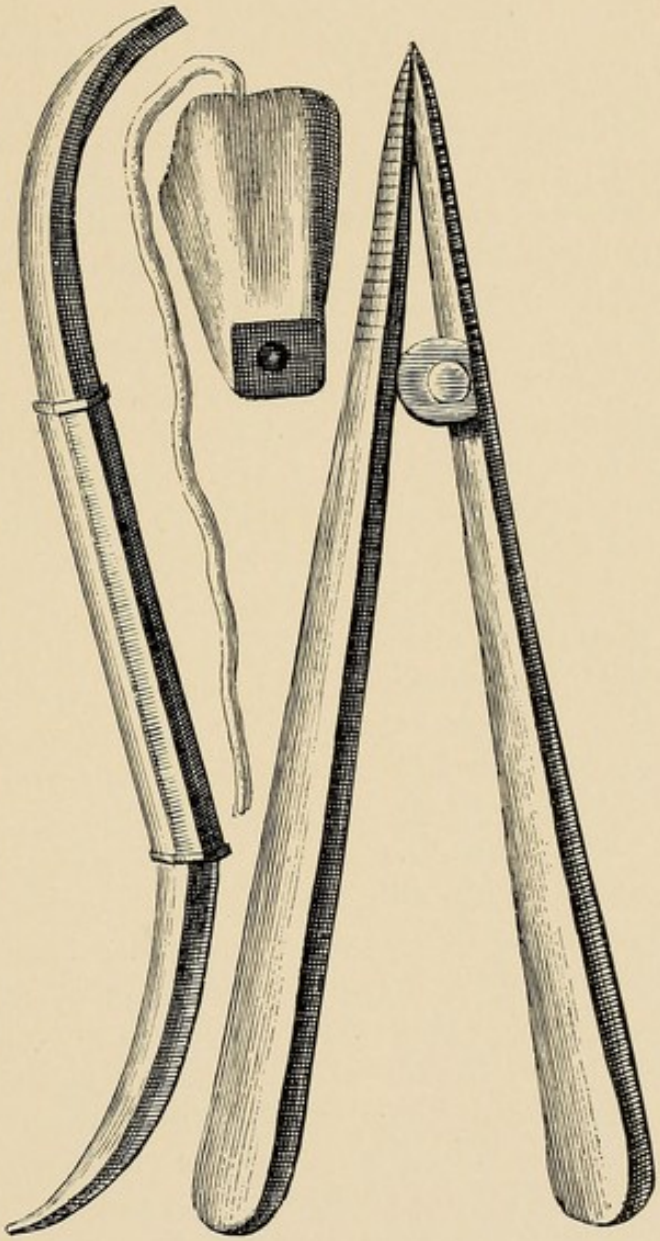
The six following chapters of the first volume treat very extensively of the anatomy and physiology of the gums,[2] of gingival diseases and their treatment.[3] The subject is treated in a masterly manner, although these chapters do not offer anything of original importance.

[1] Chap. xv, p. 205. [2] Chap. xvi. [3] Chap. xvii to xxi.

The same may be said of Chapter XXII, in which the author speaks of scorbutic affections and of their treatment.

The chapters we have cited are accompanied by four plates, representing thirteen instruments for use in the treatment of the above diseases.

FIG. 78



Instruments for opening the mouth in cases of lockjaw (Fauchard).

The author then speaks[1] of the accidents which may arise from caries and from other dental diseases, not only in the parts nearest to the teeth, but also in localities more or less distant from them, for example, fistulæ

[1] Chap. xxiii, p. 282.

reaching as far as the cheek bone or the eye, necrotic destruction of the maxillary bones, etc.

The first volume of Fauchard's work finishes with a collection of most interesting cases, which may be read even at the present day with pleasure, and from which one may derive some useful information. These cases are about eighty in number, spread over fifteen chapters, according to the various nature of the cases themselves. This valuable collection gives clear evidence of Fauchard's eminence both as operator and observer, and affords at the same time an idea of the extent of his practice which enabled him to collect so considerable a number of cases of more than common interest.

Chapter XXV contains some observations on "*well-authenticated cases*" of regeneration of permanent teeth in individuals of ages varying from fifteen to seventy-five years. We will here give two of them by way of curiosities:

"In the year 1708 Mademoiselle Deshayes, now the wife of M. de Sève, residing at Paris in rue de Baune, and who was then fourteen years of age, had the first large molar on the right side of the inferior jaw extracted by me, because decayed and causing pain. The following year she returned to have her teeth cleaned by me, and whilst doing this I observed that the tooth extracted had been wholly regenerated."[1]

"In the year 1720 the eldest son of M. Duchemin, player in ordinary to the King, who was then sixteen years old, came to me to have the second large molar on the left side of the lower jaw extracted. It was very much decayed. I drew it, and a year and a half after the tooth was completely regenerated."[2]

In Chapter XXVIII the author relates twelve cases of dental irregularities corrected by him with satisfactory and at times even surprising results. We here refer, in Fauchard's own words, to the last two of these cases, not because of their being the most important, but because from them it is evident that Fauchard was not the only dentist who undertook such corrections, although he was perhaps the only one who, in certain cases, carried them out with a rapid method.

"In the year 1719 M. l'abbé Morin, about twenty-two years of age, whose countenance was greatly deformed from the bad arrangement of the incisors and canines, consulted various colleagues of mine as to the possibility of correcting the irregularity of his teeth. Some found the thing so difficult that they advised him to do nothing at all, that is, not to risk any attempt. He came to me by chance one day whilst another dentist was with me. We both examined his mouth with much attention. Now, as this dentist was my elder, and I believed him to have more experi-

[1] Page 330. [2] Page 331.

ence than I had, I begged him to give me his opinion as to the best method to follow in this case, in order to insure success. Whether it be that he would not give me advice, or that he was not in a position to be able to do so, the fact is, that his answer was not such as I could have wished. I therefore felt myself obliged to tell him that I hoped to put this gentleman's teeth in order within three or four days. My colleague was not aware that this could be done so quickly; urged by curiosity, he returned when the time I had indicated had elapsed, and found, not without surprise, M. Morin's teeth reduced to perfect order."[1]

"Several years ago the wife of M. Gosset, Reviseur des Comptes, sent for me to examine the teeth of her daughter, then twelve years of age. I found the lateral incisor on the left side of the lower jaw strongly inclined toward the palate in such a manner as to constitute a real disfigurement. Interrogated by the mother as to the possibility of remedying this, I replied that it could easily be done in eight or ten days, with the method of threads, if the young girl were only sent every day to my house. As, however, the young lady received instruction from several masters who came to her house each day, my proposal was not accepted, in order not to distract her from her studies. This induced me to say to the mother that, if she were willing, I would put the crooked tooth into its natural position in a few minutes. Surprised at so short a time being demanded for the operation, she consented to my performing it immediately. Making use of the file, I began by separating the tooth from the neighboring ones which pressed upon it, slightly diminishing the space it ought to have occupied. This done, I straightened the tooth with the pelican, placing it in its natural position, to the great astonishment of the young girl's mother and of other persons present, who told me they had many times seen similar corrections that had been carried out by the late M. Carmeline and others, never, however, with this method or in so short a time. As soon as I had reduced the tooth to its normal position I fixed it to those next to it by means of a piece of common thread, which I left there eight days; and during that time I made the young girl rinse her mouth four or five times a day with an astringent mouth wash. After the tooth had become firm, it would not have been suspected that it had ever been out of its normal position."[2]

In Chapter XXX the author gives an account of five cases of dental replantation and one of transplantation. This last operation was carried out on a captain who had the upper canines on the left side decayed and aching; he inquired of the author if it were possible to draw it and replace it by another person's tooth. Having received an affirmative reply, the officer sent immediately for a soldier of his company to whom he had

[1] Page 368. [2] Page 370.

already spoken on the subject. This man's canine was found by Fauchard to be too large; nevertheless, for want of better he extracted and transplanted it, after having diminished it in length and in thickness. This it was not possible to do without the cavity of the tooth remaining open, and for this reason, when, after about two weeks' time it had become quite firm, he stopped it. But the stopping immediately caused such insupportable pain (which circumstance astonished the writer not a little) that he was obliged to take it out again the following day, on which the pain ceased directly. Fauchard saw this patient eight years afterward, and was assured by him that the transplanted tooth had lasted him six years, but that its crown had been gradually destroyed by caries. The root had been extracted by a dentist, not without considerable pain.[1]

We now give one of his cases of replantation in the words of the author himself:

"On April 10, 1725, the eldest daughter of M. Tribuot, organ builder to His Majesty the King, called on me; she was tormented by violent toothache caused by caries of the first small molar on the right side of the upper jaw; but although she was desirous of having the tooth removed, to be freed of the pain, she, on the other hand, could not, without difficulty, make up her mind, thinking of the disfigurement which its loss would occasion, and thus it was that she was induced to ask me if it would not be possible to put it back again after having extracted it, as I had already done in the case of her younger sister. I replied that this might very well be done, provided the tooth came out without being broken, without any splintering of the alveolus, or great laceration of the gum. The patient, upon this, completely made up her mind. I extracted the tooth very carefully so as not to break it, neither were the gum nor the alveolus injured in any way. I therefore was induced to put the decayed tooth back in its alveolus, and having done this, I took care to tie it to the neighboring teeth with a common thread, which I left in position for a few days. The tooth became perfectly firm, and only caused pain for two days after being replanted. . . . To better preserve it, I stopped the carious cavity."[2]

Not without interest is a case of disease of Highmore's antrum, originating in the following way. A charlatan attempted to extract by means of a common key a canine tooth which had erupted in an abnormal position. He applied the hollow of the key to the tooth and beat upon the handle with a stone. But the tooth, instead of penetrating into the hollow of the key, was driven into the maxillary sinus.[3]

Two important cases of "stony excrescence" of the gums (probably osteomas) are to be found in Chapter XXXII. One of these tumors

[1] Page 383. [2] Page 376. [3] Chap. xxxi, p. 391.

was removed by the dentist Carmeline after the patient had been tortured with useless operations by surgeons, who, not recognizing the true seat of the evil and mistaking it for a tumor in the cheek, had, over and above all the rest, produced a permanent disfigurement of the patient's face and a perforation of the cheek that he was obliged to keep closed for the remainder of his life with a wax plug, to prevent the exit of the saliva and of liquid or masticated aliments.[1]

Several important observations on obstinate cases of cephalalgia, prosopalgia, otalgia, and other varieties of pain arising from dental caries are to be found in Chapter XXXIII. In all these cases the removal of the decayed tooth or teeth procured the prompt cessation of pain. Among others worthy of note is a case of violent otalgia caused by the decay of a lower molar, which, however, was itself not painful. This circumstance drew Fauchard himself into error, causing him to believe that the otalgia was independent of the decayed tooth; he therefore merely stopped the tooth to prevent the caries from extending farther. The pain in the ear continued, however, and the patient therefore consulted a doctor of the Faculty of Paris, Coutier, who told her that the decayed tooth might be the cause of the earache, and that, therefore, before undertaking any other cure, she ought to have it extracted. This advice was followed and the earache ceased promptly and completely.[2]

In another case a patient twenty-seven years of age was tormented by violent pain in all her teeth on the left side, in the temple and the ear, as well as in the chin, the palate, and the throat. The doctors and surgeons consulted decided the cause to be rheumatism. The patient was bled not less than four times and subjected to various other methods of treatment (purgatives, clysters, poultices, etc.), but all in vain. She, however, perceiving that one of her teeth was decayed, had it taken out. It was believed that the cause of the malady had thus been found and removed; but an hour later the pain began again with the same violence as before, continuing for some months; after this it ceased of itself. On the return of the pain, later on, in all its former intensity, the patient consulted the very able surgeon Petit, who advised her to see Fauchard, as possibly the malady might have its cause and point of departure in some bad tooth. Fauchard found one of the inferior molars decayed. This being extracted, the pain promptly ceased, not to return any more.[3]

Chapter XXXV contains twelve cases of serious maladies arising from dental diseases. One of these cases was observed in a patient aged fifty-seven years, who in consequence of caries of the last inferior molar on the right lost through necrosis a considerable portion of the lower jaw, including the whole of the right condyle; he was affected,

[1] Page 397. [2] Page 411. [3] Page 418.

besides, with caries of the temporal bone, in so advanced a degree that the probe could reach the dura mater; he was, therefore, in serious danger of his life, had to undergo several surgical operations of exceptional gravity, and even after recovery remained permanently subject to various disturbances, such as a salivary fistula, paralysis of the lower eyelid, etc. And all this because the surgeons whom the patient had called in had directed all their attention to the secondary facts, instead of suppressing the primary cause of the evil, represented by a dental affection.

A case observed by the surgeon Juton and communicated by him to the author is also a very important one. The patient was suffering with a large abscess on the right side of the lower jaw, accompanied by such great swelling of the cheek that it was impossible to open the mouth wide enough to examine the teeth. Juton proposed opening the abscess immediately, but the patient would not consent. The following day he was sent for in great haste. The gathering had changed its seat, making its way between the skin and muscles of the neck, where it now formed so huge a tumefaction that the patient was in danger of being suffocated. The abscess was now immediately opened, but the swelling of the face still persisted; it was therefore only after a month had elapsed that it was possible to extract the root of the last molar, which had been the original cause of the whole malady. The surgeon observed that the liquid injected into the fistulous opening in the neck issued from the alveolus of the last molar. After the extraction of the root a prompt recovery was effected.[1]

The second volume of Fauchard's work is entirely devoted to operative dentistry and prosthesis.

Before speaking of the modes of cleaning, filing, and stopping the teeth, the author combats the opinion maintained by some, that these operations are in part useless, in part also dangerous, as having the effect of loosening the teeth, of depriving them of their enamel, and ruining them.

Fauchard then describes the instruments proper for detaching the tartar;[2] he speaks of the method to be followed in cleaning the teeth in order to not endanger the enamel;[3] he speaks of the different kinds of dental files, of their different uses in relation to the various cases and indications; of the precautions to be taken in making use of them;[4] of the instruments to be used for scraping and cleaning the carious cavities and of the mode of employing them.[5]

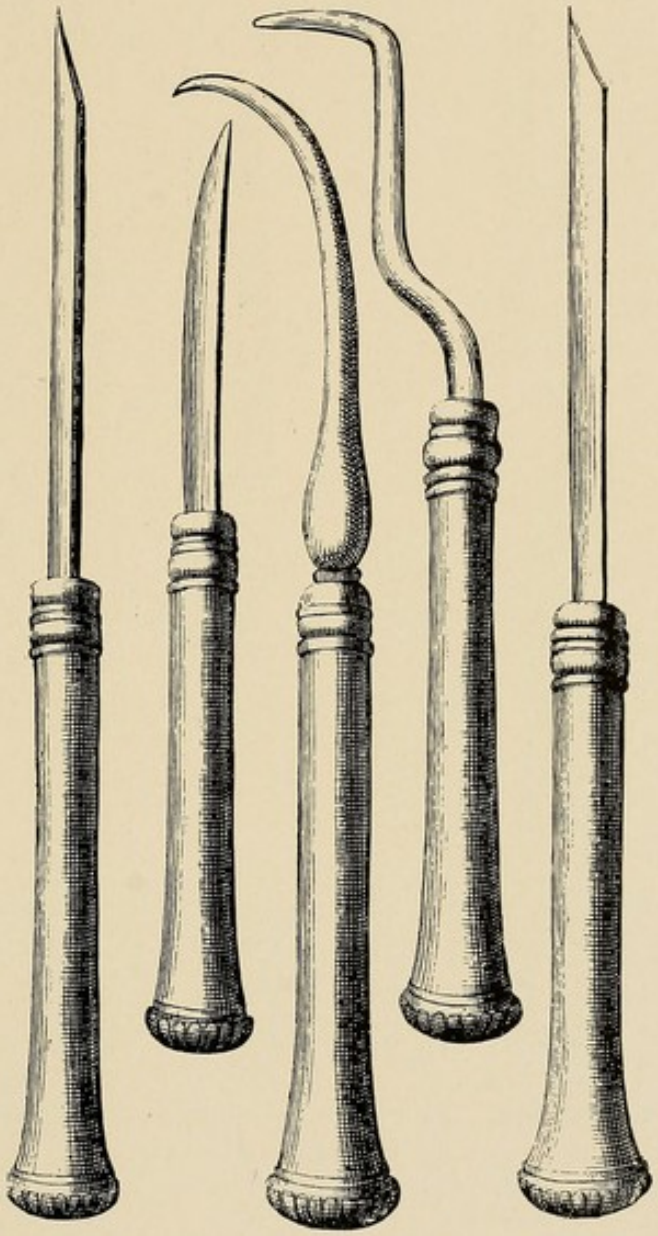
All of the above-named instruments are illustrated by figures, in contemplating which one cannot but reflect on the inferiority of the instruments then in use as compared with those of the present day. The greater

[1] Chap. xxxviii, p. 481. [2] Vol. ii, chap. ii. [3] Chap. iii. [4] Chap. iv. [5] Chap. v.

admiration is therefore due to Fauchard's talent, which, in spite of such imperfect and at times absolutely primitive means, enabled him to obtain the brilliant results cited in his observations.

Chapter VI is dedicated to the stopping of decayed teeth. The sole materials used by the author for stopping were lead, tin, and gold.

FIG. 79

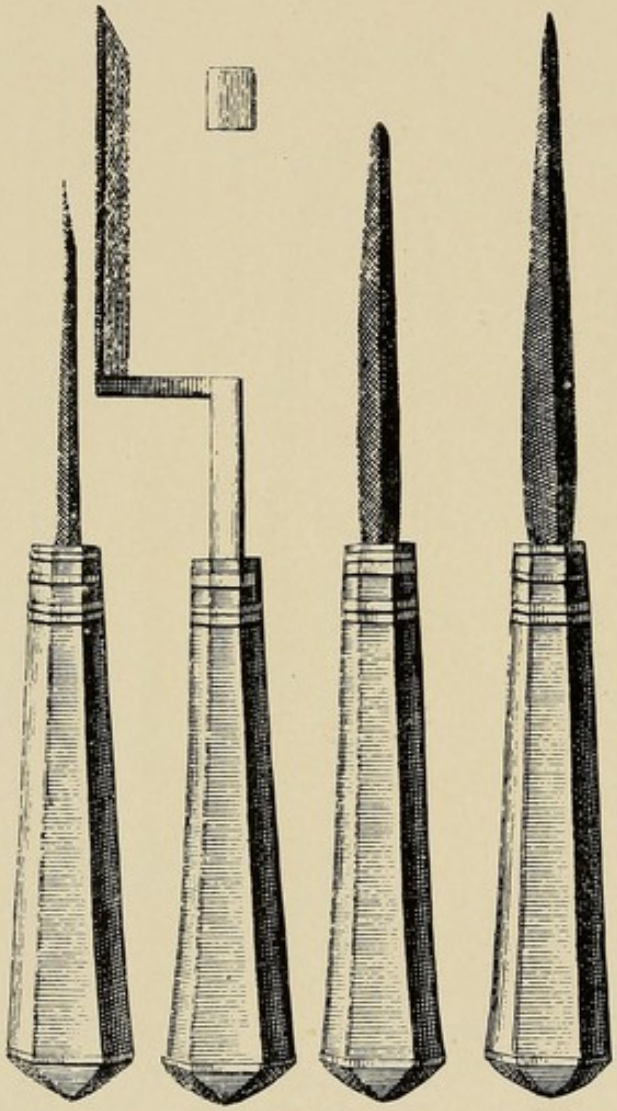


Instruments for detaching dental tartar (Fauchard).

"Fine tin," he says, "is preferable to lead, for lead turns black much more easily and is much less durable; both are preferable to gold, because lighter and adapting themselves better to the unevenness of the carious cavities. Besides, gold being dear, not everyone can or will make the corresponding outlay." The author here adds that those who, from

vanity or because possessed by the opinion that gold has special virtues, will not have their tooth stopped except with it, not unfrequently find dentists who, as the saying goes, content them and cozen them by using leaf tin or lead colored yellow, and making them pay for it as gold stopping!

FIG. 80



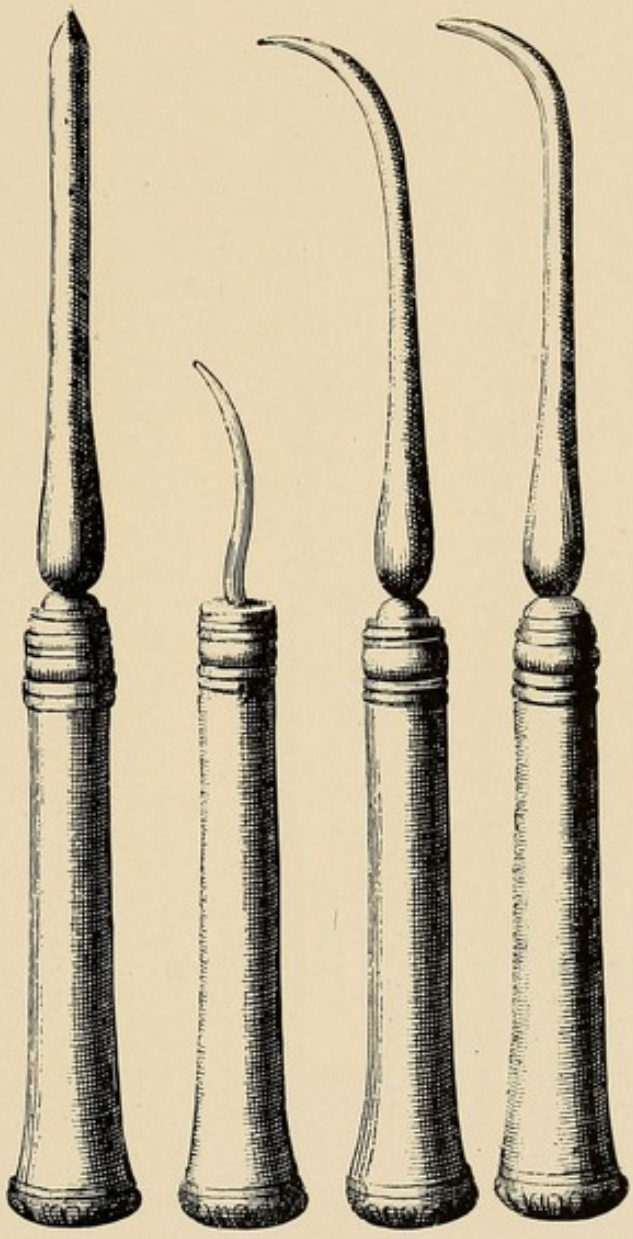
Some of the dental files used by Fauchard. The little square figure represents a small grooved wedge destined to be inserted in large interdental spaces, in order to give more firmness to the teeth to be filed.

The leaf metals were introduced and compressed into the carious cavities by means of three kinds of pluggers, which would nowadays be considered altogether insufficient and unfit for the purpose, but which then, nevertheless, served to produce excellent stoppings. The author speaks[1] of a lead stopping which had lasted in perfect condition for forty years.

[1] Vol. ii, p. 71.

Before stopping the tooth the cavity was scraped and its opening widened, if necessary, but no special form was given to the cavity itself, as is done at the present day.

FIG. 81



Instruments for scraping the carious cavities (Fauchard)

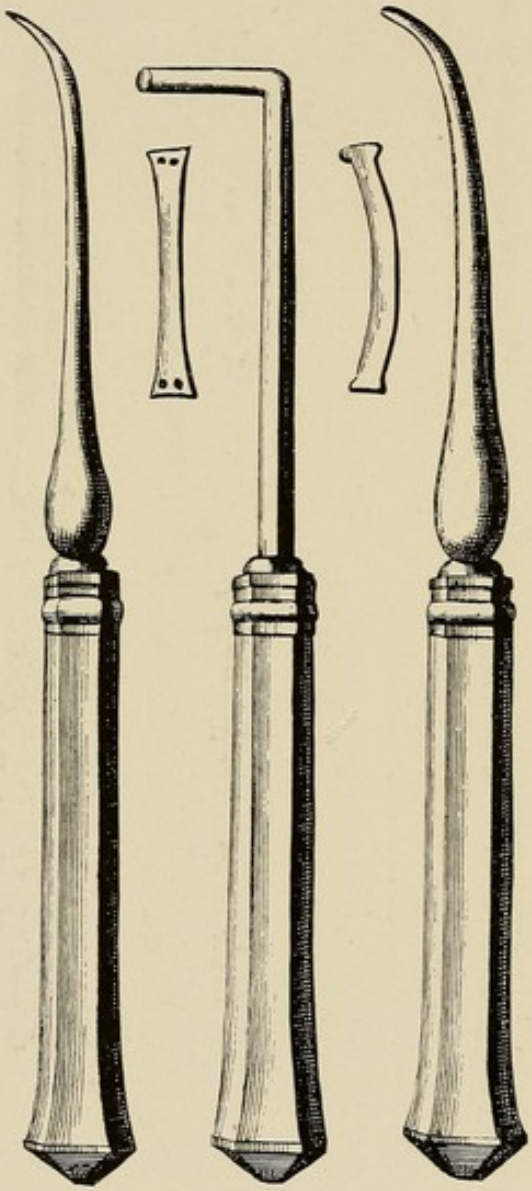
As at that time the state of the dental pulp was not taken into consideration before stopping a tooth, it often occurred that the stopping caused violent pain, which rendered its removal necessary.[1]

Fauchard says that "if the sensibility of the carious cavity be too great, the lead ought only to be pressed in very lightly at first, then after one or

[1] Vol. ii, p. 77.

two days a little more, continuing thus until it is properly compressed and fitted in, always provided, of course, that the pain does not increase. The sensitive parts of the tooth become thus more easily used to the pressure of the lead, and the pain is in this manner avoided or moderated."[1]

FIG. 82



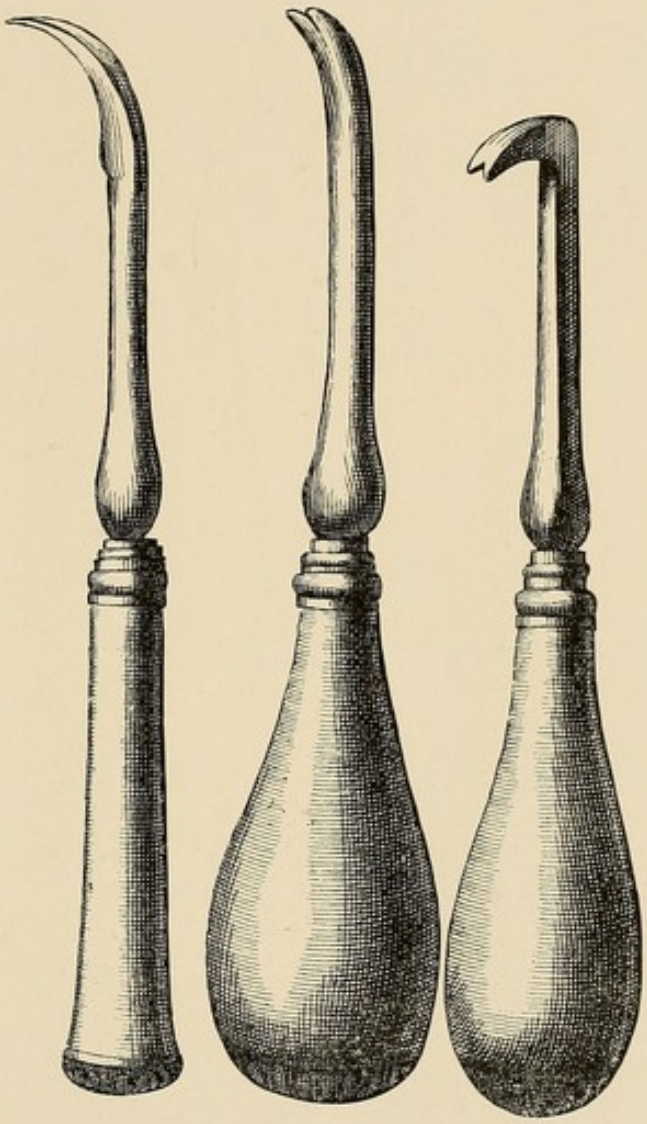
Three instruments for plugging teeth. The two small figures represent silver plates for straightening teeth (Fauchard).

The author also makes the remark[2] that sometimes, in scraping a carious cavity, "it is not possible to avoid uncovering and touching the nerve with the instruments; one becomes aware of this by the pain caused, and better still by a little blood issuing from the dental vessels." In such

[1] Vol. ii, p. 78. [2] Ibid.

cases, Fauchard advises stopping of the tooth immediately, for if it be carried out with delay, it is sure to be followed by inflammation and great pain, rendering necessary the removal of the lead or even the extraction of the tooth.

FIG. 83



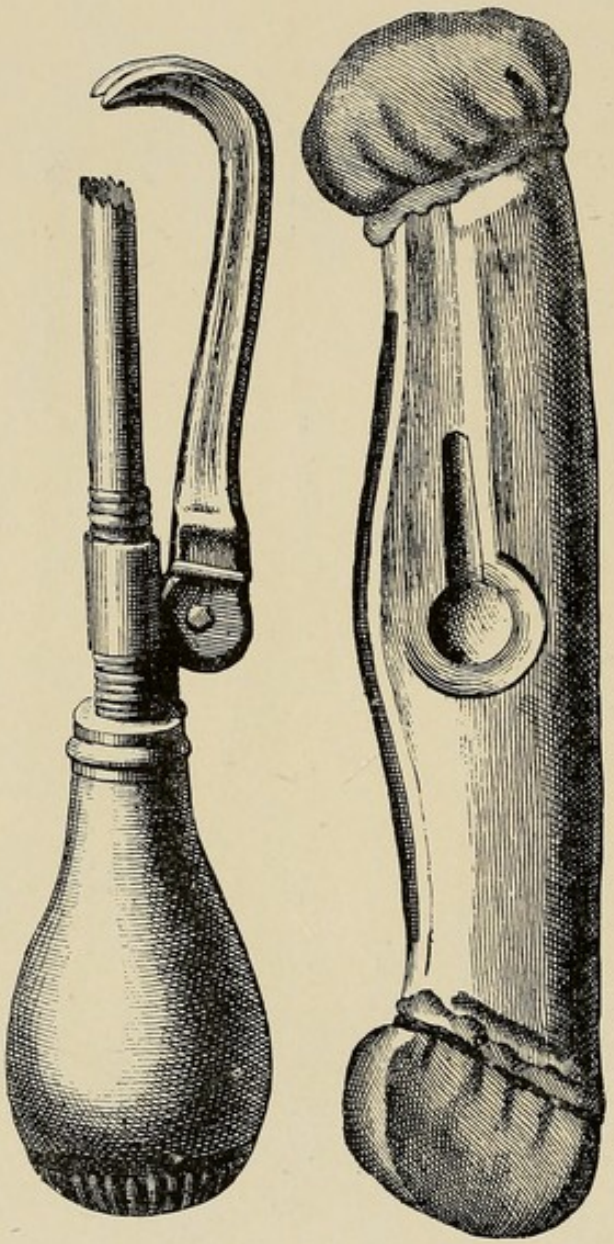
A gum lancet and two elevators, the second of which is destined to act from inside outward (Fauchard).

Cauterization of the teeth[1] continued to be much used in Fauchard's time, and this is very easily explainable when one considers that there was not then any other means of destroying the dental pulp. In making use of the actual cautery, the immediate end in view was to cause the cessation of obstinate toothache. "When the teeth give great pain and no relief is to be derived from the use of other remedies, one ought to cauterize the caries after having removed the extraneous substances that

[1] Chap. vii.

may eventually be found in the carious cavity. After the cauterization one scrapes the cavity and fills it up with cotton-wool soaked in oil of cinnamon. Later on one stops the tooth."[1]

FIG. 84



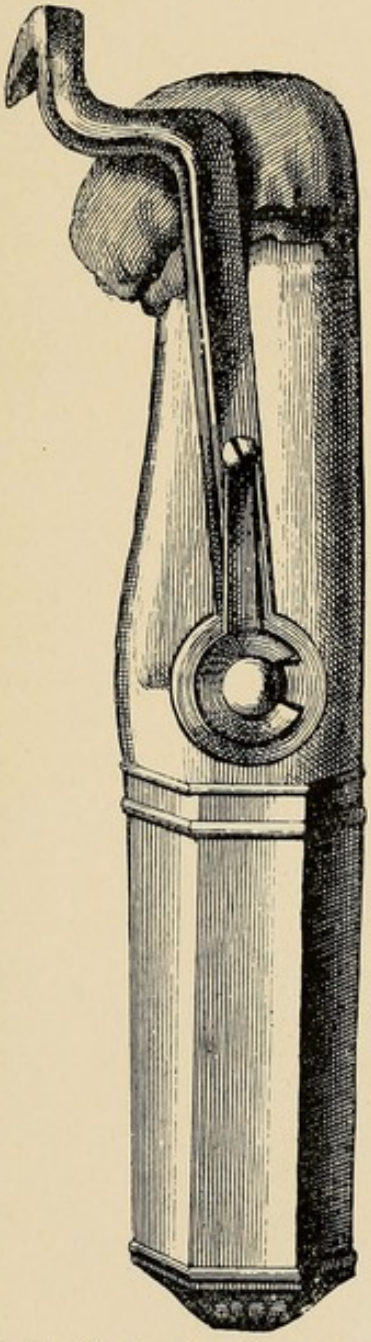
An extracting instrument called by Fauchard lever or tirtoire, and the handle of a pelican without the hooks.

The chapter in which Fauchard treats of the correction of dental irregularities is of particular interest. In speaking of his observations, we have already seen that in this field also he knew how to obtain splendid and admirable results. He, nevertheless, made use of the most simple

[1] Vol. ii, p. 80.

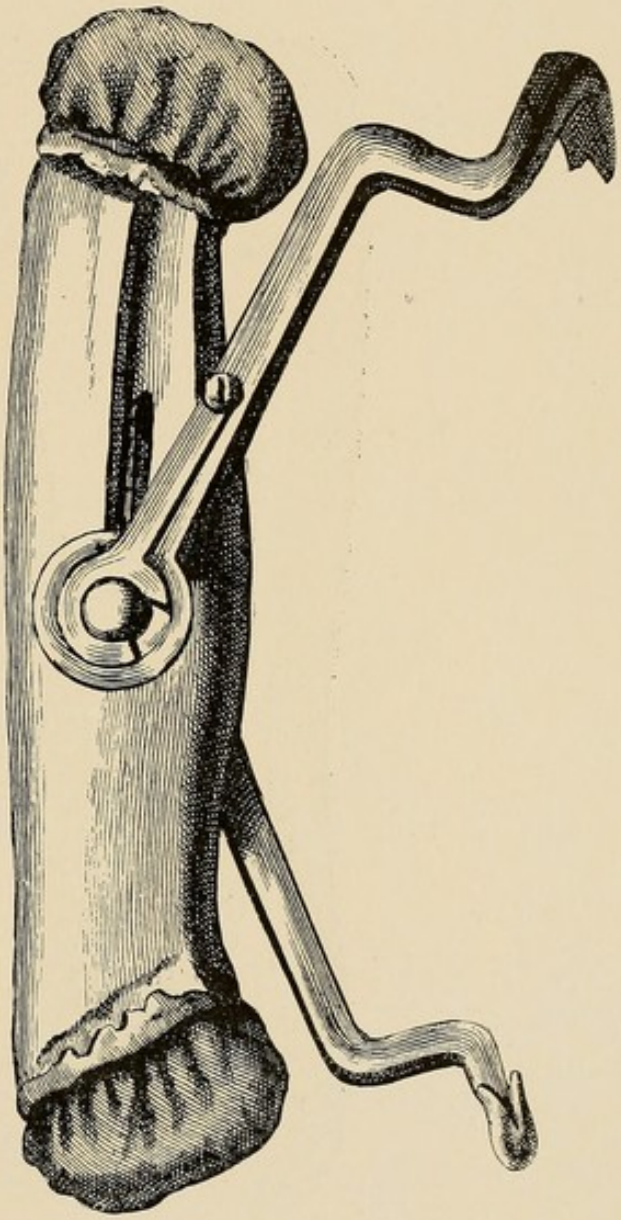
means—the file, pressure with the fingers, common threads or silk ones, little plates of silver or gold. At times, for straightening teeth, he made use of the pelican and the straight pincers, afterward tying the teeth in

FIG. 85



Fauchard's simple pelican (with one changeable hook).

FIG. 86



Fauchard's double pelican.

their normal position. He rarely had recourse to extraction as a means of carrying out dental corrections.[1]

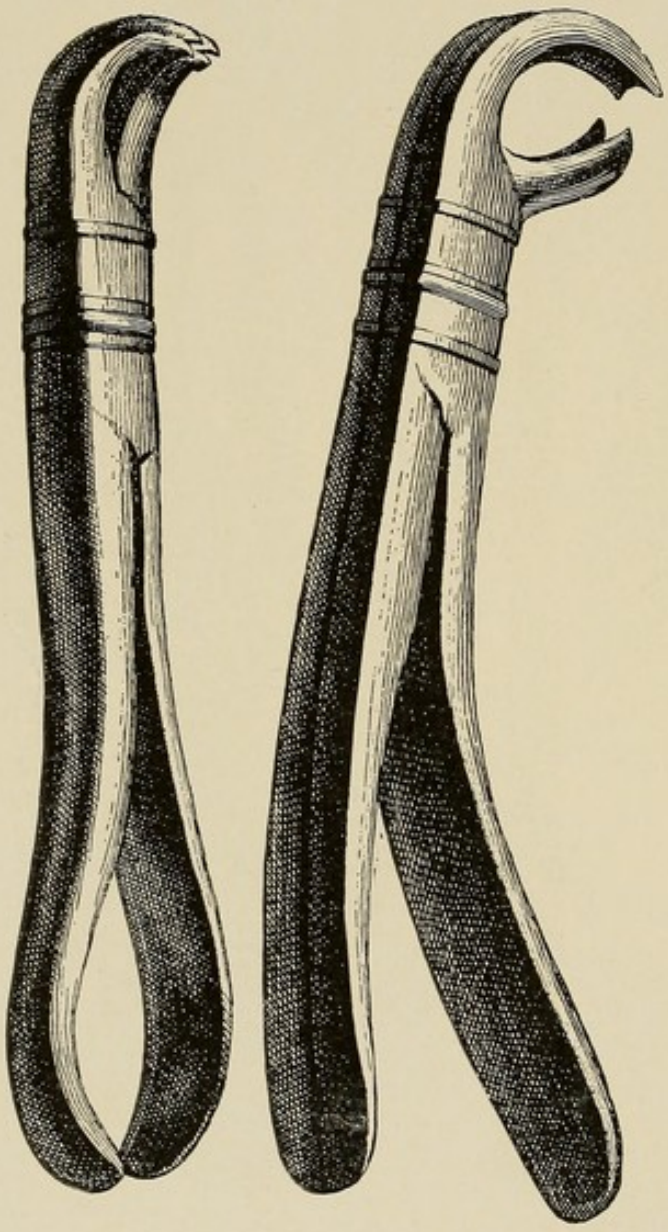
To steady loose teeth,[2] Fauchard, as did the ancients, made use of gold

[1] Vol. ii, chap. viii, p. 87.

[2] Chap. ix, p. 117.

threads. When the spaces separating a loose tooth from the neighboring ones were too large, he introduced small pieces of hippopotamus ivory into them of about the height of a line, and not exceeding the tooth itself in thickness; on each side of these was a vertical groove destined to serve as a support to the next tooth. Each of these pieces was furnished

FIG. 87



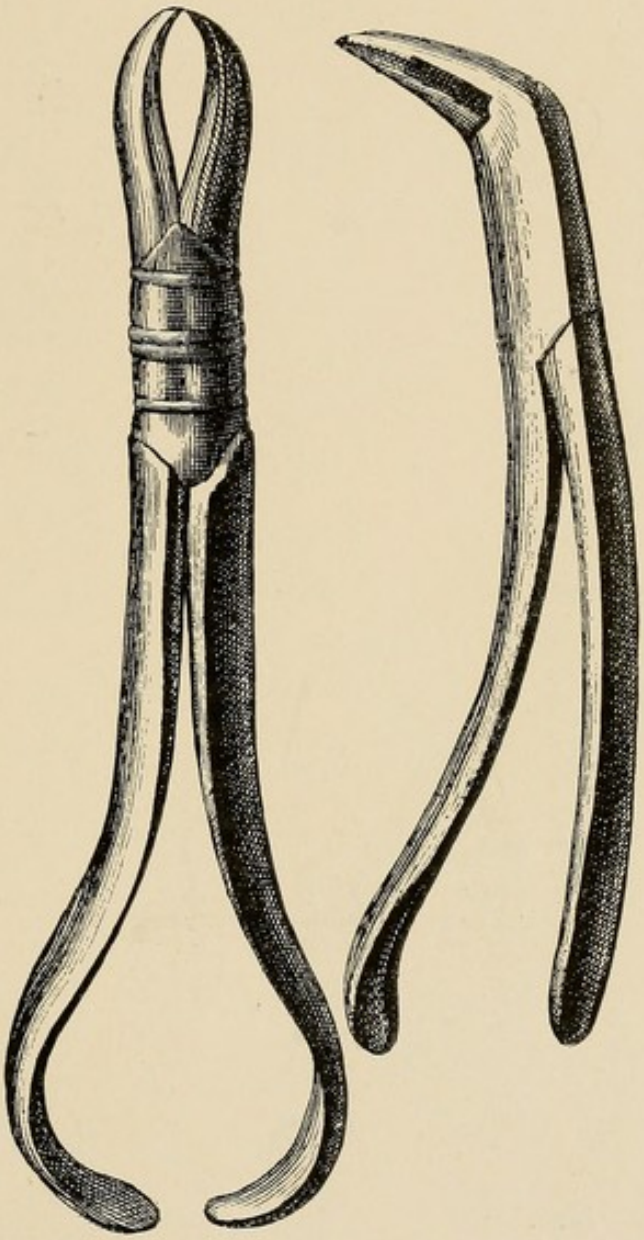
Dental forceps (Fauchard).

with two holes, through which were passed the gold threads which served to bind together the teeth and the piece of ivory itself. This latter was fixed close down to the gum.

Fauchard occupies himself in three different chapters (X, XI, XII) at great length with the extraction of teeth. He describes a pelican of

his own invention, and speaks of the advantages it presents over other pelicans previously in use. Notwithstanding this, it cannot be said that the instruments used by Fauchard for extracting teeth and roots show a sensible improvement on those in use before his time.

FIG. 88



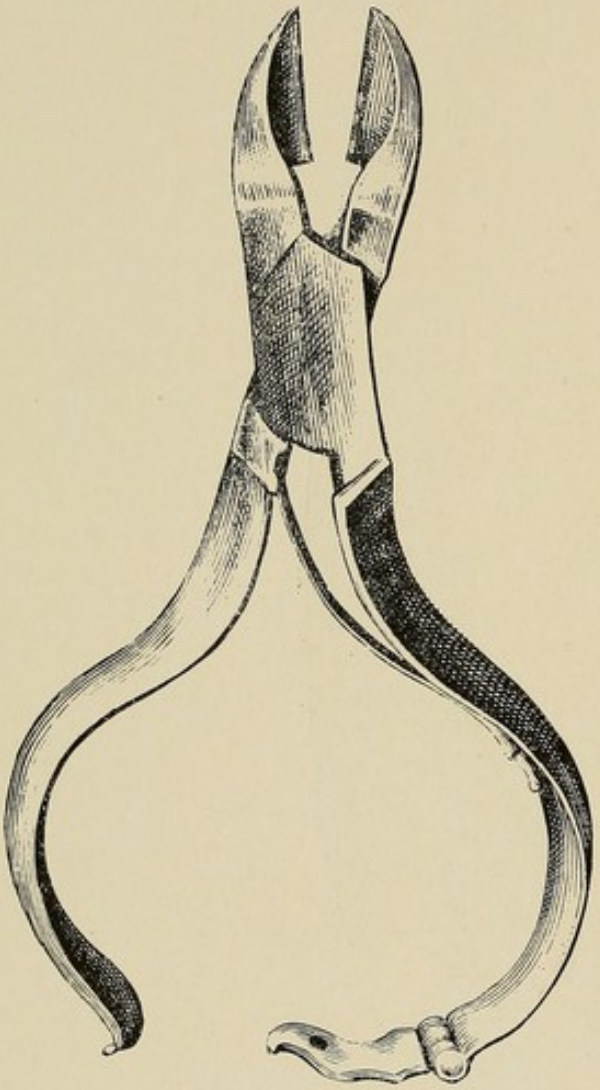
Straight forceps and crane's bill or crow's bill forceps (Fauchard)

Among the most usual operations, the author enumerates transplantation and especially replantation of the teeth.[1] Whenever, says Fauchard,

[1] Speaking of transplantation, he says: "On voit par des expériences journalières que des dents transplantées d'un alvéole dans l'alvéole d'une bouche différente se sont conservées plusieurs années fermes et solides sans recevoir acune altération, et servant à toutes les fonctions auxquelles les dents sont propres." (Vol. ii, p. 187.)

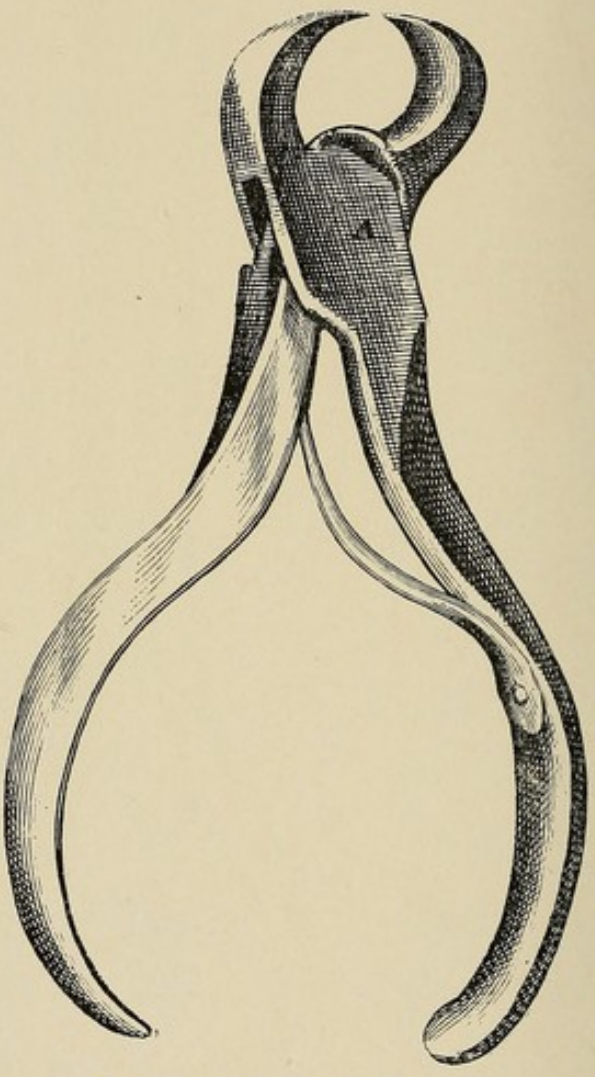
a wrong tooth is extracted by accident, it ought to be immediately replanted, and the same ought to be done when violent pain renders it necessary to extract a tooth that is not much decayed, as the patient is thus relieved without losing the tooth.[1] Fauchard adds that this operation succeeds excellently in the case of incisors and canines, and very often, too, with small molars.

FIG. 89



Cutting forceps (Fauchard).

FIG. 90



Cutting forceps (Fauchard).

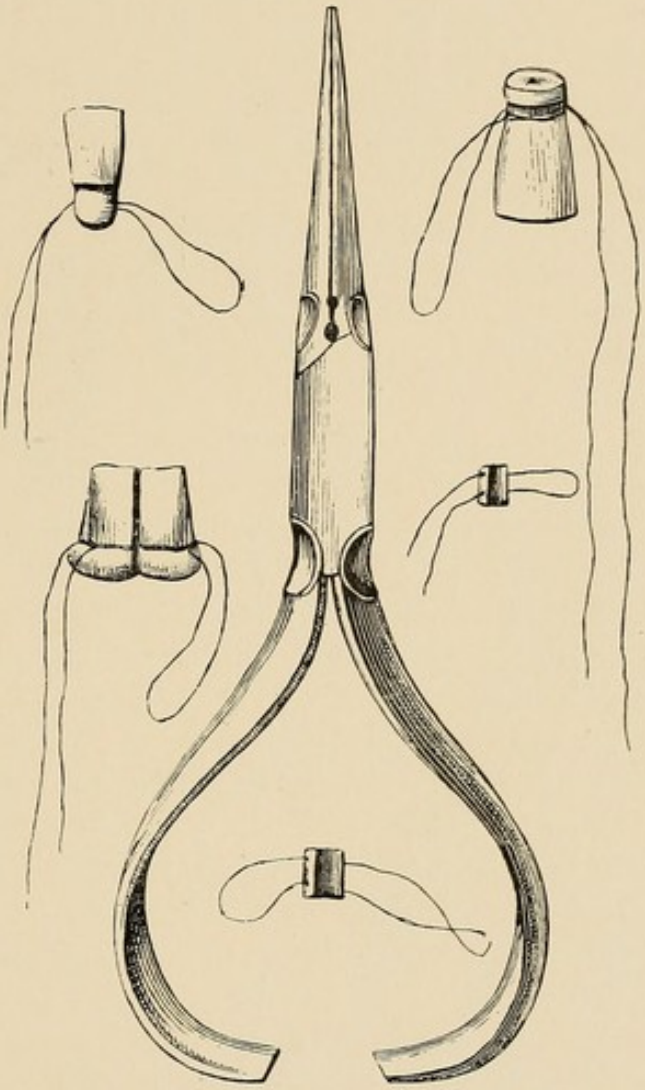
After having spoken of transplantation, he says:[2] "There is another mode of replacing human or natural teeth which I have never yet seen used except by a provincial dentist whose name I ignore." This special method consists in the transplantation of a tooth—it matters little whether recently extracted or not—after having made three or four notches in

[1] Page 188.

[2] Vol. ii, p. 192.

its root of about a line in depth. The author goes on to describe all the particularities of the operation, and then adds: "After twenty-five or thirty days one removes the thread, and the tooth is found to be firm in the alveolus, owing to the fact that this latter, exercising a pressure on the

FIG. 91



Pincers used by Fauchard in the operation of tying teeth with gold wire. The three larger figures represent natural or artificial teeth in which holes and horizontal grooves have been made in order to fix them with gold threads. The two smaller represent pieces of hippopotamus ivory with a vertical groove on each side, destined to fill large interdental spaces and to steady loose teeth by means of gold ligatures.

root on every side, becomes perfectly moulded upon it. In this manner, the tooth will remain mortised, and may be preserved for a considerable time."

This method, invented by an unknown provincial dentist, has been recently applied by Znamenski, of Moscow, for the implantation of artificial teeth made of porcelain, of caoutchouc, or gutta-percha.

One of Fauchard's greatest merits consists in the improvements introduced by him in dental prosthesis and in his having, besides, been the first to treat of this most important part of dental art in a clear and particularized manner.

The materials then most used in dental prosthesis were human teeth, hippopotamus tusks, ivory of the best quality, and ox-bone.[1]

The author minutely describes the methods to be followed to repair dental losses in every possible case and of whatever extent.

According to the circumstances, Fauchard used, for maintaining artificial teeth in their place, linen, silk, or gold thread, passed through holes made in them, and tied to the natural teeth.

When a set of two, three, four, or more teeth was to be applied, Fauchard first prepared them separately and then united them together by means of one or two threads of gold or silver in such a manner that the set formed at last a single piece, which was then fixed to the natural teeth. When the piece consisted of several teeth it was reinforced with a small plate of gold or silver fixed to its inside by means of small tacks of the same metal riveted on one side to the plate, on the other to the front part of each tooth.

The author remarks that a similar prosthetic piece lasted longer than those previously described, but required proportionately much more work and much greater expense. He adds that, by employing this plate, one can even dispense with threading and fixing the teeth together with gold or silver wire; but that it was then necessary to make a horizontal groove at the back of each tooth corresponding to the width and thickness of the plate, which could be fitted into the serial groove and fixed to each single tooth by means of two small rivets.[2]

At other times the prosthesis was carried out in a single piece of material (ivory, hippopotamus tusk, etc.) that was carved in such a manner as to substitute exactly the teeth wanting, it being fixed to the natural teeth in the usual manner.

Fauchard sometimes left the dental roots in their place (if they were in good condition), applying upon them artificial crowns, which he either bound to the neighboring teeth or fixed with screws to the respective roots.

"When one wishes to apply an artificial crown to the root of a natural tooth, one files away the part of the root that emerges above the gum, and even more if possible. One then removes, with proper instruments, all that is decayed in the root itself; after which one stops the root canal with lead and fits the base of the artificial tooth to the root in such a manner that they correspond perfectly to each other. One drills one or two holes in the tooth through which to pass the ends of a thread, which serves to fasten it to the natural teeth on each side of it, as described above.

[1] Vol. ii, chap. xiii, p. 215.

[2] Vol. ii, pp. 217 to 224.

"If the root canal has been very considerably enlarged by the carious process, so as to have rendered it necessary to stop it, the root being, nevertheless, still quite steady, one bores a small hole in the lead as deep and as straight as possible, without, however, penetrating farther down than the root canal. The artificial crown is then united to the root by a pivot in the manner I shall now describe."[1]

The method of applying pivot teeth is described with great accuracy. In it the author considers all the different circumstances that may present themselves, and says, among other things, that if the root is still sensitive to pain, one should apply the actual cautery inside the canal, before fitting the artificial crown to the root. For fixing the pivot inside the artificial crown (which was generally the crown of a human tooth), Fauchard used a special cement made with gum lac, Venetian turpentine, and powdered white coral.[2]

In the case of there not being any whole teeth to which the prosthetic piece would be fixed, but only roots, Fauchard made two holes in it in perfect correspondence with the canals of two roots, and fixed the prosthetic piece to these by means of two pyramidal screws.[3]

This method suggests in a certain way the idea of bridge-work.

In Chapters XVII, XVIII, XXIV, and XXV, Fauchard describes various methods for the application of entire sets of false teeth, both upper and lower, as well as double.

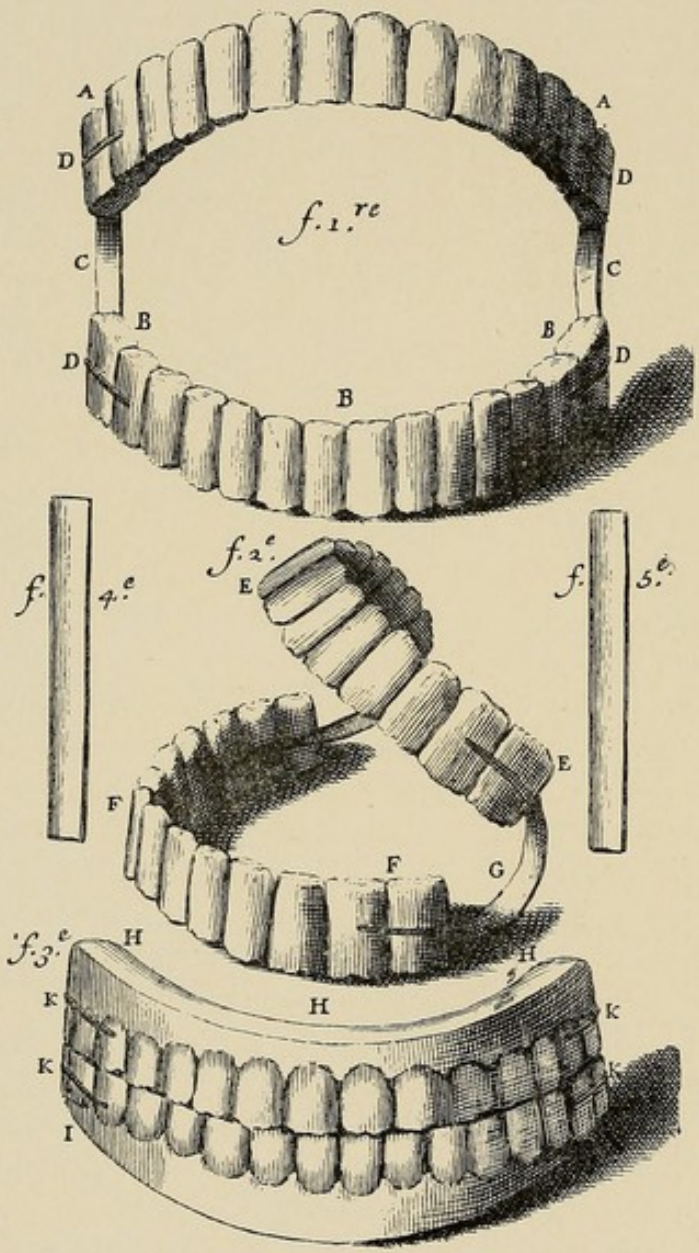
The author says that if the lower jaw is entirely toothless, a set of teeth can be adapted thereto without the need of any special contrivance; however, it is necessary that the prosthetic piece should fit perfectly, so that the configuration of the maxillary arch and the irregularities of the gum, finding themselves in complete correspondence with the piece itself, may keep it steady in its place. The support offered by the tongue interiorly, by the cheeks and the under lip exteriorly, contributes to keep the artificial set steady; one can thus masticate as easily with it as with one's own teeth, especially if the teeth of the upper jaw be still existing and the individual be already sufficiently used to the wearing of it.[4]

With regard to the application of an entire set of upper teeth, one learns from Fauchard that although some attempt had been made in this direction before this time, the results had been very unsatisfactory. He relates that: "In 1737 a lady of high rank, of about the age of sixty, who had not lost any of her lower teeth, but was deprived entirely of the upper ones, applied to M. Caperon, dentist to the King, who was most able in his profession, in the hope that he might be able to furnish her mouth with an upper set. But he said that, no tooth whatever being left in

[1] Vol. ii, p. 225.
[2] Vol. ii, p. 229.
[3] Chap. xvi, pp. 252, 255.
[4] Vol. ii, chap. xvii, p. 260.

existence, every possible point of attachment was wanting, and it would therefore be as difficult to do this as it would be to build in the air."[1] He, however, directed the lady to Fauchard, who asked for a few days to think the matter over, and succeeded in devising a means of applying an

FIG. 92



Complete dentures (Fauchard). *f.* 3 represents an enamelled denture with artificial gums; *f.* 4 and *f.* 5, steel springs.

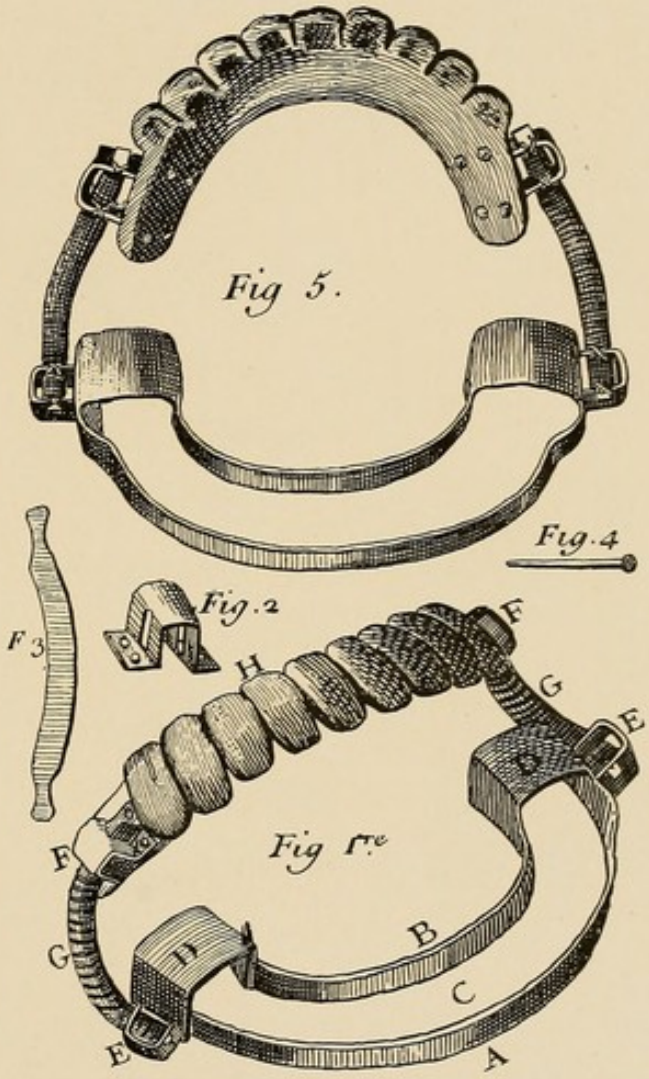
upper set of teeth, which, in fact, entirely satisfied the wishes and wants of the client. "As this lady," says the author, "simply wished to have the front of her mouth decorated, and to be able to pronounce more perfectly,

[1] Vol. ii, chap. xxiv, p. 339.

I gave less extension to the set. The lady eats easily with it and could not now do without it. For greater convenience she has two similar sets, which she uses alternately."[1]

The author describes with great minuteness the manner in which the prosthetic apparatus in question was constructed and supported, and then

FIG. 93



An upper denture supported by springs fixed to a gold appliance which embraces the natural teeth of the lower jaw (Fauchard).

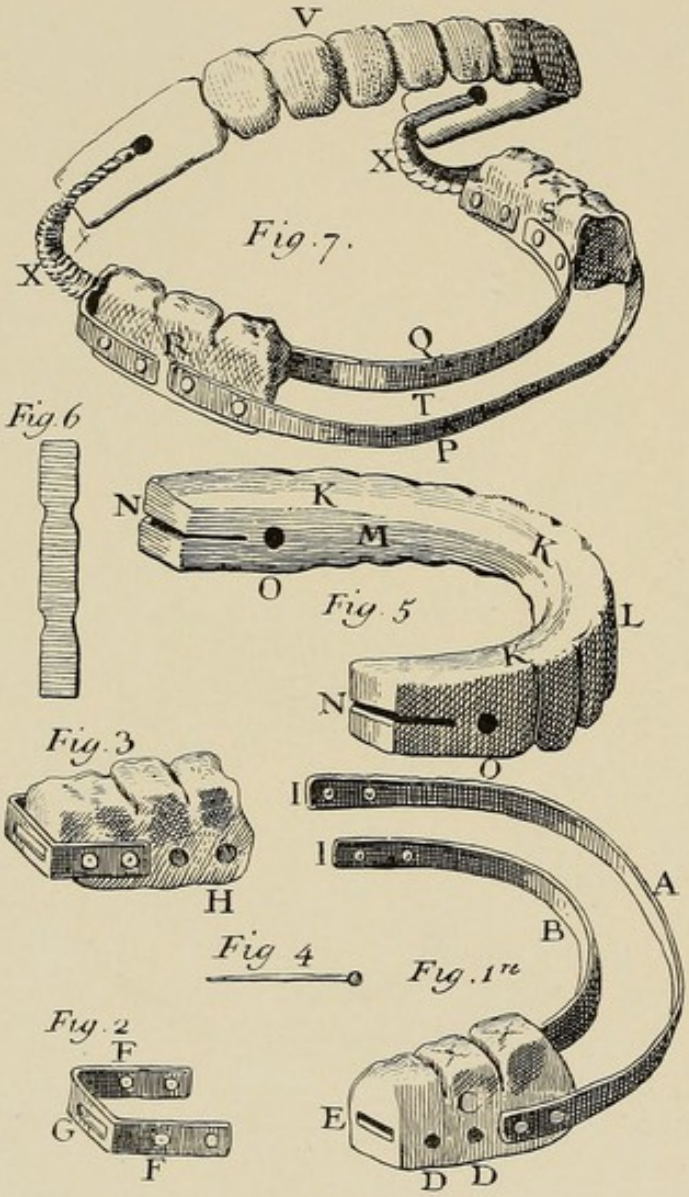
speaks of the successive improvements introduced by him into this most important part of prosthetic dentistry, particularly in what regards the springs destined for the support of the upper set of teeth.

Fauchard also relates having made an attempt to apply an upper set of teeth without the aid of springs, which proved successful in three cases. "One can," says he, "adopt an entire set of teeth to the upper jaw, of

[1] Vol. ii, p. 340.

much greater simplicity than those described, and which is maintained in its place by the sole support of the cheeks and the lower teeth. It must be very light indeed and serves almost solely to improve the appearance and the pronunciation; but when the individual gets used to it, he can also masticate with it. A set of teeth of this kind ought to adhere well to the

FIG. 94



A spring denture for a case in which the lower front teeth still exist. Figs. 1 to 6, various parts of the apparatus (Fauchard).

gums and to be constructed in such a manner that the cheeks may afford it sufficient pressure and support together with the aid of the lower teeth; these latter sometimes bring it back into its place, without anyone perceiving the movement except the wearer himself. Not long since I had to renovate a set of teeth of this kind made by me more than twenty-

four years ago, and worn by the owner to the greatest advantage. I have since made two others which have proved most useful to the persons wearing them. It is true that there are few mouths adapted for wearing these sets, so much so that, excepting the three referred to, I have never made any others. To be able to construct similar sets successfully, the dentist must be possessed of skill and ingenuity. Apart from this, they are the most suitable for persons who cannot spend much, as they cost less to make."[1]

Fauchard did not merely content himself with having perfected dental prosthesis in the manner alluded to; he also succeeded in giving a quite natural appearance to artificial teeth. To reach this end he placed the art of the enameller under contribution to the dental art. Thus he had artificial pieces covered over with enamel, imparting to them the hue that seemed to him best adapted, and also imitating admirably the natural color of the gums, so as to render the illusion perfect. The pieces to be enamelled were worked by special rules, which are minutely given in Chapter XIX of the second volume of his book.

Fauchard also brought the palatine prosthesis to a high degree of perfection. He describes five different obturators of the palate, which of themselves alone would be sufficient to testify to the highly inventive genius of the author, although they are defective in being somewhat too complicated. Some of these fixtures are a combination of a dental set and palatine obturator.

We ought now to mention, in the order of chronology, some authors of lesser importance.

Vasse and De Diest wrote about the danger of fatal hemorrhage following on dental operations.[2] They report a few cases of this kind, giving the blame of these accidents, however, to the carelessness of the operator.

Lavini published in Florence, in the year 1740, a very good treatise on dentistry (*Trattato sopra la qualità de' denti, col modo di cavarli, mantenerli e fortificarli*), which, however, marks no advance on the work of Fauchard.

M. Bunon (died 1749), a French dentist, wrote four admirable works on dentistry, which were published from 1741 to 1744. We will here briefly allude to the most salient ideas therein contained.

This author combated strenuously some prejudices then generally diffused; such as that of its not being advisable to extract teeth during pregnancy, and that of the extraction of an upper canine (eye tooth) being

[1] Vol. ii, p. 353.

[2] Jean de Diest, An hæmorrhage ex dentium evulsione chirurgi incuria lethalis? Paris, 1735. David Vasse, Hæmorrhagia ex dentium evulsione, chirurgi incuria lethalis, Paris, 1735.

attended with great danger. He demonstrated the absurdity of the latter idea by putting in evidence the anatomical fact that the upper canines are innervated by the infraorbital nerve, which does not stand in any relation whatever to the organ of sight.[1]

Among the other remedies recommended by him against the disorders and perils of first dentition, there is one most curious, not to say ridiculous: he advises rubbing the nape of the neck, the shoulders, the back, and the lower limbs of the child, but in doing this the friction should proceed from above downward, in order to offer resistance to the flow of humors toward the upper parts of the body. The utility and efficacy of this kind of massage in favoring the process of dentition seems, of a truth, very open to question.

Bunon speaks at length of *erosion of the teeth*, and declares himself to be the discoverer of this disease, which destroys the enamel of the teeth already before their eruption. The first molars, the canines, and the incisors are much more frequently damaged and affected by it than the other teeth. According to Bunon, it is generally due to measles, smallpox, malignant fevers, or scurvy, when children are subject to these maladies during dentition, and more especially during the first. He is of the opinion that erosion not only generates caries, but may be considered as being the origin of the greater part of dental affections.

This author distinguishes three principal kinds of dental tartar, the black, the pale yellow, and the brownish yellow; he admits, however, two other kinds that are less frequent, that is, the red tartar and the green.

He relates having observed in the jaw of a child, who died at the age of three years and a half, a splintering of the alveolar parietes in all directions, and attributes this phenomena to disproportion between the size of the teeth and the alveoli. On the basis of his anatomical observations, he says that caries only appears on teeth that have already come out of the gums, whilst erosion is produced in teeth not yet erupted, indeed, at times, several years previous to their eruption.

We will also mention, by way of a curiosity, Bunon's proposal to substitute the word legs for that of dental roots.[2]

Fr. A. Geraudy, a French dentist, wrote (1737) an excellent treatise on dental maladies and on the mode of preserving the teeth. His book, which was also translated into German,[3] contributed to the diffusion of knowledge relative to dental prophylaxis and therapeutics, but apart from this brought no increment to the progress of practical dentistry. Some

[1] M. Bunon, Sur un prejugé très-pernicieux, concernant les maux de dents qui surviennent aux femmes grosses, Paris, 1741.

[2] M. Bunon, Essai sur les maladies des dents, Paris, 1743. Expériences et démonstrations pour servir de suite et de preuves à l'essai sur les maladies des dents, Paris, 1746.

[3] Abhandlung von Zahnkrankheiten, etc., Strassburg, 1754.

of the ideas of the author, however, merit consideration. He clearly expresses the opinion that the shedding of the milk teeth is brought about by the pressure exercised upon them by the germs of the permanent teeth in course of development. The loss of the teeth in young subjects, or in those who have not yet reached forty years of age, is explained by the author in an altogether special manner. He relates that Louis XIV, at the age of thirty-five, had lost all his upper teeth, and the considerations he makes on the subject bring him to the conclusion that the precocious loss of the upper teeth depends in many cases on a paralysis of the nervous fibers that go to them, which paralysis is probably caused by a dissolute and intemperate life, having as its consequence the weakening of the organism and, above all, of the nervous system. Without doubt there is some truth in Gerauldy's ideas, it being well known that the falling of the teeth (as well as of the nails and the hair) often depends on nutritive disorders deriving from nervous disturbances. We have the clear proof of this in certain cases of tabes dorsalis accompanied by the spontaneous falling of the teeth and nails.

Joseph Hurlock, an Englishman, published a treatise in 1742,[1] in which he warmly recommends lancing the gums in cases of difficult dentition; he declares this to be entirely without danger, and affirms that it constitutes the sole means of salvation for not a few infants who without it would die of convulsions.

Mouton, in 1746, that is, in the same year in which the second edition of Fauchard's work was issued, gave to the light a monograph, the first extant, on mechanical dentistry.[2] The methods of this author for the most part do not differ from those of Fauchard, nevertheless one finds several important innovations in his work. To prevent the further deterioration of teeth already much destroyed, and to preserve them some time longer, Mouton had recourse to the application of "calottes d'or," that is, gold crowns. He used this for the front teeth as well as for the molars, but in the former case he had them enamelled to give them the same appearance as natural teeth.

Mouton also invented a new method of applying artificial teeth. Up to then the ordinary method had been that of fixing them to the natural teeth by means of threads passed through holes made in the artificial teeth expressly for that purpose. Mouton is the first to speak of artificial teeth fixed to the natural teeth adjoining them by means of springs or clasps.

This author relates having carried out several transplantations with perfect success, a thing that contributed greatly to his renown not only in France, but also in England. He distinguished himself, besides, by the

[1] A Practical Treatise upon Dentition or the Breeding of the Teeth in Children.

[2] Essai d'Odontotechnique, ou Dissertation sur les Dents Artificielles.

correction of dental irregularities. Lastly, it is to be noted that this author frequently had recourse, as a remedy against toothache, to the stretching of the dental nerve by means of moving and partially raising the tooth (subluxation).

A. Westphal. In proof of the great utility of lancing the gums in cases of difficult dentition, A. Westphal reports a case in which the difficult eruption of an upper canine tooth provoked considerable inflammation and protrusion of the eye on the same side as the tooth; these symptoms promptly disappeared, however, as soon as the gum was lanced down to the tooth itself.[1]

J. Bertin also declares himself in favor of this operation; he recommends never to neglect it in cases of difficult dentition, and to make the said incisions deep and wide enough.[2]

L. H. Runge, a surgeon of Bremen, published, in 1750, a monograph on the diseases of the frontal and maxillary sinuses. He says that in cases of inflammation of Highmore's antrum, the pus may make its way, corroding the bone, as far as the alveoli, or, sometimes, as far as the orbital cavity; and, *vice versa*, alveolar suppuration can give rise, by diffusion, to abscess of the maxillary sinus. In this latter, tumors of various kinds may form (polypi, cysts, sarcomas, cancers, exostosis), the existence of which is ignored at first, and only becomes manifest tardily. Runge's father, who was also a surgeon, had occasion to observe, and to treat an important case of disease of the maxillary sinus, with considerable dilatation of the same, not only on the side of the cheek, but also on the side of the palate and of the nasal fossæ. With a strong scalpel he perforated the outer wall of the antrum above the molars (keeping the cheek detached) and enlarged the aperture by making the instrument turn around on its own axis, thus giving exit to a considerable quantity of nonpurulent liquid. Detersive and aromatic injections were used for some time. The canine tooth, situated obliquely, having been extracted, its alveolus was found to communicate with the antrum. From this moment, the injections being continued, a rapid improvement was obtained and the patient was so completely cured that no deformity of the face remained.

Runge relates a case in which, having extracted a canine tooth, he found a cyst adhering to its root. From this he is induced to believe that in the case related above the disorder was also to be attributed to a large cyst having its origin in the root of the canine.

According to him, the ozena always stands in relation to a suppurative affection of the maxillary sinus, and for its treatment one must, therefore, have recourse to Drake's operations.[3]

[1] Sprengel, Part ii, p, 319. [2] Journal de Médecine, 1756.
[3] L. H. Runge. De Morbis sinuum ossis frontis, maxillæ superioris, etc., Rintel, 1750.

GEORG HEURMANN, a surgeon in Copenhagen, recommends making use, after the Cowper-Drake operation, of a small cannula in order to facilitate the exit of the pathological material contained in the sinus, and also to render it easier to introduce into it medicated or detersive substances.[1]

LÉCLUSE. One of the most celebrated French dentists of the eighteenth century is Lécluse. Dental literature was enriched by him with several works, partly written in popular style, partly addressed to dental specialists. In 1750 he published his *Traité utile au public, où l'on enseigne la méthode de remédier aux douleurs et aux accidents qui précèdent et qui accompagnent la sortie des premières dents, de procurer un arrangement aux secondes, enfin de les entretenir et de les conserver pendant le cours de la vie.* The work seems to have been very favorably received, as its first edition, printed in Nancy, was followed by a second, printed in Paris, only four years later. In 1755 he published another book: *Eclaircissements essentiels pour parvenir à préserver les dents de la carie et le conserver jusqu'à l'extrême vieillesse.* But the most important of his works is the *Nouveaux éléments d'odontologie*,[2] the first edition of which was published in 1754, and followed by a second in 1782.

We do not enter into a minute examination of these works, which, taken altogether, do not contain anything very new. We will only remark that Lécluse treated in a succinct but correct manner the anatomy of the mouth; invented some and perfected other instruments, the most important of which is the elevator that still bears his name, and finally, that he frequently performed the operation of replantation, warmly recommended by him as an excellent means of cure in certain cases of caries. The extracted tooth was stopped and afterward replanted, and, says Lécluse, became fast within eight days, proving as serviceable as a perfectly healthy tooth, and never again causing any pain.

PHILIP PFAFF, dentist to Frederick the Great, King of Prussia, was the first among the Germans who wrote a real treatise on dentistry. His book[3] contains, in 184 succinctly but well-written pages, the anatomical and physiological notions relative to the teeth, as well as all that belongs to dental pathology, therapy, and prosthesis.

Besides a few observations about supernumerary teeth, Pfaff relates several cases in which the incisors, inferior as well as superior, were renewed (twice consecutively), that is, once at the usual epoch, and the

[1] Sprengel, Part ii (?), p. 322.

[2] Nouveau éléments d'Odontologie, contenant l'anatomie de la bouche, ou la description de toutes les parties qui la composent, et de leur usage; et la pratique abregée du dentiste, avec plusieurs observations, par M. Lécluse, Chirurgien dentiste de Sa Majesté le Roi de Pologne, etc., Paris, 1754 (vol. in 12mo of pages viii–222 with six plates).

[3] Abhandlung von den Zähnen des menschlichen Körpers und deren Krankheiten, 1756.

second time between the seventh and thirteenth years. He also cites from the anatomical tables of Kulmus the following epitaph in low Latin, that seems to allude to a case of third dentition:

"Decanus in Kirchberg, sine dente canus, ut anus
Interum dentescit, ter juvenescit, hic requiescit."

In cases of hemorrhage ensuing on the extraction of teeth, the best hemostatic, according to Pfaff, is essence of turpentine, a remedy which in these cases he had always found efficient. He introduced a little ball of lint bathed in this essence as deeply as possible into the alveolus, applying upon it some blotting paper reduced to pulp or some dry lint that the patient compressed tightly by closing his teeth.

Gingival abscesses as well as fistulæ of the maxillary region almost always owe their origin, says Pfaff, to decayed teeth, and can, therefore, in general, not be cured except by the extraction of these teeth.

The prosthetic methods described by this author are, for the most part, identical with those of Fauchard and the other French dentists already mentioned. As to the materials used for prosthesis at different periods, Pfaff mentions, besides ivory, bone, hippopotamus tusk, teeth of sea cow, and human teeth, also teeth made of silver, of mother of pearl, and even of copper enamelled.

The chief merit one must concede to Philip Pfaff is that of having been the first to make use of plaster models. It is, therefore, to two Germans —Pfaff and Purmann, the latter who, as we have already seen, used wax models—that one of the greatest progressive movements in dental prosthesis is indebted, that is, the method of taking casts and making models, of which method one finds no trace whatever in the authors of antiquity, and which, it would appear, was not known even to Fauchard himself. The wax casts of an entire jaw were taken by Pfaff in two pieces, one of the right half of the jaw, and the other of the left; which were then reunited, and one thus avoided spoiling the cast in removing it from the mouth.

Another great merit of Philip Pfaff is that of having first carried out the capping of an exposed dental pulp, previous to stopping a tooth.

Notwithstanding this, Pfaff is not the first who, as Geist-Jacobi is inclined to believe,[1] *had dared to apply a filling over an exposed dental pulp without first cauterizing it.* As we have already seen, Fauchard did not hesitate in the least to fill a tooth when the dental pulp had become exposed in scraping the carious cavity. But the French dentist carried out, with much delicacy, a simple filling, whilst Pfaff first capped the dental nerve.

Jacob Christian Schaffer. In 1757 the evangelical pastor, J. Ch. Schaffer (we do not know if he was at the same time a dentist, or merely an

[1] Geist-Jacobi, p. 164.

amateur in odontology), wrote a little book[1] to disprove the existence of worms in decayed teeth, and to show the fallacy of believing that the

[1] Die eingebildeten würmer in Zähnen, Regenburg, 1757.

[Schaffer's publication is of considerable interest in that his illustration here reproduced exhibits one of the devices somewhat generally employed for the eradication of dental worms as a cure for toothache. In the title of his work Schaffer describes himself as Protestant preacher at Regensburg, member of the Royal Society of Fine Arts at Göttingen, of the Royal Society of Science at Duisberg, honorary member of the Fine Arts at Leipsic.

The several details of the plate are designated as follows:

Fig. I. The supposed worms, with single and double tails, or actually seed buds of the henbane driven out by heat, natural size.

Fig. II. Kidney-shaped seed of the henbane, natural size, without seed buds.

Fig. III. Another such seed, natural size, with the pith being driven out in bow-shape.

Figs. IV and V. Slightly magnified supposed entrails of the tooth worms, actually the inner basis substance for the development of the seed lobes.

Fig. VI. Portion of the skin and driven out supposed entrails of the tooth worms, strongly magnified: (*aa*) skin still attached; (*b*) supposed entrails.

Fig. VII. Seed same as Fig. II, magnified: (*a*) external pellicle; (*b*) seed bud.

Fig. VIII. Seed of Fig. III, magnified: (*aa*) external pellicle; (*b*) node; (*c*) seed bud driven out in bow-shape.

Figs. IX, X, and XI. Three kinds of supposed tooth worms, magnified; the lettering corresponds in all three: (*a*) head; (*b*) brown spot or mouth; (*c*) body; (*d*) apparent opening or anus; (*ee*) single or double tail; (*ff*) brown spot of the tail; also an apparent opening.

Fig. XII. Representation of the utensils and the mode in which they are arranged during the application of the supposed remedy against tooth worms: (*a*) earthen pot; (*b*) opening visible on one side; (*c*) opening in the bottom; (*dd*) iron passing through the two side openings, on which the wax balls (containing henbane seeds) are laid inside the pot; (*e*) smoke arising through the opening in the top, which is directed into the mouth; (*ff*) bowl of water in which the pot is set, into which the supposed worms fall and in which they are found after the cure.

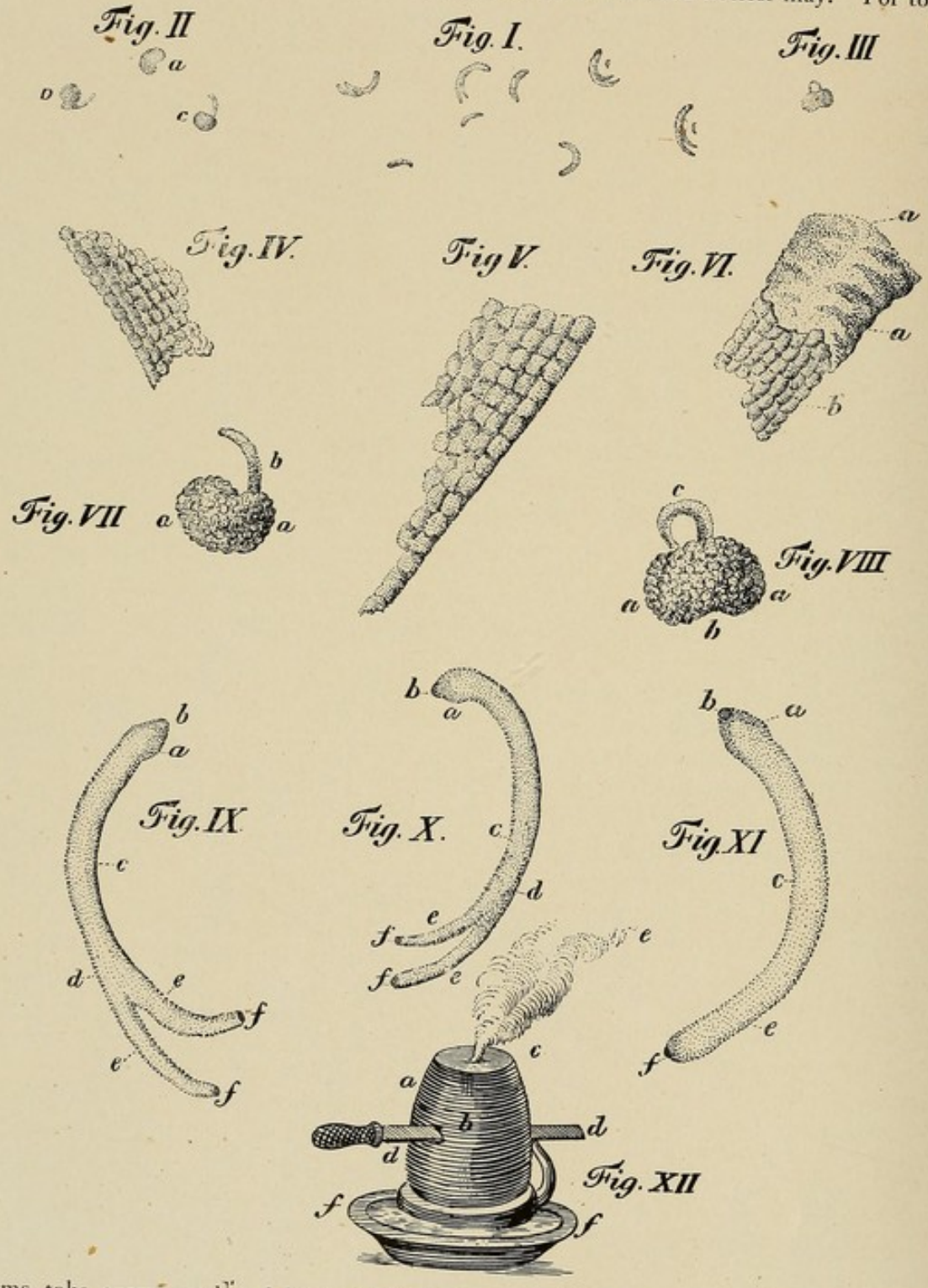
It would seem not at all improbable that the inhalation of vapors arising from heated henbane seeds might in some cases, *e. g.*, of odontalgia from pulpitis, produce a sedative effect by the action of the hyoscyamine given off. Assuming that the method possessed even a slight therapeutic value, that factor in connection with the apparently tangible evidence of the existence of tooth worms which it afforded to the ignorant, makes the method a most interesting example of the way in which superstition and ignorance about medical matters are kept alive and sustained by a very slight increment of truth.

Another interesting reference to the use of henbane seeds for the cure of toothache by fumigation as found in an old Saxon manuscript of the ninth or tenth century, a translation of which is published in Leechdoms, Worthcunning, and Starcraft of Early England, vol. ii, p. 51, a collection of documents illustrating the history of science in England before the Norman conquest, published under direction of the Master of the Rolls. The reference is as follows:

" For tooth wark, if a worm eat *the tooth*, take an old holly leaf and one of the lower umbels of hartwort and the upward *part* of sage, boil two doles (that is, two of worts to one of water) in water, pour into a bowl and yawn over it, then the worms shall fall into

supposed worms may be made to drop out by means of fumigations of henbane seeds. His book appeared, as a matter of fact, rather behind-

the bowl. If a worm eat the teeth, take holly rind over a year old, and root of Carline thistle, boil in so hot *water!* Hold in the mouth as hot as thou hottest may. For tooth



worms, take acorn meal, and henbane seed and wax, of all equally much, mingle *these* together, work into a wax candle and burn it, let it reek into the mouth, put a black cloth under, then will the worms fall on it."—E. C. K.]

hand, for in it Schaffer repeats in substance what Houllier had already said two centuries earlier, and after him various other authors, including Fauchard. At any rate, to coöperate in the complete destruction of error and in the diffusion of truth is always laudable. We feel, however, bound to add that in the very same year in which Schaffer's pamphlet was published, DUFOUR, a Frenchman, described a worm that had been taken out of a decayed tooth, and called attention to the fact that it was altogether different from the "dental worms" described by Andry.[1]

BOURDET. An excellent book on dentistry[2] appeared in France in the year 1757, the work of Bourdet, a celebrated dentist and elegant writer, in whom the gifts of literary and scientific culture were coupled with a vast experience and a profound spirit of observation. His merits procured him the honor of being appointed dentist to the King.

This author condemns as harmful the use of hard substances (such as bone rings, etc.) that people are in the habit of putting into children's hands during the period of the first dentition, in the idea that by pressing these objects between the gums, as children instinctively do, they cut their teeth more easily. As to emollients, he holds them to be completely useless, and prefers to all these remedies the use of lemon juice.

According to Bourdet, the teeth are so apt to decay, partly because of the frequent changes of temperature to which they are exposed, and partly because, differently from the bones, they are not provided with any protective organic covering.

In many cases of caries, Bourdet extracted the tooth, filled it with lead or gold leaf, and replanted it; but if, in extracting, the alveolus had been somewhat injured (a thing very likely to happen with the instruments of the period), he replanted the tooth immediately, to preserve the alveolus from the damaging action of the air, and carried out the stopping at a later time.

Even in certain cases of violent toothache not depending on caries, Bourdet luxated the tooth and replaced it in position directly. But as some dentists had accused him of having passed off as new an operation already made known by Mouton since the year 1746, Bourdet defended himself by saying that whilst Mouton only shook the tooth, raising it a little, simply to distend the nerve, he, instead, effected a complete luxation, in order altogether to interrupt the continuity of the nerve. Anyhow, this operation was not new, as it had already been recommended and practised by Peter Foreest, in the sixteenth century, and in an even more remote epoch by the Arabian surgeon Abulcasis.

[1] Recueil périodique d'observations de Médecine, Chirurgie, etc., par Vandermonde, Paris, 1757, Tome vii, p. 256.

[2] Recherches et observations sur toutes les parties de l'art du dentiste, 2 vols., Paris, 1757.

Sometimes, when the permanent canine comes forth, it has not room enough, and therefore grows outward. In this case Bourdet extracts the first premolar; the canine then advances gradually of itself toward the space left by the extracted tooth, until it occupies its place exactly. He also counsels the extraction of the first premolar on the opposite side of the jaw, in order to preserve the perfect symmetry of the dental arch on both sides. When the arch formed by the jaws is too large and of an ugly appearance, Bourdet advises extracting the first upper and lower premolars, so that the maxillary arches may acquire a more regular form. In cases in which the defect of form exists only in the lower jaw, that is, in children who have protruding chins, Bourdet corrects this deformity by extracting the first lower molars shortly after their eruption, that is, toward seven years of age. In this manner, says the author, the lower jaw grows smaller and the deformity disappears. The inventor of this method, as Bourdet himself tells us, was the dentist Capuron.

Bourdet made prosthetic pieces, whose base, representing the gums and the alveoli, was made entirely of gold and covered over with flesh-colored enamel on the outside, so as to simulate the natural appearance of the gums; the teeth were adjusted into the artificial alveoli and fixed with small pins. At other times he made use of a single piece of hippopotamus tusk, in which he carved not only the base, but also the three back teeth on each side, whilst the ten front teeth were human teeth fixed to the base with rivets.

One of Bourdet's principal merits is that of having brought artificial plates to perfection by fixing them not, as heretofore, to the opening of the palate or inside the nose, but by means of lateral clasps fitted to the teeth.

In a special pamphlet, published in 1764,[1] Bourdet treats of the diseases of Highmore's antrum. To facilitate the exit of pathological humors from the sinus, after the Cowper operation, he introduced a small cannula, forked at one end, into the antrum and fixed the two branches of the fork to the neighboring teeth by tying.

In some diseases of the maxillary sinus (polypus, sarcoma, etc.) Bourdet recommends cauterizing.

Besides his principal work, the pamphlet on the diseases of Highmore's antrum, and some others of less importance, Bourdet wrote an excellent book on dental hygiene,[2] which had the honor of two translations, one German, the other Italian; the latter published in Venice in 1773.

This celebrated author inveighs bitterly against charlatans and quack dentists, and throws light on all their impostures. It appears, however, that in the midst of this despicable class, so justly condemned by him,

[1] Sur les dépôts du sinus maxillaire.

[2] Soins faciles pour la proprieté de la bouche et pour la conservation des dents, Paris, 1759.

there existed a courageous though unscientific operator, to whom posterity would have attributed due honor had his name been handed down, for he was the first, in all probability, to try the implanting of teeth in artificial alveoli. This is, at least, what we deduce from a passage in one of Bourdet's works, in which we read that a charlatan sought to impose on the public the belief that he could make a hole in the jawbone and plant therein an expressly prepared artificial tooth, which in a brief space of time would become perfectly firm and as useful as a natural one. Bourdet adds that an attentive investigation led to the recognition of the said tooth being simply that of a sheep. It would appear, therefore, that the operation had been in reality performed, it matters but little whether with the tooth of a sheep or with one of another kind.

JOURDAIN was another eminent writer on dental matters, at this period. Rather than a true surgeon-dentist like Fauchard and Bourdet, Jourdain was a general surgeon who had dedicated himself with particular predilection to the study and treatment of oral and maxillary diseases. And precisely for this reason his writings, although of great scientific importance, are far from possessing for dental art, properly so-called, the same value as the works of Fauchard, Bourdet, and other great dentists of the eighteenth century. His works, as Geist-Jacobi justly observes, give us the impression of his having been a theorist rather than a practical dentist.

In 1759 Jourdain described in the *Journal de Médecine*[1] an improved pelican and another instrument to be used for straightening teeth inclined inward. Two years later he published his treatise on the diseases of Highmore's antrum and on fractures and caries of the maxillary bone.[2] After this, appeared his book on the formation of the teeth.[3] He therein describes with great accuracy the dental follicle from its first appearing to the moment of birth, following it throughout its evolution. This lengthy book is most interesting, for it is not a mere compilation, but gives the results of personal research and experience. But by far the most important of all the works of this author is his treatise on the diseases and surgical operations of the mouth.[4] This book went through several French editions, was translated into German in 1784, and has had, besides, two English editions in America of comparatively recent date, that is, at Baltimore in 1849, and at Philadelphia in 1851; all of which proves

[1] Vol. x, pp. 47 to 148.

[2] Traité des dépôts dans le sinus maxillaire, des fractures et des caries de l'une et de l'autre mâchoire, Paris, 1761.

[3] Essais sur la formation des dents, comparée avec celle des os, suivis de plusieurs expériences tant sur les os que sur les parties qui entrent dans leur constitution, Paris, 1766.

[4] Traité des maladies et des opérations réellement chirurgicales de la bouche et des parties qui y correspondent, suivi de notes, d'observations, et de consultations interessantes, tant anciennes que modernes, 2 vols. 8vo, Paris, 1778.

the great value of the work; it treats, however, much more of general surgery of the mouth and neighboring regions than of dental art properly so called. The first volume of 626 pages is almost entirely dedicated to the diseases of the maxillary sinus, which, for this author, were ever the object of favorite and particular study. He is not in favor of carrying out irrigation of the antrum through the mouth, even when an alveolar opening has resulted spontaneously through the extraction of a decayed tooth; he prefers instead, whenever this is possible, the reopening of the nasal orifice, by means of sounds and cannulæ adapted for the purpose, that is, varying in thickness and in length, and curved according to the necessities of the case. The natural opening of the antrum being reëstablished, one irrigates the cavity through it by means of a cannula to which a small syringe has been screwed. When the teeth are sound, notwithstanding the diseased condition of the antrum, Jourdain is absolutely contrary to the performing of the Cowper-Drake operation. When, on the contrary, the malady owes its origin to decayed teeth, Jourdain extracts them, but, as already said, carries out the detersive and medicated injections through the natural opening.

The author divides the collections of the maxillary sinus into purulent and lymphatic. The purulent are painful and corrode the bone, the lymphatic are not painful and do not corrode the bone, but distend and soften it, producing external tumefaction which yields to pressure, and, on this being diminished, gave out a characteristic sound. These so-called lymphatic gatherings referred to by Jourdain are none other than mucous cysts of the maxillary sinus. Also the other diseases of Highmore's antrum (polypi, etc.) are taken by this author into attentive and minute consideration.

The second part of the work is dedicated to the other diseases of the maxillary bones (especially of the inferior one), as well as to those of the lips, cheeks, salivary ducts, gums, frenum linguæ, etc. Dental hemorrhage and difficult dentition are also spoken of in this volume.

The author relates, with regard to the latter subject, that he had observed, in corpses of infants who had succumbed to a difficult dentition, that the crowns of the erupting teeth were covered by the alveolar margins folded upon them. This, according to him, must be the reason why even lancing of the gums proves useless in some cases of difficult dentition; it is therefore necessary, whenever it is possible to recognize the existence of this state of things, to destroy the bony margins that oppose the erupting of the teeth; the author declares that he has frequently done this, with fortunate results.

In 1784 Jourdain published a treatise on artificial dentures.[1] He

[1] Réflexions et éclaircissements sur la construction et les usages des rateliers complets et artificiels.

therein specially speaks of a complete denture with four springs, perfectly adapted to the purpose of mastication. The author attributes the merit of its invention to MASSEZ, who had imagined it toward 1772. If we may judge, however, by what Joseph Linderer says,[1] this denture appears to have been too complicated, even when compared with those described by Fauchard.

LAMORIER and RUSSEL, contemporaries of Jourdain, also studied the diseases of the maxillary sinus, and published in the *Mémoires de l'Académie de Chirurgie*, vol. iv, several important cases of polypi and other diseases of the antrum. Lamorier is not in favor of the Cowper-Drake operation. He recommends perforating the antrum immediately above the first molars, or rather between it and the malar bone. In this he seems to have been influenced by the considerations that the wall of the cavity here presents the least thickness, and that this is the most dependent part of the sinus. But he did not always deem it necessary to make a perforation here, when a fistulous opening had previously formed in some other place. His method of operating is as follows: The jaws being closed, the angle of the mouth is drawn outward and slightly upward with a curved instrument called by the author a speculum; this done, the gum is incised below the molar apophysis and the bone laid bare, and then pierced with a spear-pointed punch. The opening is afterward enlarged if found necessary.

Several contributions to the knowledge of the diseases of the maxillary sinus and their treatment were made about this time by Beaupréau, Dubertrand, Caumont, Dupont, Chastanet, Doublet, David, and especially by Thomas Bordenave, who published an important work on this subject, collecting a great number of clinical cases of great interest. Speaking of the Cowper-Drake operation, he expresses the opinion that the tooth to be extracted is not the same in all cases, for if some one of the teeth situated below the maxillary sinus should either show signs of decay or be the seat of persistent pain, the choice should fall upon that one. If, however, these teeth are all apparently sound, the one should be chosen that, under percussion, is most sensible to pain. In those cases in which the choice is altogether free, Bordenave prefers the extraction of the first large molar, for the double reason that it is generally situated in correspondence to the central part of the cavity, and that it is separated from the antrum by a very thin osseous lamina. In certain cases, the maxillary sinus is divided, by body lamellæ, into various cavities, and then, as one easily understands, it may be necessary to extract more than one tooth for the evacuation of the pathological contents. When the teeth situated below the antrum have fallen out, or have been extracted

[1] Die Zahnheilkunde, Erlangen, 1851, p. 398.

some time, and their alveoli are in consequence obliterated, it will be better to have recourse to Lamorier's method. This method may besides be useful, according to Bordenave, either when all the teeth are sound and it would consequently be a pity to sacrifice any of them, or in special cases (such as large polypi of Highmore's antrum, extraneous bodies, etc.) in which the Cowper-Drake operation would not afford sufficient space.

L. B. Lentin, a German, in 1756, published a pamphlet[1] in which he recommended electricity as a means of cure for toothache. Other writers recommended the use of the magnet, which means of cure had already been advised for various affections by Patacelus. During the latter half of the seventeenth century, Talbot, J. J. Weckes, and P. Borelli related several cures of headache and toothache by the use of the magnet. In the eighteenth century F. W. Klaerich, a medical man in Göttingen, wrote that he had used the magnet advantageously in not less than 130 cases of toothache.[2] We find it recommended later by others, Brunner, and particularly J. G. Teske, who, in 1765, wrote a pamphlet entitled *New experiments for the curing of toothache by means of magnetic steel.*[3]

He considers the use of the magnet as the most efficacious of all remedies against toothache, and believes its action to be similar to that of electricity.

In the following year, however, the belief in the new means of cure was sensibly shaken by F. E. Glaubrecht, who declared that although the magnet calms or causes the cessation of the pain at first, it returns constantly and with much greater violence.[4] The curing efficacy of the magnet in cases of toothache was highly vaunted in France by Condamine.[5]

Pasch attributes the effects of the magnet to the chill produced in the parts to which it is applied; in proof of this he adduces the fact that if the magnet becomes heated by being kept some time in the hand, it loses its efficacy altogether, whilst on the other side one may obtain the very same beneficial results with a simple steel spatula, just on account of the action of the cold; finally, he adds that the chill produced by the magnet on the affected part explains very well not only the good, but also the bad effects which it produces in many cases, such as increase of the pain, inflammation, tumefaction, and even at times spasmodic contractions.[6] Thenceforth the enthusiasm for the magnetic cure diminished gradually, all the more so inasmuch as that shortly after the celebrated English

[1] Von der Wirkung der elektrischen Erschütterung im Zahnweh.

[2] Geist-Jacobi, p. 165.

[3] Neue Versuche zu Curirung der Zahnschmerzen vermittelst eines magnetischen Stahles, Königsberg, 1765.

[4] F. E. Glaubrecht, De odontalgia, Argentorati, 1766.

[5] Journal de Médecine, 1767, p. 265.

[6] Jos. G. Pasch, Abhundlung aus der Wandarznei von den Zähnen, etc., Wien, 1767.

dentist Thomas Berdmore ridiculed it by placing it in the same class as charms, exorcisms, and other foolish and superstitious means of cure.[1]

Adam Anton Brunner. One of the most distinguished German dentists in the second half of the eighteenth century was Adam Anton Brunner. His two principal works are the *Introduction to the science necessary for a dentist*,[2] and the *Treatise on the eruption of the milk teeth*.[3]

This author falls into various errors with regard to deciduous teeth. According to him they are twenty-four in number, and without roots; but these may develop in those milk teeth which in exceptional cases remain in their places after the period in which they generally are shed.

A milk tooth, says Brunner, ought never to be extracted unless there be manifest signs of the presence of the corresponding permanent tooth, or when it is painful and decayed. Badly grown teeth can often be put in order solely by the pressure of the fingers frequently repeated, but when this is not sufficient, one must have recourse to waxed threads or to special contrivances.

In applying a pivot tooth, he screws the pivot to the artificial crown and perforates the root canal only just sufficiently to admit the other extremity, which he drives in by little strokes of a hammer upon the crown, without its being necessary to use cement. We learn from this author that in his time there were turners and other craftsmen who occupied themselves with dental prosthesis.[4]

Brunner prefers gold for fillings to any other substance whatever.

J. G. Pasch, whose name we have already mentioned, relates the case of a young maidservant becoming suddenly affected with deafness, and who recovered her hearing completely on the eruption of one of her wisdom teeth. From a passage of this author's we learn that at that time many had recourse to the crushing of the infraorbital nerve as a cure for certain cases of toothache. He, however, decidedly rejects such a remedy, as it proves for the most part ineffectual and may, besides, produce very serious consequences. This author carried out many experiments as to the effects of acids on the teeth.[5]

C. A. Gräbner[6] recommends not deceiving children by extracting their teeth unexpectedly, but rather to persuade them of the necessity of the operation; for by deceiving them one loses their confidence, and in many cases inspires them with an invincible aversion to the dentist.

This author invented a so-called "calendar of dentition," for the

[1] Th. Berdmore, A treatise on the disorders and deformities of the teeth and gums, London, 1768.

[2] Einleitung zur nöthigen Wissenschaft eines Zahnarztes, Wien, 1766.

[3] Abhandlung von der Hervorbrechlung der Milchzähne, Wien, 1771.

[4] J. Linderer, vol. ii, p. 431.

[5] Geist-Jacobi, p. 166.

[6] Gedanken über das Hervorkommen und Wechseln der Zähne, 1768.

purpose of showing at a glance the period of eruption of each of the deciduous and permanent teeth, and as well for noting down the time at which the various teeth are changed, so as to avoid every possible error in this respect. This calendar consists of a figure or diagram representing the two dental arches, with transversal lines that separate the different teeth one from the other, the relative indications being also given.

The observations of this most sensible and conscientious dentist with regard to the extraction of teeth are worthy of note: "The haphazard pulling out of a tooth is an easy enough thing; the only requisites for doing this are impudence and the audacity natural to the half-starved charlatan. But to carry out the extraction of a tooth in such a manner that, whatever be the circumstances of the case, no disgrace may accrue to the operator or damage to the patient, requires serious knowledge, ability, and prudence."

RUEFF relates the case of a man, aged forty years, who, having made use of fumigations of henbane seeds to relieve himself of violent toothache, obtained the desired end, but at the same time lost his virile power. He, however, reacquired his force by the care of the author.[1]

THOMAS BERDMORE was the dentist of George III of England, and one of the first and most eminent representatives of the dental art in that country. Before him, no one had had the appointment of dentist to the royal family. In the year 1768 he published an excellent work on dentistry,[2] that was translated into various languages and went through many editions; the last of these appeared in Baltimore in the year 1844, that is, seventy-six years after the first English edition—a splendid proof of the worth and fame of this work.

Berdmore contributed to the progress of dentistry in England not only by his writings, but also by imparting theoretical and practical instruction to many medical students desirous of practising dental art as a specialty.[3] One of these was ROBERT WOOFFENDALE, who went to America in the year 1766, and was the first dentist whose name is there recorded.

Berdmore considers as the principal advantage of the application of single artificial teeth the support they afford to the neighboring ones. Although in no way an impassioned partisan of dental grafting, like his contemporary, the celebrated surgeon Hunter, he, nevertheless, sometimes had recourse to replantation, recognizing the advantages to be derived from this operation, provided it be ably and opportunely carried out; but he was decidedly averse to transplantation. Before definitely inserting a gold filling, Berdmore considers it a good practice to try the

[1] Carabelli, p. 91.

[2] A treatise on the disorders and deformities of the teeth and gums, London, 1768.

[3] See The Rise, Fall, and Revival of Dental Prosthesis, by B. J. Cigrand, p. 148.

tolerance of the tooth with a temporary filling of cement or some other like substance. His experiments as to the action of acids on the teeth are most interesting. He found that nitric acid destroys the enamel in a quarter of an hour; muriatic acid acts almost as rapidly, but with the difference that it also alters the color of the interior parts; sulphuric acid renders the teeth very white, and, even if used for three or four days, only destroys a small portion of the dental substance, but by reason of its action the enamel becomes rough and can be easily scraped away with a knife. Remarkable experiments on this subject were also made later by Kemme.[1]

Pierre Auzebi, a dentist at Lyons, published a treatise on odontology in 1771, which is only remarkable for certain strange ideas that he therein exposes, the entire book being in complete contradiction with the great progress already realized, at that period, in dental science. Auzebi likens the human body to a hydraulic machine, formed by the union of solid and liquid parts. For him the bones are merely *folded membranes* and the teeth are *bones composed of small membranes*. The author declares that he is unable to admit the theory of germs in the genesis of the teeth because "these germs, being all in identical conditions as to heat and moisture, ought all to develop at the same time like the grains of corn in a field." Rather than having their origin from special germs, the teeth, he says, are derived from lymph, this being, according to Auzebi, the fundamental substance from which all the hard parts of the body are generated. A drop of lymph gathered at the bottom of the alveolus hardens and constitutes the first beginning in the formation of the teeth. Beneath this other lymph is gradually collected, which pushes upward and the part of the tooth already formed, surrounds the dental vessels, and thus becomes the root of the tooth. To facilitate dentition he recommends, among other things, rubbing the gums with hard, rough, and angular bodies. He also maintains, as does Brunner, that the milk teeth have no roots, contradicting, in this respect, the opinion of Fauchard, of Bunon, of Bourdet, who decidedly affirm that the deciduous teeth are furnished with roots, precisely the same as the permanent ones. According to him, when it so happens that the milk teeth have roots, they are not shed. To calm toothache, the author recommended a sedative elixir, the aspirating of a few drops of which sufficed to obtain the desired effect.[2]

John Aitkin, in 1771, perfected the English key, so as to render the extraction of the teeth easier and to avoid the danger of fracturing the alveolus or the tooth itself, and of injuring the gums.[3]

[1] Carabelli, p. 91.

[2] Carabelli, p. 93; Lemerle, Notice sur l'histoire de l'art dentaire, p. 117.

[3] J. Aitkin, Essays on several important subjects in surgery, London, 1771.

Frère Côme, a celebrated French surgeon, also contributed to the perfecting of this instrument.[1]

In 1771-72, Fr. L. Weyland and Henkel recorded some very important cases of diseases of Highmore's antrum.[2]

W. Bromfield, in a collection of surgical observations and cases published in London in the year 1773, also speaks of affections of the maxillary sinus. He says that he has had opportunity of persuading himself that the purulent gatherings of this cavity not unfrequently discharge spontaneously during the night, finding their exit through the natural orifice of the antrum, when the body is in the horizontal position.[3]

John Hunter, the celebrated surgeon, must be named among the most illustrious champions of odontology in England. He was born February 13, 1728. His first instructor in medical studies was his brother, William Hunter, a scientist of great merit, whose school of anatomy in London was attended by numerous students from all parts of the British Kingdom. Under so excellent a guide John Hunter made rapid progress, and in less than twenty years became the most famous physiologist and professor of surgery of that day. He was surgeon-general to the English army.

His *Natural History of the Human Teeth* (London, 1771) and his *Practical Treatise on the Diseases of the Teeth* (London, 1778) initiated in England a new epoch for the dental art, which, abandoning its blind empiricism, began to take its stand on the basis of rigorous scientific observation.

But although Hunter's merits were great with respect to the scientific development of odontology, we must remember that he was a general surgeon, and not a dentist, and that precisely for this reason he had not, neither could he have, other than a restricted personal experience relative to the treatment of dental diseases. This explains why the anatomical and physiological part of Hunter's works on the teeth is so far superior to the part concerning practical treatment.

Indeed, in the field of practice, this author often falls into grave contradictions, and is frequently hesitating and uncertain on important points of dental therapeutics.

Hunter gives a very long and detailed description of all the parts constituting the oral cavity and the masticatory apparatus. He sought to establish a scientific nomenclature for the teeth, and in fact the denominations of *cuspidati* for the canine teeth and of *bicuspids* or *bicuspidati* for the small molars originated with him. Hunter says that the enamel of the teeth is a fibrous structure, and that its fibers depart from the body

[1] Sprengel, vol. ii, p. 348.
[2] Sprengel, p. 350.
[3] Bromfield, Chirurgical observations and cases, London, 1773.

of the tooth like rays. He believes it to be entirely inorganic, as it is absolutely impossible to convert it into animal mucus. The tooth is constituted for the most part by a long mass (it is thus he calls the dentine), which is, however, much harder and denser than any other bone. This part of the tooth is formed of concentric lamellæ, and is vascular, as is proved by the exostosis of the roots and the adhesions that exist at times between the roots and the alveoli. Hunter gives a good description of the pulp cavity and of the pulp itself. He studied odontogeny with great care, as is demonstrated by his special researches on this point. He admits the existence of distinct germs for the enamel and for the dentine. According to him the incisors are formed from three points of ossification, the canines from one, and the molars from three or four. The tooth after its eruption is an extraneous body "with respect to a circulation through its substance, but they have most certainly a living principle by which means they make part of the body, and are capable of uniting with any part of a living body." The milk teeth, says Hunter, are not shed by a mechanical action of the second teeth, but by an organizing law of Nature. The physiology of the masticatory apparatus is treated by Hunter with great accuracy and most extensively. This author combats, by many arguments, the opinion that the teeth grow continually; he explains the apparent lengthening of those teeth whose antagonists are wanting, by the tendency of the alveoli to fill up, which, however, is not possible in normal conditions, because of the constant pressure exercised upon the teeth by their antagonists.

Caries, says Hunter, is a disease of altogether obscure origin; it is not owing to external irritation or to chemical processes, and seems to be a morbid form altogether peculiar to the teeth. Only in very rare cases does it attack the roots of the teeth. It rarely appears after fifty years of age. Hunter does not admit that this disease may be communicated by one tooth to another. As to its treatment, the caries, if superficial, may be completely removed by filing the decayed part of the tooth before the disease penetrates to the cavity, and its spreading will thus be arrested for a time at least. In cases where the caries penetrates to some depth, without, however, the destruction of the crown of the tooth being so extensive as to render it useless, Hunter believed the best mode of treatment to be extraction and replanting of the tooth after having subjected it to boiling in order to cleanse it perfectly and to destroy its vitality entirely, this being, according to him, the mode of preventing the further destruction of the tooth, which once dead can no longer be the seat of any disease. If, instead, one wishes to have recourse to cauterization of the nerve, it is necessary to reach as far as the apex of the root; which, however, is not always possible. This is a very important point, for no one before Hunter had yet affirmed the necessity of entirely destroying the diseased

pulp as an indispensable condition of the success of the filling to be later carried out in order to conserve the tooth.

Hunter is extremely concise when speaking of the filling of teeth; considering the great importance of this argument, his conciseness can only depend on his having had no personal experience in the matter. He considers lead preferable for fillings.

The frequent occurrence of erosion of the teeth, whether of the cuneiform variety or of other kinds, did not escape the attention of this acute observer, but he was not able to give any explanation of it.

In cases of empyema of Highmore's antrum, Hunter advises the opening of the cavity through the alveolus of the first or second large molar.

Periodontitis is classified by the author among the diseases of the alveolar process. He occupies himself with this affection at great length, seeking to explain the mode in which it is produced. He distinguishes two forms of the disease, according to whether or not there be exit of pus from the alveolus. The alveolar process is, in his opinion, the principal seat of the disease, to which, as a complication, is added the retraction of the gums. For the diseased alveolus the tooth becomes, in a certain manner, an extraneous body, of which it tends to rid itself. The alveolar margins undergo absorption; the bottom of the alveolus tends to fill up, analogously to what occurs after extraction, and the falling out of the tooth ensues as a natural consequence of this process. An altogether similar process, producing the falling out of the teeth, is the normal consequence of senility.

The author considers that the malady in question has as its point of departure an irritation caused by a tooth; and as almost a proof of this he relates a case in which the extraction of the affected tooth, an upper incisor which became too long, and the transplantation of another tooth caused the cessation of the morbid process and the perfect consolidation of the transplanted tooth. However, Hunter does not draw from this isolated case the conclusion that transplantation may be elevated to a method of cure for this malady. Indeed, he says that, so far as is known to him, there is no means of prevention or of cure for it. His treatment, therefore, is merely directed to the curing, in so far as is possible, the phlogistic symptoms, by scarifications of the gum and by the use of astringent remedies. He does not exclude the possibility of a complete recovery, but the mode in which this obtains seems to him as obscure as is the nature of the disease itself.

In speaking of the correction of dental irregularities, Hunter advises not to extract the milk teeth unless this be an absolute necessity. He says, besides, that it is useless to extract any tooth whatever, unless one endeavors at the same time to force the irregular tooth or teeth into their

normal position by exercising the requisite pressure upon them. In young subjects the regulating of crooked teeth is an easy matter, because of the softness of the maxillary bone. However, it should not be undertaken before all the bicuspids have come through. To correct protrusion of the upper jaw, the author recommends the extraction of a bicuspid on each side. To regulate the incisors it is sometimes necessary to make them rotate on their axis with the forceps. In certain cases of protrusion of the lower jaw one may have recourse with advantage to the inclined plane.

As a general rule, it is useless to lay bare a tooth with the lancet before extracting it, although in certain cases this may be advantageous in order to render its extraction easier and less painful.

Hunter was a strenuous partisan of replantation and transplantation of the teeth; he made various experiments on animals, and treated this important argument with particular fulness and much better than had been done up to then by others.

In cases of difficult dentition he considered incision of the gums most useful and, if necessary, to be had recourse to several times.

Foucou, the French dentist, in 1774, made known a compressor invented by him for arresting hemorrhage ensuing on the extraction of teeth. This instrument, which could be used for either jaw, exercised its pressure not only in a vertical direction, but also laterally, and did not give much inconvenience to the patient. Carabelli, who wrote seventy years later, speaks with praise of Foucou's compressor, which he considers the best instrument of its kind.

Courtois, in his book published in 1775,[1] says that the enamel of the teeth only reaches its perfection of development at twenty to twenty-two years of age, and begins thenceforward to wear away gradually. In speaking of the enamel, he advises avoiding the use of the file as much as possible. This author's book is interesting for the many important clinical cases it contains.

Willich, in 1778, related a most curious case relating to a woman, aged forty years, who had never had her menstrual function, but had, nevertheless, given birth to two children; the extraction of a tooth was followed by an alveolar hemorrhage that lasted an hour; thenceforward, this hemorrhage recurred regularly each month, for the space of eight years.

Bücking, in 1782, published a *Complete Guide to the Extraction of the Teeth*,[2] wherein he minutely describes all the instruments, their use, the position of the operator and of the patient, indicating at the same time the instruments best adapted for the extraction of each tooth. He declares

[1] Le dentiste observateur, Paris, 1775.

[2] Vollständige Anweisung zum Zahnausziehen, Stendal, 1782.

himself averse to the practice of subluxation as a means of cure for toothache, a method which, first recommended by the Arab physician Avicenna, and later, in the sixteenth century, by Peter Foreest, had fallen into oblivion for a long time, and was again brought into credit by two celebrated French dentists, Mouton and Bourdet, the latter of whom relates having had recourse to it successfully in not less than six hundred cases.

Notwithstanding the high authority of this illustrious dentist, Bücking does not consider this method of cure advisable, adducing, however, in support of his opinion, arguments of no great value, viz., that teeth after subluxation continue painful for a certain time, and that they always remain in an oblique position. The method in question, which has the effect of breaking the dental nerve, is, in our opinion, practically equivalent to a replantation, or is, in point of fact, a replantation, when the luxation of the tooth is complete. The arguments that Bücking brings forward against it are futile; the first objection, for the most part, does not subsist, and, in any case, the persistence of pain for a short time would be of small importance compared with the great advantage of preserving the tooth; as to the second, it is to be understood of itself that subluxation performed by means of the pelican (the instrument then used for the operation) would cause the tooth to assume an oblique position; but even supposing it did not straighten up of itself, there could not have been any difficulty for the good dentists of that period in forcing the tooth again into normal position and in maintaining it there. The weak side of the operation consisted rather in the fact of its being probably carried out without due consideration of the dangers resulting from the possible alterations of the dental pulp.

At the time of which we are writing many believed that the enamel of the teeth could be regenerated altogether or in part, and that, therefore, it was of no great consequence that it should be worn away by the use of the file or of abrasive dentifrice powders. Thus, for example, the renowned surgeon Theden expressly recommended such powders, as the best adapted for cleaning the teeth and for freeing them from tartar.[1]

Van Wy,[2] the Dutch surgeon, in 1784, related two cases of regeneration of the maxillary bones; other cases of the same kind were related some years later by Percy and Boulet.[3]

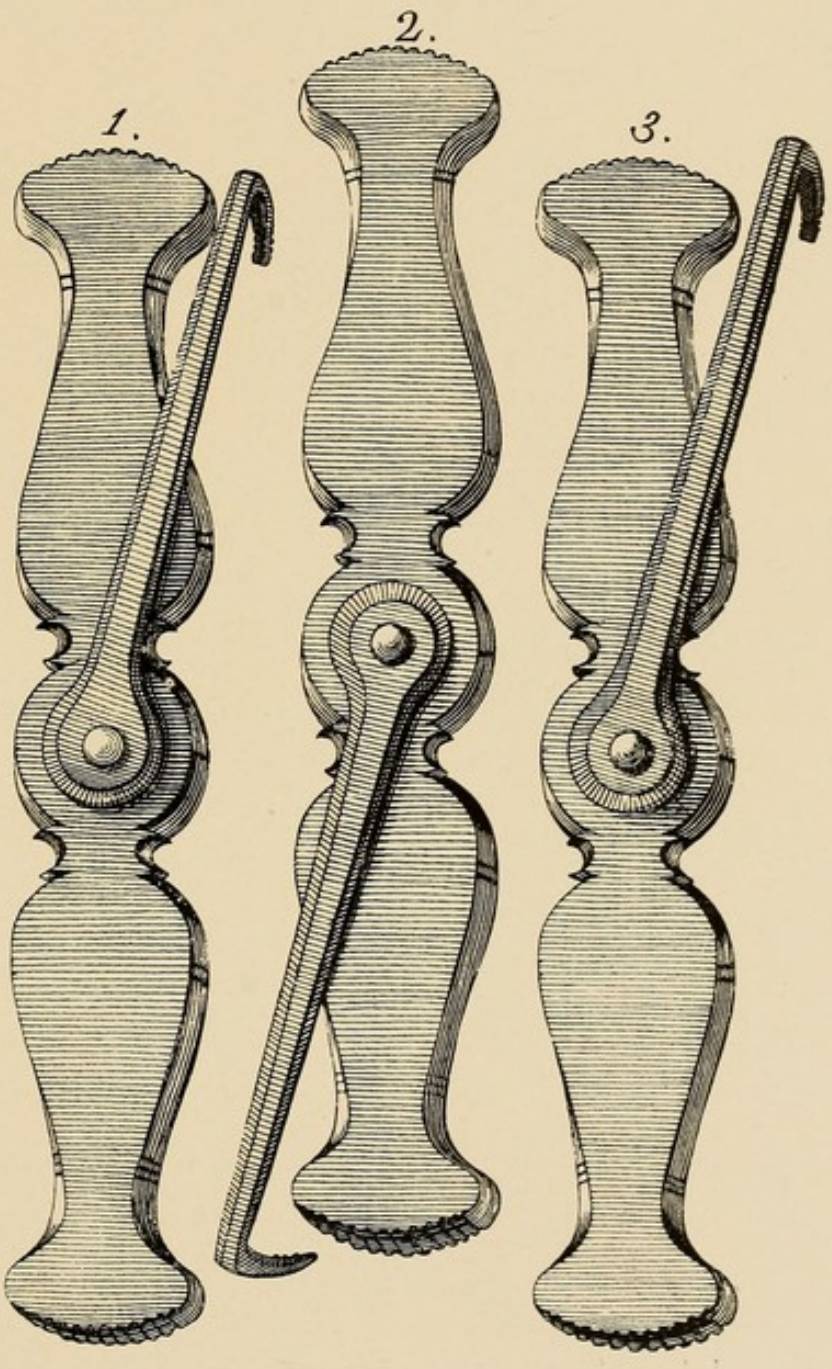
Chopart and Desault recommended, in cases of difficult dentition, the excision of the gum in correspondence with the teeth that are to come out, rather than simple incisions.[4]

[1] Theden, Neue Bemerkungen und Erfahrungen, Berlin, 1782, part second, p. 254.
[2] J. van Wy, Heelkundige Mengel stoffen, Amsterdam, 1784.
[3] Journal de Médecine, 1791, tomes 86, 87.
[4] Sprengel, p. 356 to 357.


ANTONIO CAMPANI
Pubblico Dentista
della Città di Firenze.
Diomira Franchi del.
Carboni Sculp.

Antonio Campani, of Florence, published in 1786 a treatise on dentistry,[1] very elegantly printed, and illustrated with thirty-six plates very

Fig. 96



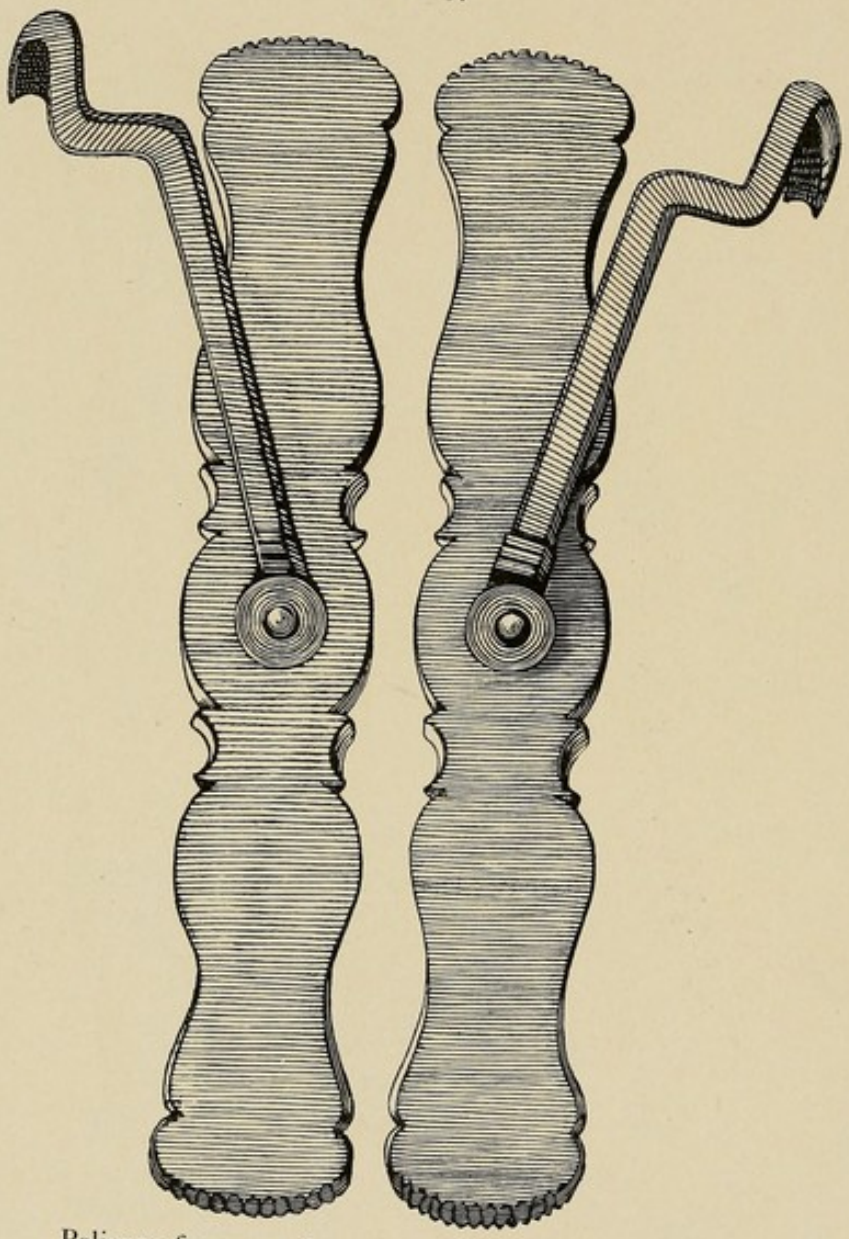
Pelican for extracting incisor, canine, and molar teeth (Campani, 1786).

neatly carried out. This book, however, contains nothing of real importance for the development of dentistry.

[1] Odontologia, ossia Trattato sopra i Denti.

Benjamin Bell, the English surgeon, a contemporary of Hunter, also devoted much attention to diseases of the teeth, and, if it may be argued from the clear and precise manner in which he expresses his opinions on various questions relating to dental pathology and therapy, it would seem that he had much greater experience in this field than the celebrated Hunter.

Fig. 97

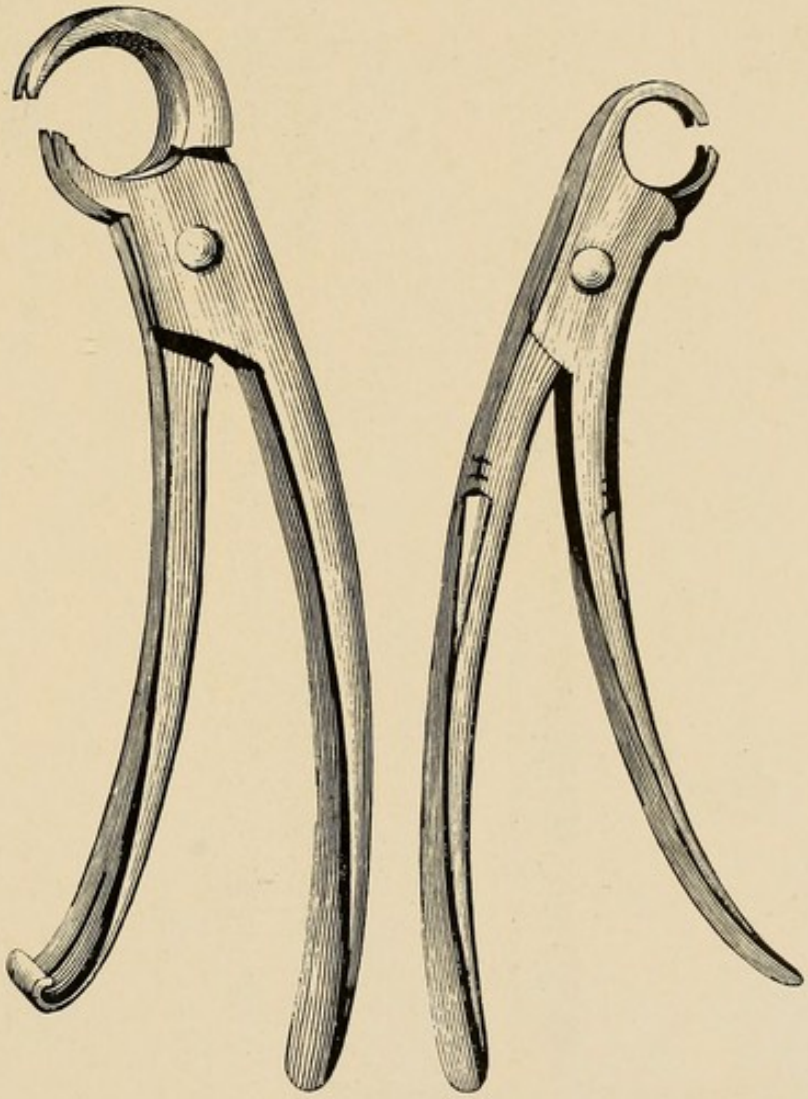


Pelicans for extracting wisdom teeth (Campani).

With regard to incision of the gums, in cases of difficult dentition, this author contradicts certain assertions of the German surgeon Isenflamm (1782), who argued that when the tooth is already to be perceived through the gum, the incisions are altogether useless, while if the tooth be still at some depth, the gingival incision will soon close again, so that the cicatrix

will render the eruption of the tooth still more difficult. Bell admits, too, that lancing the gum is altogether superfluous when the tooth has pierced the tissue, all the more so that the accidents provoked by the eruption are then generally already passed and gone, but the operation ought, in his opinion, to take place much earlier; and should the wound close again before the tooth has erupted, the gum must be lanced a second time.

FIG. 98

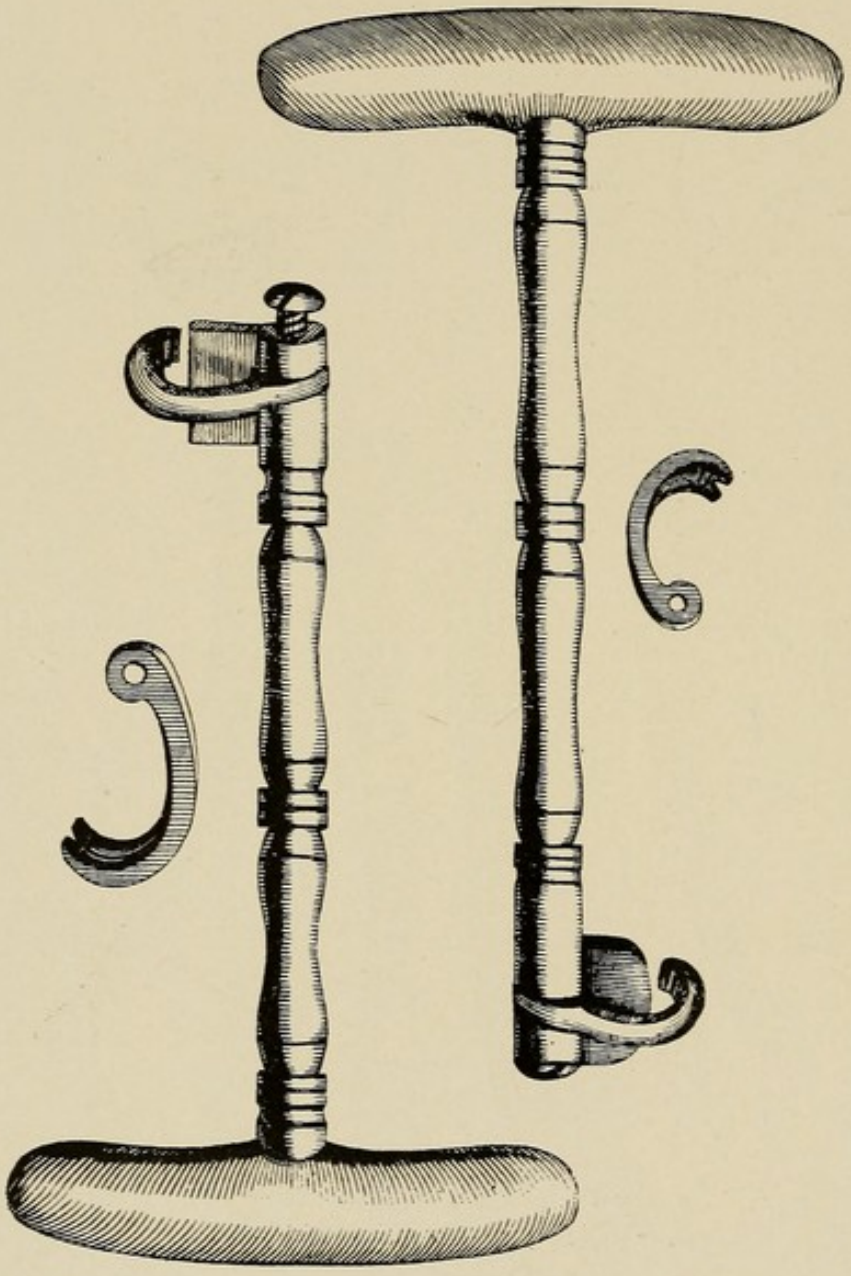


Campani's forceps: The first for molar teeth when loose or after having been shaken with the pelican; the second for deciduous teeth.

Bell contradicts the opinion of Jourdain and Hunter that the morbid gatherings of Highmore's antrum are generally consequent upon the closing of the normal opening of the cavity in the middle meatus. In many cases of disease of the maxillary sinus this orifice remains open, the liquid therein collected discharging itself not unfrequently through it, in certain positions of the body. Instead of penetrating into the antrum

through the nasal orifice, as Jourdain would have it, Bell advises opening the cavity by Lamorier's, or, better still, by Drake's method. Except in special cases, the first or second molar ought to be extracted, but preferably the second. After trepanning the alveolus and emptying the cavity,

FIG. 99

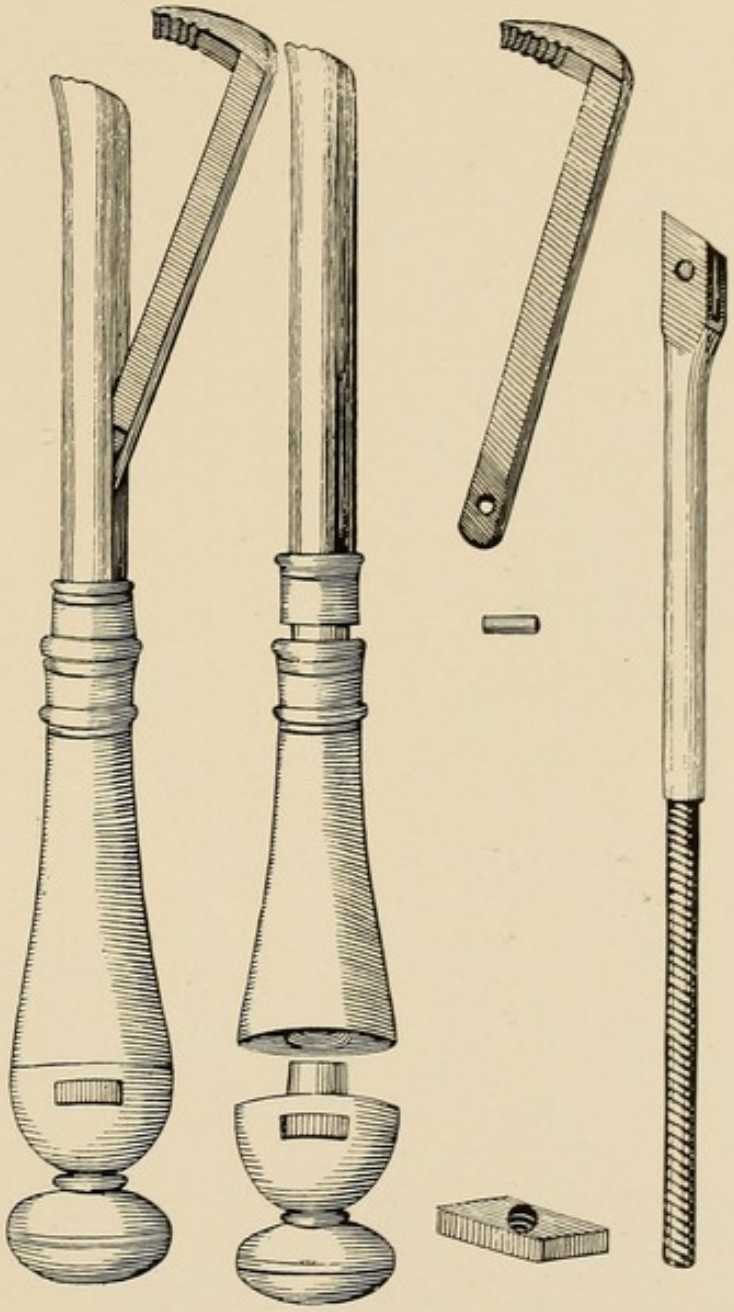


Two key instruments with changeable hooks (Campani).

the opening should be closed with a conically shaped peg to prevent its slipping into the cavity. From time to time the liquid that tends to reaccumulate should be allowed exit, and detersive injections should be made, preferably of lime water.

Looseness of the teeth, which in old age may be considered a normal condition, is always a disease when it occurs in youth. In certain cases its cause is unknown, in others it depends on an affection of the gums, either of a scorbutic nature or consequent on an accumulation of tartar.

FIG. 100

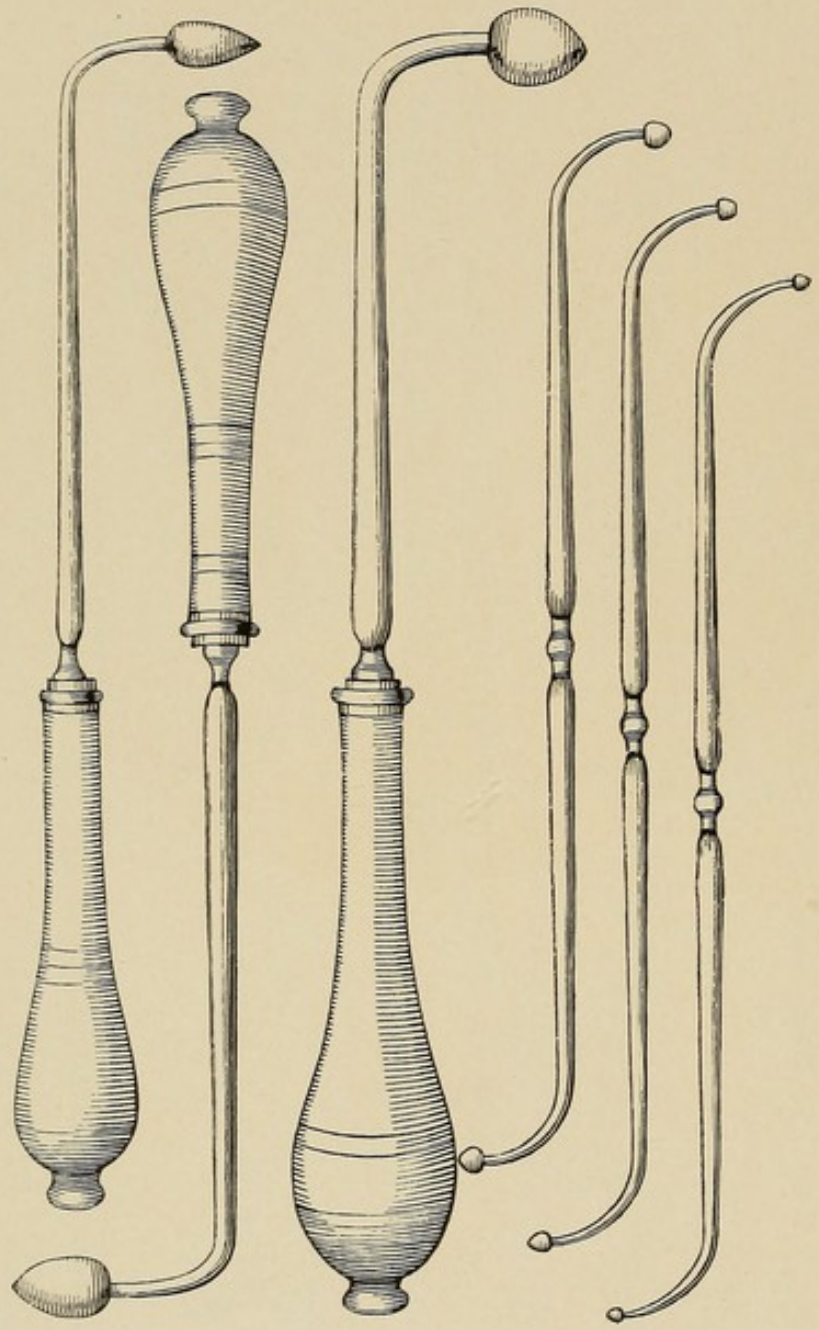


An instrument especially destined to extract loose bicuspid teeth. The screw in the interior of the instrument allowed the hook to be brought to just the right point in each case (Campani).

According to Bell, dental caries is generally owing to a bad condition of the humors of the entire body and to a peculiar morbid disposition,

rather than to external causes acting locally, although these latter may contribute, together with the general causes, to the producing of the disease.

FIG. 101



Campani's dental cauteries: The large ones for cases of post-extractive hemorrhage; the small ones for the cauterization of carious cavities.

This author was decidedly averse to the use of the file. For stopping carious cavities he advises the use of mastic, gum lac, or wax, if the cavity is large and funnel-shaped; this stopping, however, requires to be renewed frequently. But when the cavity, wider at the bottom, narrows toward



N.LAS DUBOIS DECHÉMANT, *CHIRURGIEN,*

DENTISTE INVENTEUR DES DENTS DE PÂTE MINÉRALE

Ces perles d'une si belle eau.
Qui, dès notre plus tendre enfance.
Germent déjà dans le berceau.
Pour parer notre adolescence.
C'est le secret du Créateur.
Et le rôle de la nature.
Mais après cet unique acteur.
Vivat CHÉMANT pour la doublure.

Le grand point toujours réservé
Au seul artiste incomparable.
C'est bien CHÉMANT qui l'a trouvé
Il joint l'utile et l'agréable.
Quand la faux du temps a détruit
Du palais la brillante armure.
Avec la sienne, on mange, on rit.
Vivat CHÉMANT pour la doublure.

Couplets du Général Cte de Mortange

the surface, one ought to use gold or, still better, tin-foil. The pulp ought always to be destroyed previously by cauterization.

Bell advises great caution in carrying out transplantation, it having been proved by many examples that contagious maladies of a serious nature may easily be communicated in this way from one individual to another.[1]

In the case of a young woman who had an upper incisor transplanted, WATSON observed undoubted symptoms of syphilitic infection with supervening accidents of exceptional gravity, which in spite of careful treatment ended in death.[2]

Hunter also relates having observed, in seven cases of transplantation, very serious accidents which, however, he did not believe to be owing to syphilis, although bearing a certain symptomatic resemblance to it. Contrariwise, the well-known German surgeon Richter not only admitted the possibility of transmitting syphilis through a transplanted tooth, but even that the transplantation of an altogether healthy tooth from the mouth of a person undoubtedly free from syphilis might be followed by serious accidents of a syphilitic nature, and this because the possible existence of a latent syphilis in the person to whose mouth the tooth was transplanted cannot be excluded; in which case the abnormal stimulus exercised by the transplanted tooth might very well give rise to syphilitic manifestations. Therefore, the fact that the person who furnished the tooth was and continued to be in a state of perfect health (as precisely in the case cited by Watson) would not be sufficient proof that the accidents ensuing on the transplantation might not be of a syphilitic nature.

LETTSON also observed, in certain cases of transplantation, accidents of more or less gravity which he held to be due to syphilis, calling, however, to mind a case cited by Kuhn, of Philadelphia, where the possibility of syphilis was not to be thought of, as the morbid symptoms disappeared entirely, without any treatment, as soon as the transplanted tooth was removed.[3]

AUGUST G. RICHTER, the above-named German surgeon, in those portions of his work dedicated to dental affections and diseases of Highmore's antrum, treated these subjects with admirable clearness and order, without contributing, however, anything original to the development of dental surgery.[4]

NICHOLAS DUBOIS DE CHEMANT, in 1788, of whom we shall later have occasion to speak again, published in Paris his first pamphlet on mineral

[1] Benjamin Bell, System of Surgery, 1783 to 1787, vol. iii.

[2] Medical Transactions of the College of Physicians of London, 1783, vol. iii, p. 325.

[3] Memoirs of the London Medical Society, 1787, vol. i.

[4] August Gottlieb Richter, Anfangsgründe der Wundarzneikunst, vol. ii (1787) and vol. iv (1797).

teeth, entitled *Sur les avantages des nouvelles dents, et rateliers artificiels, incorruptibles, sans odeur.*

Jean Jacques Joseph Serre (1759 to 1830). Among the dentists of the end of the eighteenth century and the beginning of the nineteenth, a special mention is due to Jean Jacques Joseph Serre. He was born at Mons, in Belgium, but his remarkable practical and scientific activity was chiefly called into exercise in Vienna and in Berlin. He published several works, the most important of which is a practical treatise on dental operations.[1]

Among his minor works, one edited in Vienna, in 1788, treats of toothache during pregnancy; another, printed in Leipsic in 1791, treats most extensively of diseases of the gums; a third speaks of the mode of maintaining the teeth and gums in good condition. This little book of dental hygiene, like the rest of Serre's books, met with great favor, and went through two editions in a brief space of time (Berlin, 1809 to 1812).

The works of this author show great study, very wide practice, and an admirable spirit of observation and research. They had the merit of greatly contributing to raise the level of dental culture in Germany, and one finds in them a pretty nearly complete account of the dentistry of that period. Apart from this, they possess a special interest because of the vast number of dates and important historical facts therein contained.

As it would be useless here to enter into a minute analysis of the contents of these books, we will limit ourselves to mentioning a few ideas of which Serre was a strenuous supporter.

He combats an old prejudice that had recently been reinforced by the authority of Jourdain, that is, that it does harm to extract a tooth when the soft parts around it are inflamed and swollen. He likewise combats the prejudice, also of very ancient date, that teeth ought not to be extracted during pregnancy. Only, he considers it as well to avoid the cauterization of the dental pulp in cases of gestation. In extracting teeth, the forceps ought only to be used after the tooth has been luxated by means of the pelican. Serre highly approves of this instrument, although he recognizes it to be a dangerous one in the hands of those who do not know how to make a proper use of it. This author invented or perfected various extracting instruments, among which a conical screw for extraction of roots hollowed out by caries deserves particular mention, and which, under a somewhat modified form, is still in use.

One of the most interesting chapters of Serre's great work is the one in which he treats of affections of Highmore's cavity.[2] He speaks at length of the anatomy of the maxillary sinus, of its relation to the teeth

[1] Praktische Darstelling aller Operationen der Zahnarzneikunst, Berlin, 1803 and 1804.

[2] Chapter xlii.



Johann Jacob Joseph Serre

Geboren den 5t May 1759.
in Mons in vormaligen Niederlanden

situated below it, of the various modes in which the diseases of the antrum are produced, of their symptoms and treatment. He passes in review the various operative methods, and finds that in general the Cowper-Drake is the one to be preferred to all the others. He says that to open the sinus the simple extraction of a molar suffices in the greater number of cases, the trepanning of the alveolus not being generally necessary.

J. ARNEMAN, in 1766, published at Göttingen a synopsis of surgical instruments[1] that deserves mention in so far that the dental instruments of that time as well as those of earlier periods are therein taken into account with sufficient exactness.

A. F. HECKER attributed the accidents of difficult dentition to a special alteration of the saliva caused by the irritation deriving from the erupting teeth. In these cases the saliva is supposed by him to acquire a high degree of acridness and to become almost similar to the poison of rabies. Departing from this theory, the author declares it to be necessary to mitigate the irritation produced on the gums and other parts of the mouth by the altered condition of the saliva, as well as to modify the quality of the saliva itself and to promote the elimination of the same from the body by emetics and aperients. According to him, liquid carbonate of potash administered in drops, together with syrup of poppy heads, manna, etc., is a most useful remedy, having specially for its effect to diminish the acridness of the saliva.

Besides this remedy, the author extols the use of blisters behind the ears, as also of tepid baths, which calm pain and spasms, favor the excretions, and procure repose and sleep. He rejects the incision of the gums as altogether useless, and is most opposed to the use of opium, which he states renders children liable to apoplexy.

And here we will mention, rather by way of curiosity than for any real historical interest which they possess, two pamphlets on *odontitis*, published respectively in 1791 and 1794 by Ploucquet and Kappis, who maintained that not only the dental pulp, but all the parts that form the tooth are susceptible of inflammation.[2] In Kappis' pamphlet we find the following ideas developed, upon which we do not think necessary to comment. The inflammatory process consists essentially in the increased flow of humors to a given part and in a more or less intense reaction of the vital force. Both of these things may take place in the teeth. These are liable to swell, that is, to undergo an increase of all their dimensions, in proof of which assertion the author relates the case of an individual, who when attacked by a violent toothache had found the spaces between his teeth so narrowed that it was no longer possible to make use of his

[1] Uebersicht der Chirurgischen Instrumente.

[2] Ploucquet, Primæ lineæ odontitidis, sive inflammationis ipsorum dentium, Tubingæ, 1791; Kappis, Primæ lineæ odontitidis, etc., Tubingæ, 1794.

usual toothpick, even if he had tried to do so regardless of pain. But when the toothache was over, the same toothpick again became serviceable as before. He says that there is no cause for wonder that in odontitis no redness of the teeth is to be perceived, for in other inflammations as well, redness is wanting, and, moreover, it exists in the interior membrane of the tooth. As in other inflammations, so also in odontitis, the usual issue is resolution. Dental fistulæ may derive from internal suppuration. The impurities deposited on the teeth are by him supposed to be owing to an increase of their secretion! According to the author, caries, the breaking down of teeth apparently healthy, as well as their falling out, is generally caused by an inflammation of these organs, that is, by odontitis, an affection that, he says, may be of very varied kind, the principal forms being the rheumatic, arthritic, sympathetic, and gastric.

Ranieri Gerbi.[1] In a book by this author we find recommended a very singular cure for toothache, even of the most violent nature. It is in no way scientific, and is besides not particularly pleasant, notwithstanding that the author, professor at the University of Pisa, was a scientist of merit, enjoying special esteem as a mathematician and cultivator of natural sciences.

Under the name of *curculio anti-odontalgicus* he describes an insect living habitually inside the flowers of the *carduus spinosissimus*, that could be used with great advantage against toothache, in the following manner: One crushes fourteen or fifteen larvæ of the insect between the thumb and forefinger, and then rubs the two fingers together until the matter remaining upon them is entirely absorbed. Instead of the larvæ (which, as is known, represent the first stage of insect life) one may also use the fully developed insects. One then applies the two fingers that have crushed the insects or their larvæ upon the decayed and aching tooth. If the pain is of a nature to be cured by this means, it diminishes almost instantaneously, and ceases altogether in a few minutes. It is said that the fingers preserve their healing power for a great length of time, even a whole year, and in proof of these assertions Ranieri Gerbi speaks of no less than six hundred cures performed! Other insects besides the *curculio anti-odontalgicus*, used in the same manner, are said to possess the same curative properties, among them the *curculio jaceæ*, *carabus chrysocephalus*, and the *curculio Bacchus*, which last, says Gerbi, has long been used for this purpose by the peasants of Tuscany. The author also says that some German doctors and naturalists experimented with success with several insects indigenous to Germany as remedies against toothache. These insects, also mentioned in a work published in Bayreuth in 1796, author unknown, are:[2] the *coccinella septempunctata*,

[1] Storia naturale di un nuovo insetto, Firenze, 1794.

[2] Der anfrichtige Lahnarzt.

the *coccinella bipunctata*, the *carabus ferrugineus*, the *chrysomela sanguinolenta*, the *chrysomela populi*, the cantharis or Spanish fly, and others. Later on, Hirsch also extolled the healing power of another insect, the *cynips rosarum*. With regard to the mode of application, Gerbi says that instead of crushing and rubbing these insects or their larvæ between the fingers, one can use a piece of wash leather in a similar manner.

It is to be observed, however, that the insects that are found generally in the ripe wild teasle—or more precisely their larvæ—had already been used for a long time as a remedy against toothache; indeed, we even find these means of cure recommended in the natural history of Pliny. In a book entitled *Histoire d'un voyage aux îles Malouines fait en* 1763 *et* 1764, by a certain Dom Pernetty, this author speaks of some remedies made known to him by the Superior of the Franciscan friars of Montevideo; and among others one finds the following: "One draws out the worm that is generally found in the head of the fuller's teasle when this is ripe. One rolls this worm between the index finger and the thumb, lightly pressing it until it dies of languor. The one or the other of the two fingers applied on the aching tooth will have the virtue, for a year at least, of making the toothache cease."[1]

Heinrich Callisen, in an excellent treatise on surgery[2] published at Copenhagen in 1788, writes at sufficient length and with great accuracy on dental and maxillary diseases. According to this writer, it rarely suffices to trepan one alveolus for the treatment of the morbid collections of Highmore's antrum, as the maxillary sinus is very often divided by partitions into various cells, so that in order to give exit to the pus contained in each of them, it is necessary to extract several teeth and trepan their alveoli.[3] One ought not, therefore, to give the preference to this method, unless in the case of the teeth in question being decayed. But should they all be in a good state, or should a large opening be necessary because of the nature of the disease in the cavity, it will be better to follow Lamorier's method, that is, to incise the gum crosswise under the malar process and then, after scraping away the periosteum, trepan the bone. Further, in the case of the disease in the maxillary sinus having given rise to tumefaction, softening of the bone, and fluctuation in the palatine region, it is precisely there that the perforation ought to be carried out. To prevent the reclosing of the opening before the cure is completed, the author advises the use of pledgets, small bougies, a piece of prepared sponge, or even a small tube. According to Callisen,

[1] Without comment!

[2] Principia systematis chirurgiæ hodiernæ.

[3] The anatomical fact alluded to by the author, far from presenting itself very often, as he says, is of rare occurrence, and cannot be held in account for establishing a general operative rule.

the injections through the nasal orifice of the maxillary sinus are partly impracticable, and partly of no utility.

It always does more harm than good to file or to scrape the decayed part of a tooth, without stopping it afterward, as by thus doing, says the author, one only renders it still more liable to the access and the action of harmful external influences. In preparing the cavity for stopping, the bottom of it should be more ample than its external aperture, that the filling may remain firm.

For extracting molars, he makes use either of the pelican or of the key; for the incisors and the canines, of the forceps; and for roots, of the goat's foot.

Callisen treats incipient *idiopathic* epulis by destroying it through cauterization, after having covered the teeth with wax; if the epulis be large and more or less hard, he removes it with the bistoury; as to *symptomatic* epulis, he holds the removal of the original cause to be the best mode of treatment.

This author declares himself decidedly in favor of replantation and transplantation, expressing the idea that these methods are always to be preferred to the application of artificial teeth. He maintains that after a tooth has been replanted, and its consolidation has taken place, there is no possibility of any further pain, the nerve being broken. The author relates a brilliant cure which he carried out upon a lieutenant, who, during the siege of Copenhagen, had received a blow that had sent all his front teeth into his mouth. Callisen immediately put them all back in their places with such ability that they became perfectly firm again. With reference to transplantation, he only believes in its being possible for teeth with a single root.

In works published toward 1790, Lentin and Conradi, devoted their particular attention to the morbid conditions that produce looseness and spontaneous falling of the teeth. For the treatment of these conditions Conradi recommended general and local remedies. The general remedies were directed to the suppressing of acridness in the blood, which he considered to be an etiological element of primary importance. As to the local remedies, they ought specially to consist in keeping the teeth clean by the use of a toothbrush, in painting the gums with tincture of catechu and myrrh, and in rinsing the mouth frequently with a decoction of cinchona or of willow bark. Against toothache caused by caries, he particularly advises essence of cloves, introduced into the carious cavity on a piece of cotton-wool.[1]

Friedrich Hirsch was much less disposed than were many of the preceding writers to incision of the gums in cases of difficult dentition.

[1] Sprengel, pp. 372, 373.

Against the accidents connected with this morbid condition, he prefers, in general, the use of gentle aperients or of emetics, and regards the scarification of the gums as opportune only in cases where symptoms indicating a high degree of nervous tension manifest themselves.

Against incipient caries, Hirsch used simple cauterization, which he held to be capable of arresting the morbid process, at least in many cases. He says, however, that when a real carious cavity exists, it is absolutely necessary to stop it; and for this purpose, rather than metallic or resinous fillings, he prefers a cement of turpentine and quicklime, made into a paste with varnish of oil of linseed. Nevertheless, when it is a case of the lower teeth, tin-foil is also, according to him, an excellent filling material.

Like some of the preceding authors, Hirsch admitted the existence of *interior caries* in apparently healthy teeth, and was the first to indicate a good mode of diagnosticating these occult dental affections. It consists in tapping the suspected teeth with a sound until one finds the one in which the percussion provokes pain, and this will be the diseased tooth. One detaches the gum from the neck of this tooth, and at the point, on the neck itself or on the beginning of the root, where a small protrusion is found, one perforates the tooth with a chisel, or some other fit instrument, so as to penetrate to the interior of it. Through this passage one introduces into the tooth a fine, curved, red-hot sound, repeating the operation several times. Lastly, one fills the cavity with lead; and in this manner the tooth will be cured and no longer painful.

In speaking of the correction of dental anomalies, Hirsch relates a case in which the deformity consisted in the union of two central incisors, which formed one single piece, resembling a paddle, and spoiled the appearance of the face. He divided them with a saw, cauterized the surfaces of the section, scarified the gum, and, to gain a little space, introduced a small wedge, until the gum had grown up within the new dental interstice, thus giving an altogether normal appearance to the part.

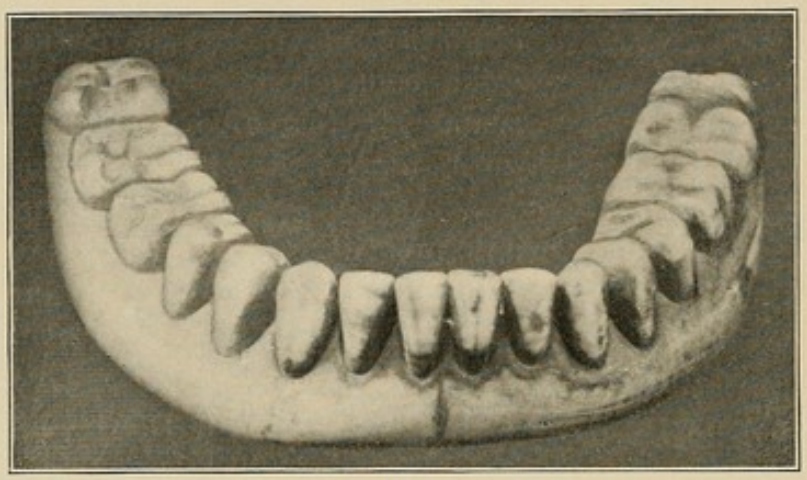
It is noteworthy that Hirsch made use almost exclusively of the goat's foot for the extraction of teeth, of whatever kind they might be, the instrument being rather longer, however, than that ordinarily known by this name, and making his left hand serve as a lever rest.

To arrest strong hemorrhage ensuing from the extraction of teeth, Hirsch used scraped parchment, which he introduced into the alveolus and pressed with force into it by means of a sound; then he superposed compresses and kept the jaws tight together with a bandage passed around the head.

This author, too, was very favorable to replantation. As to transplantation, he says that even when the gum and the alveolus are quite healthy, the individual entirely free from scurvy and syphilis, and not

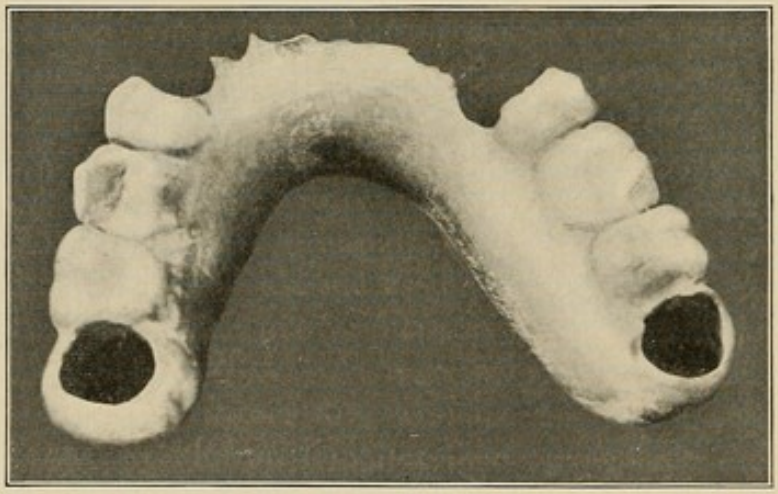
above fifty years of age, the transplanted teeth do not take root perfectly except in an average of one case in three. For carrying out this operation he never made use of teeth extracted from the mouth of a living person, but, on the contrary, he used the teeth of young and healthy subjects

FIG. 102



Full lower set in hippopotamus ivory, with human front teeth; seventeenth century. (From Guerini's collection.)

FIG. 103



Upper denture in ivory, at the end of the eighteenth century, for a case in which the last molars and the front teeth were present. (From Guerini's collection.)

who had died a violent death; these were, besides, carefully cleaned before transplanting them, and in this way the author believed the transmission of disease to be nearly impossible.[1]

J. E. WICHMANN combated energetically the practice, then pretty general, of endeavoring to facilitate the eruption of the teeth by

[1] Hirsch, Praktische Bemerkungen über die Zähne und einige Krankheiten derselben, Jena, 1796.

incision of the gums. He considered this practice as one to be absolutely rejected, supporting his opinion on the consideration that dentition, being an altogether physiological process, which, moreover, takes place in parts relatively of but little importance, never can give rise of itself alone to serious accidents. Besides this, he says, it is very difficult to say which tooth precisely is about to erupt and at what point. The incisions would, therefore, have to be made by chance, which would often render the morbid condition still more serious.

K. A. BLUMENTHAL endeavored to confute Wichmann's opinions, with but little success; for, indeed, the same opinions, expressed later by J. H. Sternberg in a more detailed manner and with ampler views of the subject, met with ever-increasing approval. Thenceforth, the practice of gingival incisions in cases of difficult dentition fell more and more into discredit.[1]

ROBERT BUNON,[2] the French dentist, is one of the most illustrious personalities to be met with in the history of our profession. He was born at the beginning of the eighteenth century, and devoted himself betimes to the dental art, gathering instruction therein partly from different dentists and partly from the few odontological books he was able to find. In this manner he learned pretty much all that was known at that time by dentists in general. He then decided to travel, in order to acquire further knowledge and experience. He practised especially in the north of France and in what is now the state of Belgium; at Antwerp, Brussels, Givet, Maubeuge, Cambrai. In his ardent thirst for knowledge, when he happened to pass through a town where some dentist of note resided, he never neglected to call on him, thus acquiring fresh information and perfecting himself as well in the practical exercise of his profession. At the same time, his desire to learn all that was new concerning dental art and science was so intense that he had translations made of the medical and surgical works of Latin, Italian, German, and English authors. However, all this reading, although it enlarged his general knowledge, taught him nothing, or almost nothing, about those subjects that interested him above all the others. His practical experiences, meanwhile, brought a great number of patients to his notice, and, being by nature a very acute observer, he was able to establish the existence of many facts up to then unknown. At this time he commenced his studies on dental erosion, on the development of the teeth, and on the prophylaxis of dental maladies, his favorite subject. "I felt," he writes, "that the necessity of having recourse day by day to the extraction of teeth resulted from

[1] Sprengel, pp. 376, 377.

[2] For all that regards Bunon's life and writings we have availed ourselves of the excellent historical work of A. Barden, "Un précurseur: Bunon," a communication presented to the Geneva Session of the International Dental Federation (August, 1906).

deficient knowledge on our part, and I considered this extreme remedy as one of the greatest evils to humanity."[1] He therefore endeavored to extend his own knowledge in every possible way, and as one means of doing this he visited hospitals and schools; and, ardent champion as he was of conservative dentistry and of prophylaxis, he succeeded in interesting medical men and surgeons, midwives and schoolmasters, and parish priests as well, in the question of the preservation of the teeth. The teeth he extracted he kept for the purpose of studying the conformation, the lesions, the dental anomalies; sometimes he split them up to examine the dental pulp. And he never neglected an opportunity of procuring anatomical pieces that appeared interesting to him.

In 1728 Fauchard's book, *Le Chirurgien Dentiste*, appeared. The fame of this work reached Belgium, where Bunon then was, and he immediately set about trying to get a copy of it. After searching in various towns, he finally found one in Givet. He read it with the greatest interest, and later, in one of his works, spoke of it in terms of highest praise. It would seem, however, that he did not learn much that was new to him by reading this book, which proves that he already possessed a vast odontological culture and was also profoundly versed in technical dentistry, which forms the most important part of Fauchard's book. He was somewhat astonished at finding in this celebrated author's work hardly anything on the subjects that principally interested him, that is, the erosion, the development of the teeth, and the prophylaxis of caries. This circumstance very clearly reveals the different mental tendencies in these two great men, the one, drawn toward the practical side of the profession which principally interests him and forms the basis of his work, the other, an impassioned searcher into causes, and student of prophylaxis.

After the perusal of Fauchard's book, Bunon, who had already conceived the idea of publishing the results of his observations and of his own particular studies, felt more than ever the propriety and necessity of doing so; and to realize his idea, he established himself toward the year 1735 at Paris. Two years later, just when the manuscript of his work was almost finished, Gerauldy's book appeared. Bunon relates that he opened this book in fear and trembling; its title, *The art of preserving the teeth*, gave him reason to fear that Gerauldy might have profited by some of the ideas and observations he had communicated to various persons, to write a book similar to the one that he himself had it in his mind to publish.[2] He was able, fortunately, to convince himself immediately that his fears of being forestalled and plagiarized were unfounded.

Notwithstanding, Bunon was determined not to publish his book until the opportune moment and with all possible probability of success. With

[1] Expériences et démonstrations, p. 13.

[2] Ibid., p. 60.

this object in view, he made up his mind first to obtain the diploma of surgeon-dentist. To reach this aim, he was obliged to conform to the regulations of the *Edict of May*, 1699, which then regulated the practising of dentistry, and this was as much as to say that he was obliged to enter the College of Surgery, to undertake two years' practice with a regularly licensed surgeon, to undergo theoretical and practical examinations, and to take oath before the Chief Surgeon of the Realm. Once in possession of the diploma of surgeon-dentist, he was separated thenceforward from the vulgar crowd of charlatans and invested with all the prestige which a degree, so rarely acquired at that time, conferred upon its possessor; but before facing public opinion he desired to make himself known, and, so to say, first to try his ground, by making known some of his newer ideas, and see what reception they might meet with from his colleagues and the public in general. He, therefore, published, in January, 1741, in the newspaper *Mercure de France*, a letter on the so-called *eye tooth*,[1] combating the then widely diffused prejudice that the extraction of an upper canine constituted a grave peril to the eye. He demonstrated the absurdity of this idea by putting in evidence the anatomical fact that the upper canines are innervated by the infra-orbital nerve, which has no relation whatever with the visual organ.

Still better to further his object of making himself a name, he published in the same year and in the aforementioned paper his dissertation on the teeth of pregnant women.[2] There he demonstrated the falseness of the idea that one ought never to extract teeth during the state of gestation, and brought into relief the necessity of treating the dental diseases of pregnant women with still more accuracy than those of other persons.

These publications, bearing as they did the marks of good sense, favorably interested the public opinion. The way was therefore prepared, and Bunon judging the moment to have come for publishing his work, placed it in the hands of a literary man for the necessary corrections of style. He also showed his manuscript to several persons of consideration, but was grieved to perceive that the new ideas put forward in it were skeptically received. He now thought it might be as well to appeal to the judgment of a highly competent authority, and fixed on M. de la Peyronie, Head Surgeon of the Realm. This gentleman, after reading the work, highly praised the author, and Bunon gained permission to publish the book under his patronage, on consideration that he should give his word to furnish the proof of the many assertions made therein on all kinds of subjects.

[1] Lettre sur la prétendue dent œillère.

[2] Sur un préjugé très pernicieux, concernant les maux de dents qui surviennent aux femmes grosses.

The goal was now reached, and Bunon, on the strength of such illustrious patronage, published his book in March of 1743, under the title, *Essay on the maladies of the teeth, wherein are suggested the means of obtaining their good conformation from the earliest age, and of assuring their preservation during the whole course of life.*[1]

All the principal journals of the time (*Journal des Savants, Journal de Trévoux, Journal de Verdun, Mercure de France*, etc.) published extracts from the book and eulogized the author, who had even the high satisfaction of receiving an honorable mention from the Royal Academy of Surgery, in the public sitting held in 1743.

Bunon, therefore, was now famous, and had, besides, gained wealthy clients, as we see from the perusal of his observations, where the best names in France are to be met with, put in evidence by him without the least thought of professional secrecy. He could now enjoy his well-merited successes, in accordance with the thought expressed by him in one of his books: "All those who labor for the progress of an art have legitimate right to the honor and to all the recompenses to which success is entitled."[2]

The study of Bunon's work proves, in fact, that he had good right to be proud of having written it. The mere perusal of it, however, does not suffice to enable the reader to judge of its merits, for to do this properly, it is necessary to study at the same time his other book, published in 1746, entitled *Experiences and demonstrations made at the Hospital of Salpêtrière and at St. Côme, before the Royal Academy of Surgery, serving as continuation and proof to the Essay on the maladies of the teeth.*[3] The essay is, in fact, a small 12mo book of 212 pages, written in a concise style, and, strange to say, most concise in the most important points.

Many facts of great moment are given under the form of rapid indications, or of assertions without proof; thus their importance is apt to pass completely unobserved by those who do not take the trouble of studying this work thoroughly and with the help of the explanations, illustrations, and comments contained in the second book we have referred to.

M. A. Barden, of the École Odontotechnique of Paris, was the first to undertake a serious and conscientious study of Bunon's works. By so doing he has thrown full light on the author's great merits, and brought forward the high scientific importance of his works.

[1] Essai sur les maladies des dents, où l'on propose les moyens de leur procurer une bonne conformation dès la plus tendre enfance, et d'en assurer la conservation pendant tout le cour de la vie.

[2] Expériences et démonstrations, avertissement, p. xix.

[3] Expériences et démonstrations faites à l'Hôpital de la Salptêrière et à St. Côme, en presence de l'Académie Royale de Chirurgie, pour servir de suite et de preuves à l'Essai sur les maladies des dents.

One of the important questions studied by Bunon concerns the hygiene to be observed in order to obtain the development of a good dentition. On this question he rightly establishes the principle that hygiene and dental prophylaxis should begin from the period of the formation of the milk teeth. He works out this principle with rigorous logic, and finishes by tracing the hygiene of the mother during pregnancy, of the woman (be she mother or nurse) during the nursing period, and of the nursling as well.

As to the accidents of first dentition, Bunon sets forth a highly scientific opinion, fully coinciding with the ideas of modern writers, that is, that dentition is not the sole cause, nor even the principal cause, of such accidents, but simply a coöperating cause. He made the observation that in healthy infants, children of healthy parents and nursed by healthy women, the time of teething is gotten over without difficulty, while serious accidents occur frequently in weak and sickly children not brought up and nourished according to hygienic principles, or born, as not often happens, with special hereditary predispositions.

One of Bunon's merits is that of having attributed to the first teeth all the importance they really have, and of having insisted on the necessity of attentively curing their maladies. He also drew attention to the dangers that may result from the eventual persistence of the first teeth at the epoch of the second dentition, or from the persistence of their roots after the destruction of the crown by caries. These roots, he says, by their contact with the neighboring permanent teeth may infect them, and cause them to decay.

Bunon's researches into the development of the teeth enabled him to describe precisely the position that the various teeth of the second dentition occupy in the jaw with regard to the milk teeth, before these are shed.

Bunon was, besides, the first author who studied accurately dental hypoplasia, and it is greatly to his honor that his ideas and observations about this pathological condition have been accepted and confirmed in substance by the greater part of the authors who have come after him, having remarkable worth even at the present day. According to him, this congenital defect of the teeth is owing to infantile maladies, such as hereditary syphilis, infantile scurvy, malignant fevers, smallpox, or measles; the harmful effects of these maladies, however, are limited to the teeth in progress of development, and have no influence on those that have already come forth. Erosion, as this defect was termed by Bunon, sometimes affects the first teeth, but is to be found much more frequently in the second or permanent ones. Those most often affected are the first molars, and in frequency follow the incisors, the canines, the premolars; the second and third molars are the most rarely affected.

Bunon studied with great accuracy the means of preventing anomalous positions of the permanent teeth, owing, according to him, almost always to want of space. In certain cases he advises the extraction of the milk tooth in order to facilitate the eruption of the permanent one, and, necessity urging, he does not hesitate to sacrifice one of the permanent teeth to procure the advantage of a normal position of the others. With regard to this subject, the following passage is worthy of note, for in it we find sketched out the theory of preventive extraction as a means of facilitating the eruption of the wisdom tooth: "It is better to have the teeth incomplete as to number than to have the ordinary number badly arranged; for the mouth will appear none the less well furnished because of having one or two teeth the less; the other teeth will be commodiously distributed, and the last molars will find sufficient room when they come forth; thus, the disorders which these teeth often occasion will be avoided."[1]

After caries, Bunon considers dental tartar as the most potent enemy to the vitality of the teeth. He distinguishes three principal species: the black, the lemon or light yellow, and the brownish yellow; however, he allows of two other varieties of less frequent occurrence, the red and the green tartar.

At a period when an extraordinary confusion obtained with regard to gingivitis, because of the great number of varieties allowed, Bunon strongly affirms the unity of this morbid process, and considers tartar as the constant cause of it, without denying, however, that other causes of various kinds may contribute at the same time to produce it.

In cases of scorbutic stomatitis, Bunon advises, and very rightly, the complete removal of tartar from the teeth before having recourse to any other local treatment. He also insists on the necessity of attending to the teeth and gums, and especially of freeing the former from tartar before undertaking the specific treatment of syphilis, considering the good state of the teeth and gums as one of the most important prophylactic measures against mercurial stomatitis.

Anyone who takes the trouble of reading Bunon's works attentively cannot help admiring his depth of insight, his spirit of observation, his exquisite clinical sense, and his ingenuity. As illustrating this last quality of his, we may cite two cases of fracture of the lower jaw that he succeeded in curing in a short time by the method of binding the teeth, the preceding attempts of experienced surgeons having entirely failed. One of these cases is particularly interesting. The seat of the fracture corresponded with the bicuspids, which, however, had fallen out from the effects of trauma; the neighboring teeth were also loosened. Bunon filled the empty space left by the bicuspids with a piece of ivory, provided with two holes;

[1] Essay, p. 127.

From an old painting in oil.

MRS. SPENCER WATTS, PAINTED IN A COUNTRY VILLAGE



The Italian dentist Ruspini presenting the children of his orphanage to the members of the Free Masons Hall in London, with whose aid the institution had been founded.

then, by an ingenious crossing of threads passing from the second molar on the one side to the second bicuspid on the other, very tightly tied, he formed, so to speak, one single block, and succeeded in bringing about the consolidation of the shaking teeth and the complete cure of the fracture, which was effected in less than a month.

The unfavorable judgments passed on Bunon by some writers result, in a great measure, from the circumstance that one finds quoted in his books certain modes of treatment that today appear positively ridiculous. But those who, very wrongly and with deplorable levity, consider Bunon as nothing more than a vulgar empiric, ought to reflect that even the greatest men cannot altogether avoid the influence of the ideas and the prejudices of their time. Some tribute they are almost fatally bound to pay to these prejudices. It is, therefore, not to be wondered at, if one finds in Bunon's works, as well as in those of many other old writers, indications given of more or less strange remedies. Thus, as facilitating the eruption of teeth, he recommends among other remedies the rubbing of the gums with a mixture of honey, fresh butter, hare's brains, and oil of lilies, or with the fat of an old cock, dog's milk, and pig's brains. Against the disorders and dangers of the teething period he also advises rubbing the nape of the infant's neck, the shoulders, the back, and the lower limbs, always taking care, however, to rub from above downward, thus offering opposition to the flow of humors toward the upper parts of the body.

These means and methods of treatment reflect, so to speak, the medical ideas and the curative practices of that time, and come down, in part, from remote ages, as evidently appears from what is said in different parts of this book. But such small blemishes ought certainly not to be taken into account in passing judgment on Bunon's works, the most substantial part of which is made up of very original ideas and observations. The high intrinsic value of Bunon's works gives him a just right to be considered one of the most illustrious forerunners of modern scientific dentistry.

Bartolomeo Ruspini, an Italian dentist, exercised his profession in London with great success for more than thirty years. He was patronized by all the greatest personages of the Kingdom and also by the Royal family, from whom he received special marks of distinction. He attained a very conspicuous position, and with the aid of the London Freemasons' Lodge, of which he was an influential member, but chiefly by the results of his professional work, he was able to found an orphanage that was called by his name, being moved to do this by his great love for children, whose dental maladies and disorders had always been an object of particular study for him. In 1768 he published *A Treatise on the Teeth, Their Structure and Various Diseases*. This book was remarkably well received and went through a number of editions, the last in the year

1797. Ruspini did not, in reality, contribute very much to the development of dental science. He is, however, to be especially remembered as the inventor of a very good mouth mirror, a means of examination which afterward gradually came into general use.

Having brought our history of dentistry up to the end of the eighteenth century, in order to complete our work we must now speak of an innovation in dental prosthesis, which, although gradually brought to perfection in the following century, was first introduced at that time. We allude to the

INVENTION OF MINERAL TEETH.

The merit of this invention is due, in part, to an individual outside the dental profession, namely, to the French chemist Duchâteau, of St. Germain en Laye, near Paris, who first had the idea of employing porcelain as material for dental prosthesis. However, his idea would not have yielded fruitful results had it not been for the coöperation of the dentist Dubois de Chemant, who succeeded in putting it into practice.

The circumstances connected with this invention were the following: The chemist Duchâteau had for some time worn a denture of hippopotamus ivory, but as usually happened with all the prosthetic pieces of that time, which were made of organic material, and were, therefore, subject to decay, this denture had acquired a very disagreeable odor, resulting from the action of the buccal humors. Besides which, Duchâteau being obliged, by reason of his profession, to continually taste pharmaceutic preparations, his denture had gradually become impregnated with medicinal substances that imparted a nauseous taste to everything he ate. The unpleasantness of this was a subject of much consideration with him, and thus it was that, to remedy the evil, he gradually matured the idea of having a porcelain denture made, on the model of the ivory one. In the year 1774 he applied to the porcelain manufactory of M. Guerhard in Paris for the carrying out of his design. The first trial was not successful, for in the baking the paste contracted so much that the denture was no longer of the right dimensions. To remedy this, he now had another and larger denture made, to allow for its contraction in the baking. But the results did not correspond with his wishes, and many trials were still necessary before Duchâteau was able to obtain a denture which he judged fit for use, although not without defects. As this denture, because of its dead whiteness, produced an unpleasant effect, he had a yellowish tint, resembling that of the natural teeth, given to it, and, as is usual with painting on porcelain, fixed this color by baking a second time.

However, this denture proving unserviceable, Duchâteau was obliged to put it aside and begin new experiments. These were made with a special kind of porcelain paste used in France for the first time in 1740, which vitrified in baking at 12° to 25° by Wedgwood's pyrometer, whilst the usual porcelain required a temperature of 72° to 75° by the same test; but the results thus obtained were no better than the preceding ones, and upon these new failures Duchâteau applied to the dentist Dubois de Chemant, of Paris, for his collaboration. Together they made fresh attempts, modifying the composition of the paste by adding a certain quantity of pipe clay and other coloring earths to it. These modifications enabled them to carry out the baking of the pieces at a much lower temperature, and after various experiments the final result was a denture that fitted the gums well enough, and which, in point of fact, Duchâteau was able to wear.

Encouraged by this success, he tried to manufacture like dentures for personages of high rank, hoping to gain money thereby, but his want of knowledge of the dental art prevented him from succeeding in his undertaking. However, in 1776 he laid this new process before the Royal Academy of Surgeons in Paris, receiving the thanks of that body as well as an honorable mention.

Whilst Duchâteau, discouraged by failure, was giving up all idea of deriving profit from the practical application of his invention, Dubois de Chemant, on the contrary, did not cease working for a moment, in order to bring the new method of prosthesis to perfection. Little by little he introduced important modifications into the composition of the mineral paste used in the manufacture of the dentures, incorporating therewith Fontainebleau sand, alicant soda, marl, red oxide of iron, and cobalt. His experiments and researches aimed at three principal ends, viz.:

1. The obtaining of mineral teeth offering all the gradations of color presented by natural ones.

2. The arriving at a rigorous calculation of the contraction of the mineral paste in the baking, so as to be able to make prosthetic pieces of the desired form and dimensions.

3. The perfecting of the means of attachment of the prosthetic pieces, and, in particular, of the springs.

By working with intelligence and perseverance, Dubois de Chemant gradually obtained satisfactory results, and when, in 1788, he published his first pamphlet on mineral teeth, he had already made dentures and partial prosthetic pieces for a certain number of persons, who wore them to great advantage.

As to the chemist Duchâteau, from 1776 to 1788, that is, during the twelve years subsequent to his communication to the Academy of Surgeons, he did absolutely nothing at all. He is, therefore, entitled to the

credit of having had a happy idea and of having endeavored to put it into practice; but the merit of having given life to the idea, abandoned for so many years by him with whom it originated, is exclusively due to Dubois de Chemant; he is, therefore, with reason considered the true inventor of mineral teeth.

Dubois de Chemant, however, was so unjust as to take the whole credit of the invention for himself, declaring in his writings that the original idea had been exclusively his own, and was in no way due to Duchâteau.

In 1789 Dubois de Chemant made his invention known to the Academy of Sciences and to the Faculty of Medicine of Paris; both pronounced in favor of it, and in consequence of the opinion given by such high authorities, he soon after obtained an inventor's patent from Louis XVI.

Dubois' successes now aroused the envy of many of his colleagues, and especially of Dubois Foucou, the king's dentist, who, together with the greater part of the dentists of Paris and the chemist Duchâteau, brought an action against him, accusing him of having usurped the invention of Duchâteau, and demanding, for this reason, the annulment of the inventor's patent that had been granted him. But the law courts, in an opinion dated January 26, 1792, rejected the demand for annulment, recognized the patent of invention as fully valid, and condemned Dubois Foucou, Duchâteau, and their confederates to the costs of the judgment.

Paris being at that time in full revolution, Dubois de Chemant was induced to emigrate to England. He established himself in London, and there obtained a patent without much difficulty, according him the exclusive right, for fourteen years, of manufacturing dentures of mineral paste.

Dubois de Chemant wrote several pamphlets in order to make known to the public this new kind of dental prosthesis and its advantages; some of these were published in Paris (1788, 1790, 1824), and others during his long residence in London, where he remained from 1792 to 1817. In these pamphlets he upholds the great superiority of "the incorruptible teeth of mineral paste" over all other kinds of artificial teeth; he calls special attention to the fact that teeth of bone, ivory, and of every other organic substance whatever gradually become spoilt through the action of the saliva, of oral heat, of food and drink, etc., and not only lose their primitive color and assume a dirty hue, most unpleasant to the eye, but acquire a bad odor, at times quite insupportable, becoming, besides, a cause of irritation to the gums and the mucous membrane of the mouth, not to speak of their gradual softening and wearing out, which renders them unserviceable after a certain time. All these disadvantages were avoided by using the new prosthetic material, this being incorruptible and inalterable.

The prosthetic appliances by Dubois de Chemant were made in one single piece that represented the gums and teeth, whether in the case of one or more teeth, or of whole dental sets. He used to take a cast of the parts on which the prosthesis was to be applied, and by a process, the details of which are not known; he succeeded in obtaining prosthetic pieces that fitted the parts perfectly, notwithstanding the difficulties resulting from the shrinking of the paste in baking. If the piece required retouching, he did this by means of special tools for grinding down porcelain. He could, besides, drill holes in the porcelain for the application of the means of attachment. In fact, Dubois de Chemant was the creator of a new method of prosthesis applicable to any and every case, and which gained the praise and admiration of the great doctors and scientists of that day, among whom may be mentioned Geoffroy, Vicq d'Asyr, Descemet, Bajet, Petit Radel, Darcet, Sabatier, Jenner, and others. The Paris Faculty of Medicine gave it as their judgment that the prosthetic pieces manufactured by Dubois de Chemant united the qualities of beauty, solidity, and comfort to the exigencies of hygiene.

These eulogies must, however, be received with a certain reserve, as, beyond doubt, the mineral teeth of that time still left much to be desired. In England, where, as we have already said, they had been introduced by the inventor, they at first obtained a great success, which was, however, of short duration, and Maury[1] tells us that toward 1814 they had fallen into great discredit and had been entirely abandoned; this signifies that practically they did not fulfil the expectations held out.

Dubois Foucou and Fonzi. Among the first who occupied themselves with the manufacturing of mineral teeth, contributing also to their improvement, are to be named Dubois Foucou, to whom we have already made reference, and Fonzi, an Italian by birth, who exercised the profession of dentist in Paris. Dubois Foucou made some improvements in the coloring of porcelain teeth, and in 1808 published a pamphlet in which he explained his mode of proceeding in manufacturing them.[2] In the same year Fonzi made known a new kind of teeth,[3] which he called *terro-metallic*. These differed from those of Dubois de Chemant in that they were all single teeth intended to be applied on a base by means of small hooks of platina, with which each tooth was furnished. In addition to this important innovation, Fonzi also discovered the means of imitating in some degree the semitransparent tint peculiar to natural teeth.

[1] F. Maury. Traité complet de l'art du dentiste, d'après l'état actuel des connaissances, 2 vols., Paris, 1828.

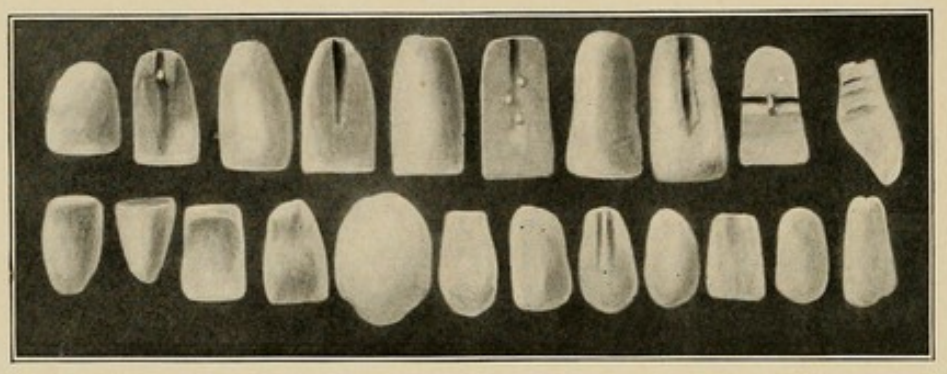
[2] Exposé de nouveaux procédés pour la confection des dents dites de composition, par M. Dubois Faucou, Paris, 1808.

[3] Rapport sur les dents artificielles terro-metalliques, Paris, 1808.

Notwithstanding this, the teeth made by Fonzi, of which there are still some specimens in various dental museums, had anything but a good appearance, and there still remained much to be done before mineral teeth reached the height of perfection which they attained later on.

The credit of having introduced many new improvements in the manufacture of mineral teeth belongs especially to the Americans. Among those who particularly distinguished themselves in this department of dental art, we may note Charles W. Peale, Samuel W. Stockton, James Alcock, and Dr. Elias Wildman. But the most brilliant results, as is

FIG. 104



Earliest specimens of mineral teeth.

well known, were obtained by the celebrated Samuel S. White, who, by an intelligent and persevering activity, dedicated almost exclusively to improving mineral teeth and to bringing them into general use, contributed vastly to the progress of modern dental art. Samuel S. White undoubtedly stands forth as one of the noblest and grandest figures in the history of dentistry, and his name will ever be recorded with honor and veneration by dentists of all ages.

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