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A

HISTORY OF DENTISTRY

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

BY

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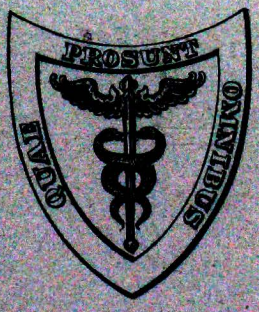

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PREFACE.

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.

CONTENTS.

PART I.

FIRST PERIOD—ANTIQUITY.

PART II.

SECOND PERIOD—THE MIDDLE AGES.

PART III.

THIRD PERIOD—MODERN TIMES.

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.

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

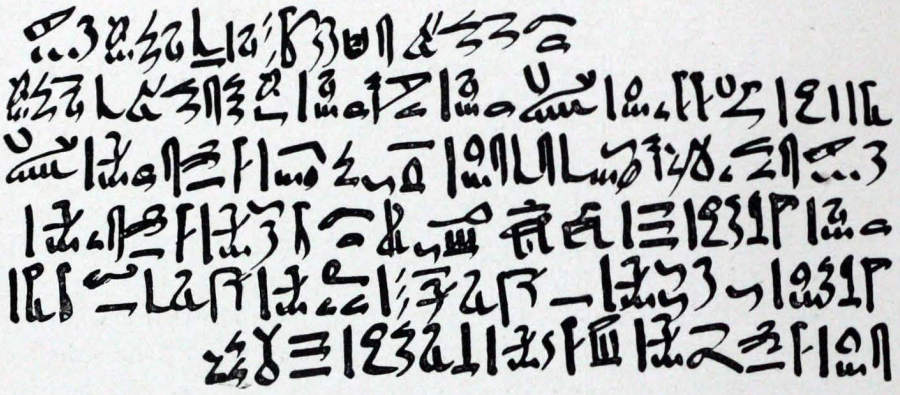
[1] See Introduction to the German translation of the Ebers papyrus, by Heinrich Joachim, Berlin, 1890.

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:

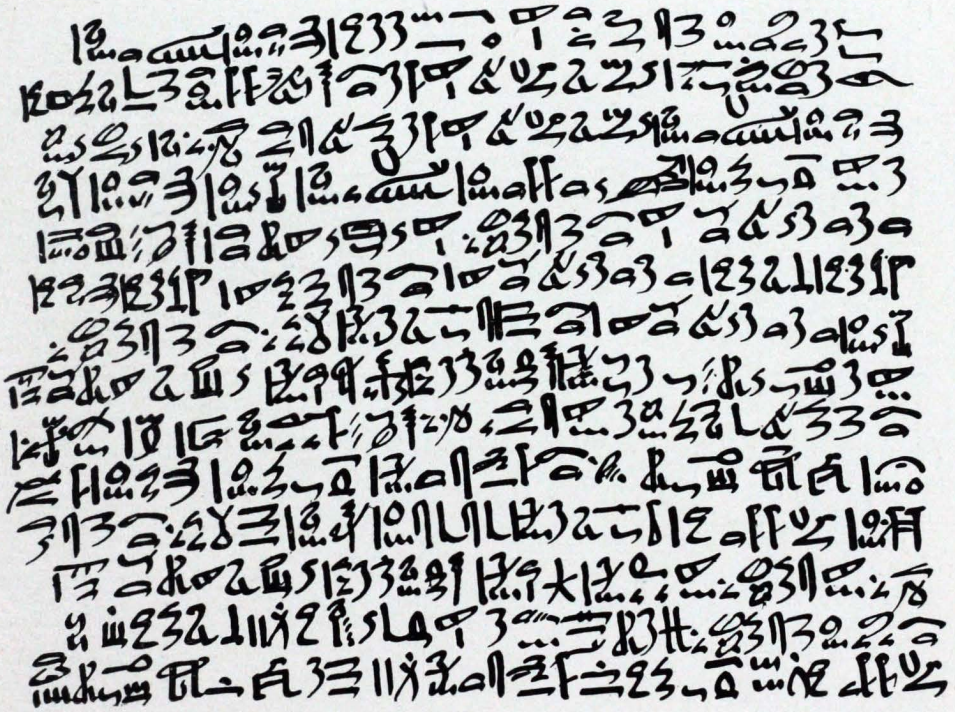
"Beginning of the book about the treatment of the *uxedu* in all the members of a person, such as was found in a writing under the feet of the God Anubis, in the city of Letopolis; it was brought to His Majesty Usaphais, King of Upper and Lower Egypt." Now, as Joachim remarks, the Usaphais herein named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

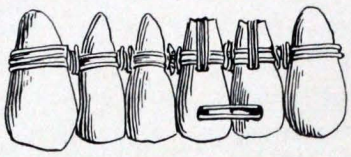
Fortunately, however, we are not bound to content ourselves with simple suppositions, for a well-authenticated archeological discovery made in the month of May, 1862, has put us in possession of an irrefutable proof.

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

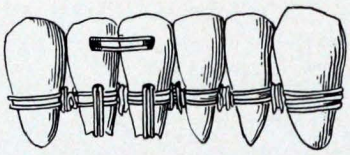
FIG. 3



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

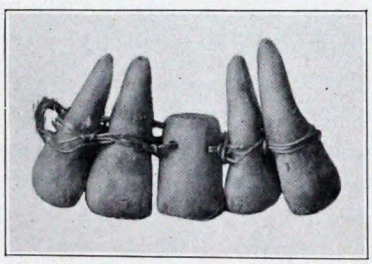
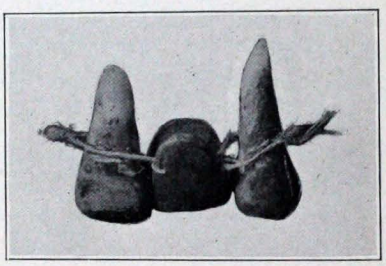


FIG. 6



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.

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.

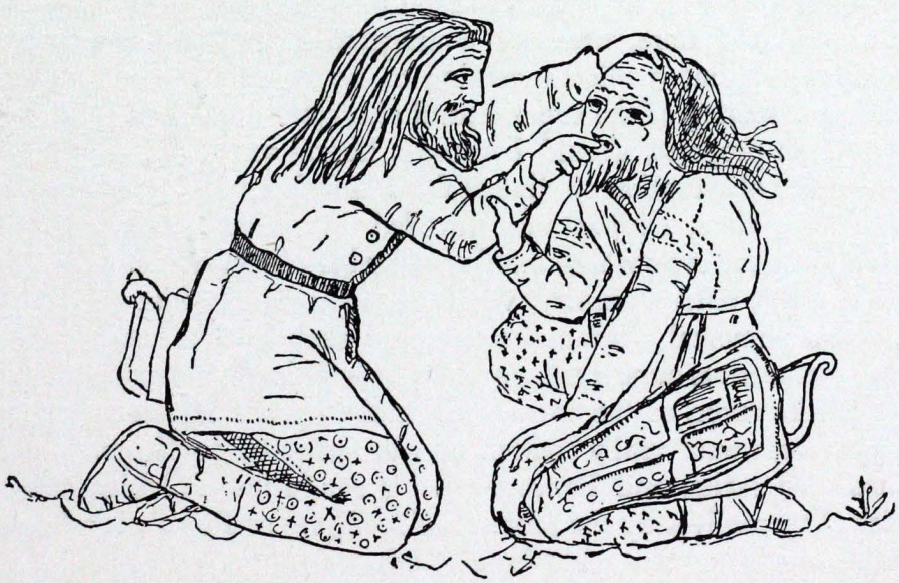
Surgical instruments of proved utility were deposited in the temples. Celius Aurelianus makes mention of a leaden instrument used for the extraction of teeth (*plumbeum odontagogon*), which was exhibited in the temple of Apollo, at Delphi.

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.

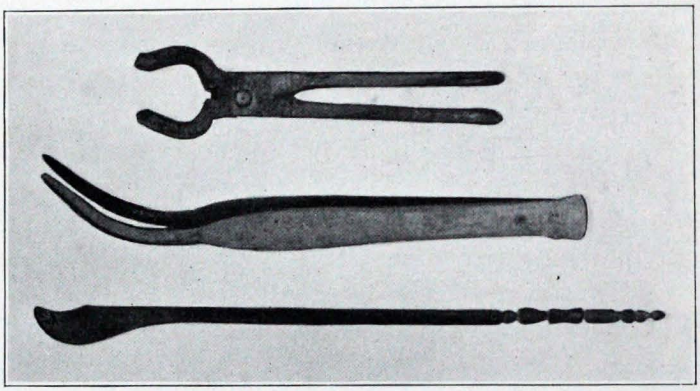
[5] Page 507.

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!

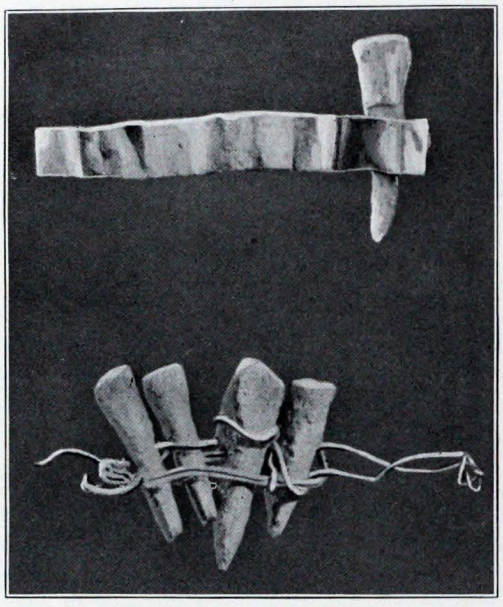
In speaking of fracture of the lower jaw, Hippocrates recommends binding the teeth next to the lesion together. He distinguishes between

[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

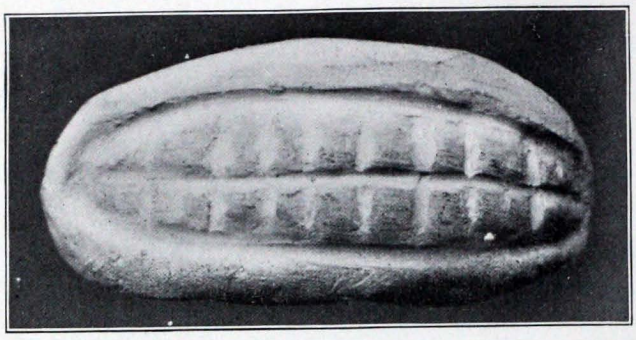


FIG. 11

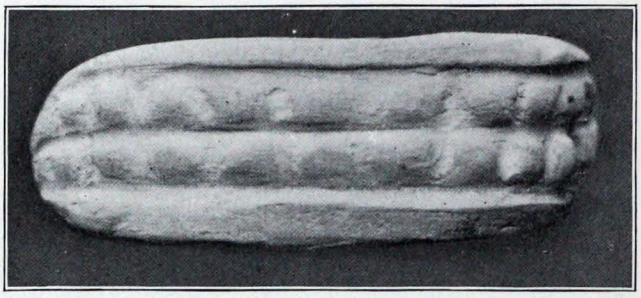
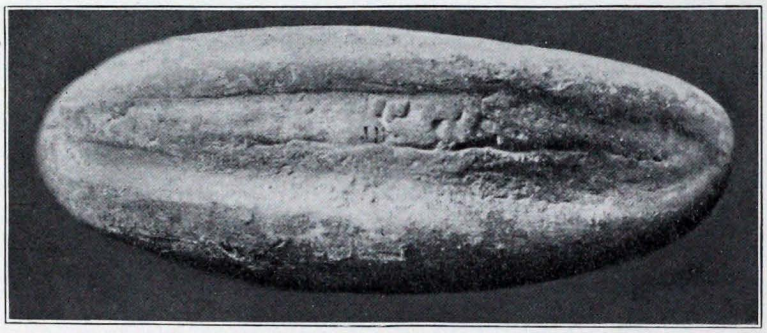


FIG. 12



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.

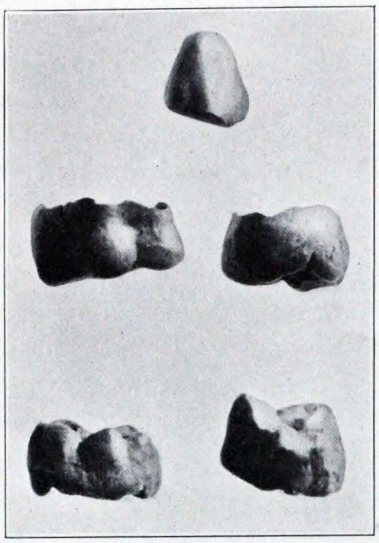
At Tarquinii and Orvieto burial generally prevails.

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]

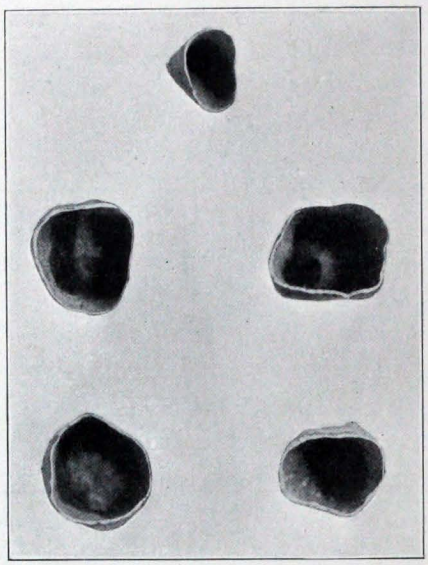
Notwithstanding cremation, which certainly must have destroyed a great number of the dental appliances of that time, and in spite of the many different destructive agents which successively did their work on those human remains during so many centuries, not a few prosthetic

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.

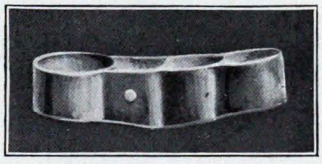
In the museum of Pope Julius in Rome there is a dental appliance found at Valsiarosa in one of the many Etruscan tombs excavated in that locality near Civita Castellana, the ancient Falerii (Fig. 15). This

[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



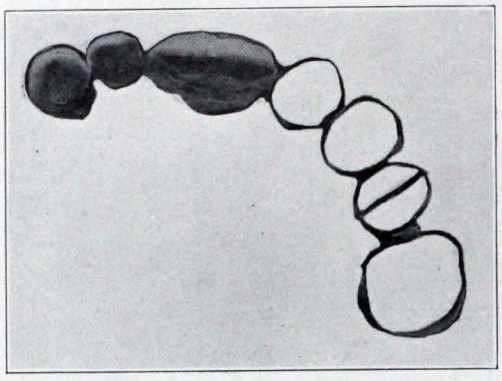
Etruscan appliance found at Valsiarosa, destined to support an artificial bicuspid, now disappeared.

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.

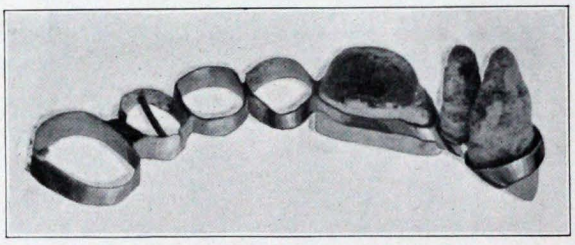
When I was intrusted with the reproduction of all the ancient prosthetic pieces existing in the Italian museums, I met with special difficulty in the reproduction of the above-mentioned piece; and this because I

FIG. 16



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

FIG. 17



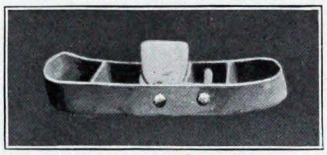
The same appliance reversed.

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.

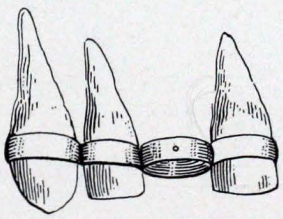
FIG. 18



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



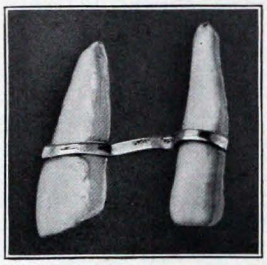
Etruscan appliance supporting one inserted tooth (upper middle incisor on the right) which is now disappeared. (Museum of the Conte Bruschi at Corneto.)

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.

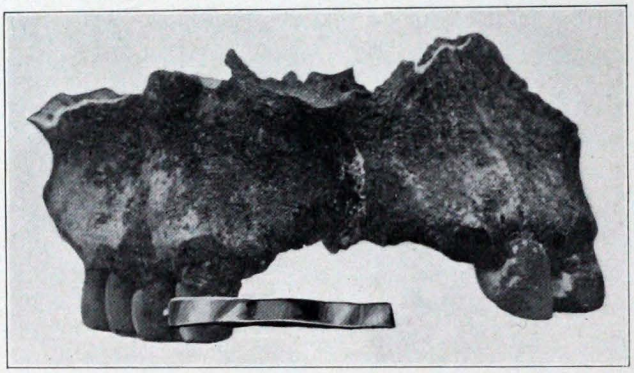
FIG. 20



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



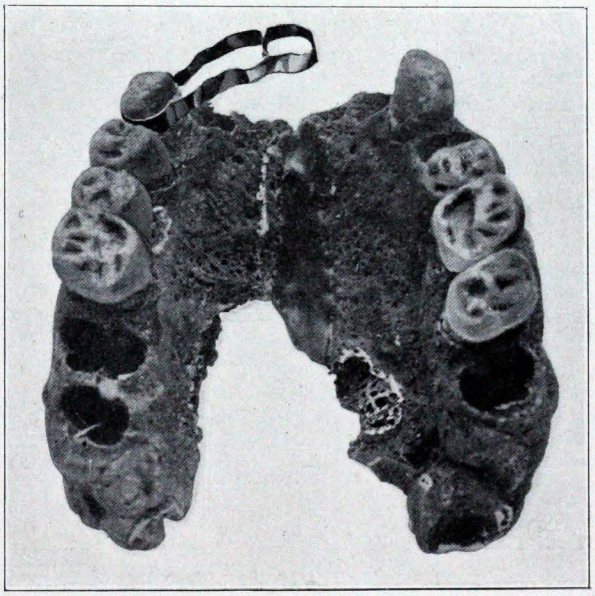
Dental appliance still adhering to the jaw, discovered in an Etruscan necropolis near Orvieto, and now in the possession of the Ghent University.

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.

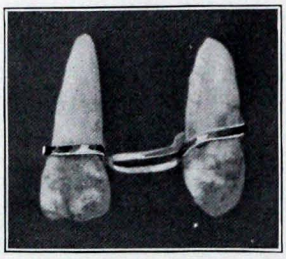
the left must have contained the left central incisor, that has now disappeared, while the large central compartment must evidently have contained the two incisors on the right side. As there is no pivot in the whole appliance, and as the alveoli are not obliterated, there can be no doubt that the appliance 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.

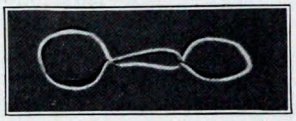
others, they being, on the contrary, most visible. It is in consequence to be surmised that in those times the wearing of false teeth and other kinds of dental appliance was not a thing to be ashamed of; indeed, that it rather constituted a luxury, a sort of refinement only accessible to persons of means. 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.

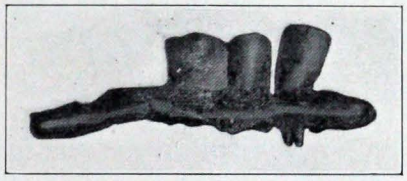
This ingenious appliance was found still adherent to the mandible of a skeleton, in a tomb which, according to the eminent archæologist Dalli Osso, belongs to a period comprised between the third and the fourth century before Christ.

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.

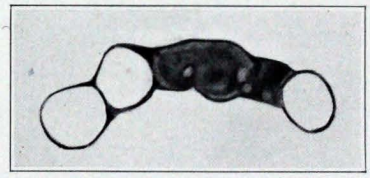
The above apparatus belongs to the archeological collection of Signor Luigi Nobile, in Teano, in whose possession it was found.

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.

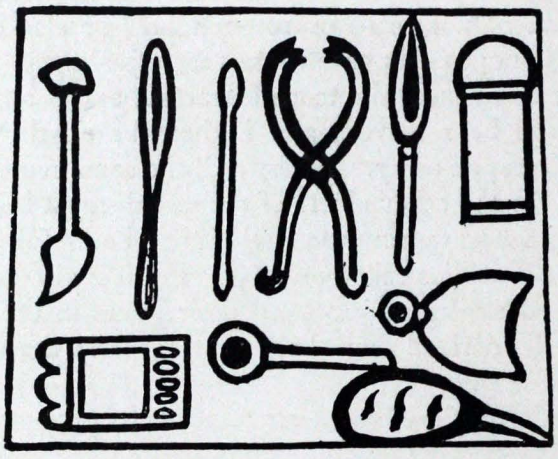
[2] Trisulphide of arsenic.

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.

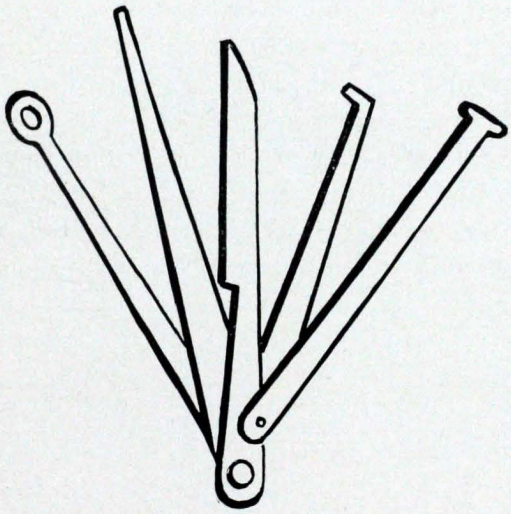
[3] Medio recumbit imus ille qui lecto,
Calvam trifilem segmentatus unguento,
Foditque tonsis ora laxa lentiscis;
Mentitur, Esculane; non habet dentes.

[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.)

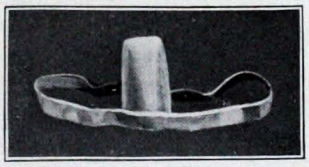
[5] Lib. ix, epig. xxxviii.

[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.

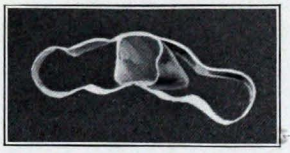
This alone should be sufficient, even were further proof wanting, to give us an idea of the degree of development and of the point of perfection reached by dental prosthesis at that time. But besides this, we now also possess an ancient Roman piece furnishing a palpable proof of the ability and ingenuity 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.

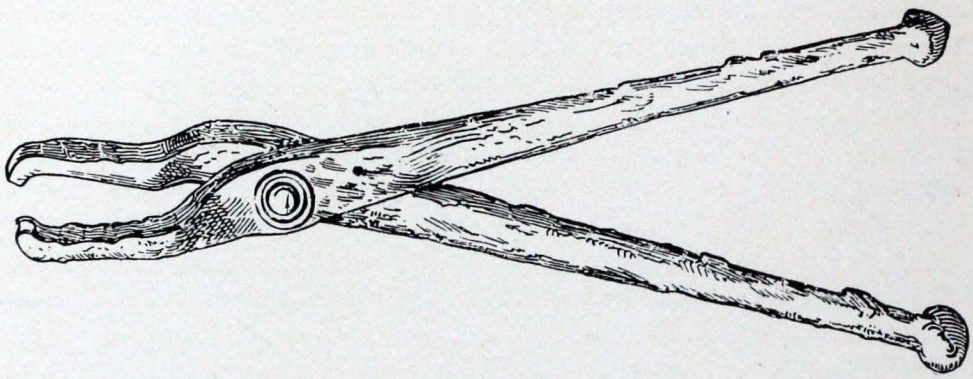
Celius Aurelianus. In the book *De morbis acutis et chronicis*, written by Celius Aurelianus (who lived, according to some, in the third century, according to others, in the fourth or at the beginning of the fifth), a very interesting chapter on odontalgia is found. He shows himself to be, for the most 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.