The teeth and dentistry in the 20th century : in which is included a chapter on dental prosthetics in its relation to art / by Joseph Miller.

THE TEETH AND DENTISTRY IN THE 20TH CENTURY

"We cannot stay the progress of civilization for the sake of our teeth; but it is in our power to adopt the means placed at our disposal by civilization for their preservation."

Joseph Miller

This little book is dedicated to my patients whom I have ever striven to serve to the best of my ability, and whose appreciation of my work will always be my most cherished reward.

THE TEETH

AND

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IN THE

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IN WHICH IS INCLUDED

A CHAPTER ON

DENTAL PROSTHETICS

IN ITS RELATION TO ART

[2ND ED.]

By

JOSEPH MILLER

L.D.S.R.C.S. Edin.

(Late Dental Surgeon to the Viceroy of India)

[1912?]

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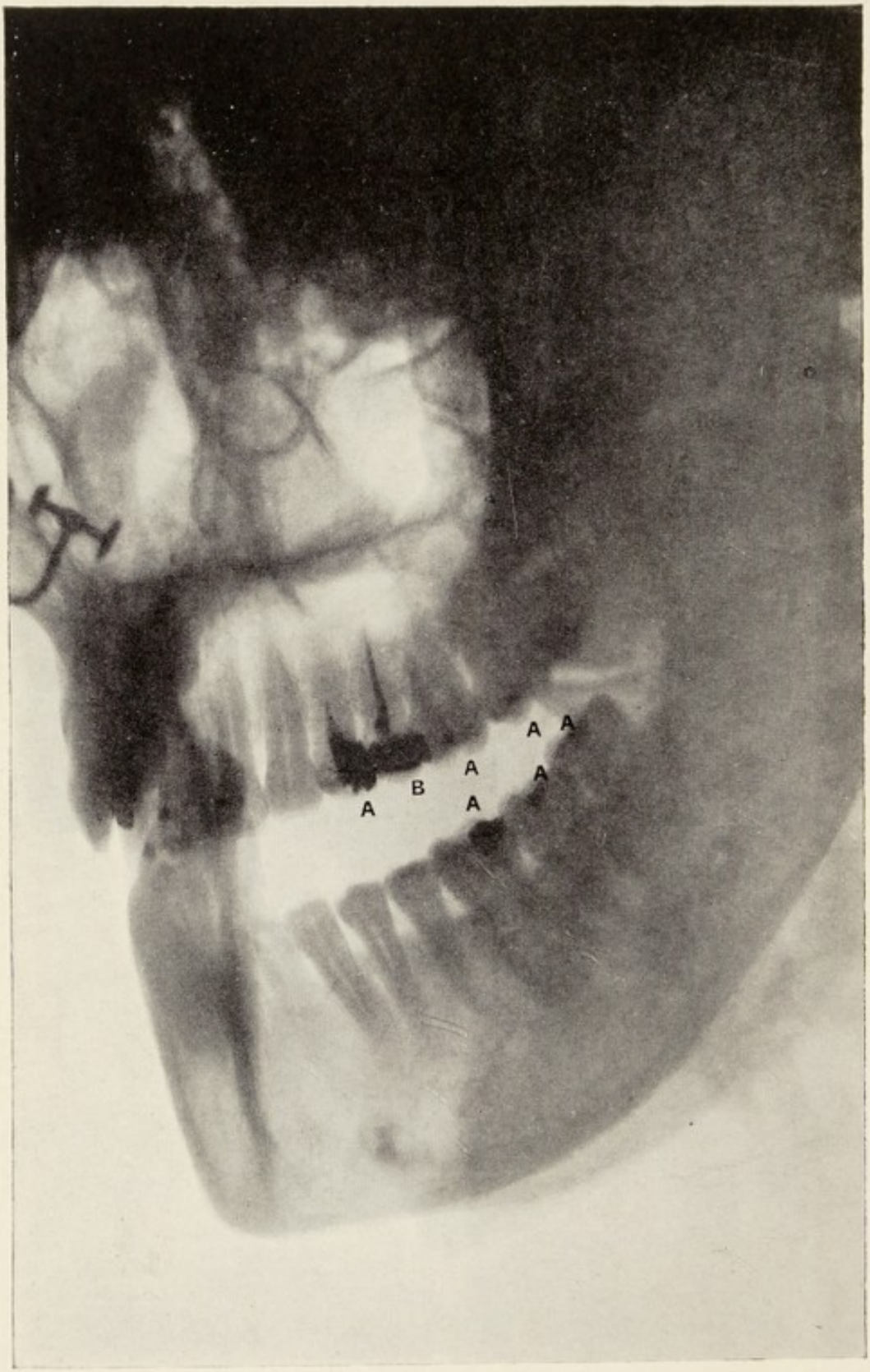

X-RAY PICTURE OF THE JAWS OF AN ADULT.

A.—Fillings.
B.—Crowned tooth with root-filling.

PREFACE TO THE SECOND EDITION.

In revising the present edition of this little book I have not found it necessary to add much to the chapters on Civilization and the Teeth, or their decay and preservation, as the experimental research and investigation which have taken place since the publication of the last edition confirm the opinions then expressed, that Civilization is largely responsible for the deterioration of the teeth; that decay of the teeth is a preventable disease; and, further, the treatment suggested has not only received the endorsement of experience, but is advocated with little modification at the present time.

Crown and bridge work, which had not long been introduced, has fully justified the high expectations entertained of its usefulness.

Anaesthetics.

New drugs have been introduced and new methods devised for the relief of pain, especially in improved means for the administration of "Nitrous-oxide Gas"—the best and safest general anaesthetic for dental operations. By a very simple device the administration of this gas can be extended sufficiently long to enable the dentist to perform almost

any operation at one sitting, which, under the original method, would have necessitated three or perhaps four visits. This advantage, moreover, is obtained without any increased inconvenience to the patient.

Local anaesthetics have also been much improved and are now very generally employed in minor operations, or in cases where the patient prefers it to a general anaesthetic. In a recent work on "Local Anaesthesia in Dentistry," by Professor Guido Fisher (a leading authority on the subject), it is stated that Novocain—the most generally approved local anaesthetic—has been employed in nearly a million cases without one fatal result, or even any untoward sequel. By way of comparison it may be said that the patient of to-day runs less risk in undergoing a dental operation than the traveller by rail, 'bus or tram, or, indeed, the ordinary pedestrian in the street; provided, of course, that the administration is undertaken by a properly qualified person.

Filling materials.

Marked improvements have been made in the manufacture of materials used in filling teeth, both with regard to their lasting qualities and their improved appearance in the mouth. Some of the new porcelain enamels, when care is taken to match the colour, represent the natural tooth substance in a really remarkable degree and are extremely difficult to detect. It is, of course, especially useful for teeth in the front of the mouth.

Inlays.

Inlays are another useful adjunct in the conservative work of the dentist of to-day. By an ingenious process lesions of the teeth are made good by small accurately adapted castings of gold or porcelain, saving the patient fatigue and the operator's time and trouble of making the filling out of numberless small pieces, as formerly had to be done when filling with gold.

X-Rays.

I must not omit to mention the usefulness of Röntgen's wonderful discovery in the diagnosis of many obscure dental troubles arising from impacted (unerupted) teeth. It is especially useful in determining the treatment to be adopted in the regulation of children's teeth and the alteration of their jaws, and in many other ways. Dentists are now able to peep into the innermost recesses of the jaws and read with unerring certainty what was formerly a sealed book.

Many improvements have been made in the technique of dental mechanics, but from an artistic point of view this branch of our work has scarcely received the attention it deserves. That the responsibility for this does not wholly rest with the dental profession I have endeavoured to make clear.

The matter is one of some importance, because there must always be a large number of persons who, notwithstanding the means placed at their disposal for the preservation of their natural teeth, have to depend at some time or other for their comfort and well-being on the use of artificial substitutes.

It is with the view of drawing attention to the greater possibilities of this interesting branch of our work, that I have added a chapter on "Dental Prosthesis in its Relation to Art," and another conveying many useful hints to those already wearing dentures.

I hope, in so doing, I may be able to make clear to many who are not aware of the fact, that the designing and making of artificial substitutes is only really successful in the degree in which artistic perception is brought to bear in its execution.

JOSEPH MILLER.

17, Upper Wimpole Street,
London, W.
1912.

PREFACE TO THE FIRST EDITION.

Recognising that it is no less the duty of the Dentist to instruct his patients regarding the preservation of their Teeth, than it is that of the Physician to disseminate any special knowledge of which he may be possessed, tending to the prevention of disease in general, I have been in the habit, as time and opportunity permitted, of explaining as clearly as I could, the causes of Dental Caries to patients who have had the curiosity to inquire. I am convinced, however, that the exigencies of a busy practice have prevented me, in many cases, from making my explanations as clear as I could have wished.

Acting on this conviction, I have, in the following pages, endeavoured to summarise all that is known respecting the care and treatment of the Teeth; and in doing so, my aim has been to communicate, in a popular and succinct form, information which is usually desiderated, and which I hope will be generally appreciated.

Since the introduction of vulcanite, no material improvement in the mechanical department of Dentistry was recorded, until very shortly before the publication of my notes. It was about this

time that what had all along been considered as an unattainable ideal of prosthetic Dentistry—the adaptation of artificial Teeth without plates—was first introduced. This work seems, as it were, to fill the gap which had heretofore existed between operative and mechanical Dentistry, a new power being now placed in the hands of the profession for the conservative treatment of Teeth, even when beyond preservation by filling ; so that the sanguine hopes of some, that we shall eventually be able to abandon the forceps, do not, viewed in the light of the present possibilities of our art, appear so wide of the mark after all.

Following the chapter on the anatomy of the Teeth, I have alluded, in the briefest possible manner, to the importance of thorough mastication of the food, in connection with its subsequent digestion and assimilation. I have done so more with a view to remind my readers, than to give information on a subject which is more fully explained in any school text-book on physiology.

Being more convinced than ever, that the welfare of the Teeth rests as much with the individual as it does with the Dentist, I have noticed Dr. Pierrepont's Perfect Cleansing Toothbrushes, which I heartily recommend to all who have any regard for the hygienic condition of their mouths, and the welfare of the important organs of mastication within.

Dr. W. D. Miller, the celebrated oral bacteriologist, has made many elaborate experiments on the decay of the Teeth and its causes ; and the

result of his researches I have also referred to as being likely to benefit those who may think it worth while to follow his advice.

In the chapter on Conservative Dentistry I have referred at some length to the relationship which Dentistry bears to general surgery, and to the treatment of the dental organs, being based on the accepted laws of that science; also to the high organisation of the Teeth, and their intimate connection with the surrounding tissues. By so doing, I hope I shall be making it clearer to many of those who do not seem to be aware that the Teeth, like other organs, although badly diseased, readily yield to proper treatment, and the operation of extraction need nowadays be very seldom performed.

I will only say, in conclusion, that I am actuated as before by the desire that my patients should be *au courant* with all that is going forward in dental science, feeling assured that the better they become acquainted with the scope of our work, the more they will appreciate the successful efforts which have been made to minimise the suffering and inconvenience attending lesions of the Teeth.

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INTRODUCTION.

Sir James Paget, at the opening of the Health Exhibition in London some years ago, expressed his opinion that it was the duty of every man to make health his ambition. It is a maxim both sound and useful. He referred, of course, to the health of the human body as a whole, leaving the numerous subdivisions of the Science of Hygiene to be dealt with by their respective specialists.

Eating and drinking were fully discussed, as well as the chemistry of the various articles of food, solid and liquid, in their relation to the human organism. Climate, clothing, sanitation, work and recreation—each received its due share of attention.

That such an exhibition—with its concomitant lectures—was calculated to be productive of much good, no one could well doubt ; and it is specially pleasant to reflect that to Great Britain the honour is due of conceiving and successfully carrying out so universally interesting and so thoroughly practical an enterprise.

Among the sciences which have of late years been cultivated for the alleviation of suffering, and as a means whereby more perfect health may be

secured to multitudes of our fellow-creatures, the science of Dentistry should occupy a very prominent position. That it is a subject worthy of the attention and study which have been devoted to it, scarcely needs assertion, in face of the calculation that eighty out of every hundred of the inhabitants of the West are afflicted, more or less, with Caries of the Teeth before reaching adult age.

A great and salutary impetus was given to the Dental Profession by the Dentists' Act of 1878. Previous to the passing of that statute there was little or no unity between Dentists, and their sole representative Corporation in Great Britain was the Odontological Society, with less than 250 members. Great apathy formerly prevailed; but that, fortunately, has now been superceded by an *esprit de corps* that is as commendable as it is gratifying. Now we have the British Dental Association, which, with its provincial affiliated branches, has a membership roll of over 2,000. Dental Hospitals, too, which formerly existed only in London, Edinburgh and Dublin, have been established in Manchester, Liverpool, Birmingham and other important centres. That these institutions are appreciated by the poor is proved by a monthly attendance of many thousands of patients at the two Metropolitan Dental Hospitals alone.

The attention which Dentistry has commanded within recent years has resulted in much good being done in another direction, for now nearly all schools and institutions of any pretensions have qualified Dentists attached to them; and it is to

be hoped that the same advantages will ere long be extended to the millions of children attending the Government Schools, which will not only improve the general health of the masses, but be of incalculable benefit to the race to come. Dental surgeons have also been attached—experimentally only at present—both to the Army and Navy, and there can be no doubt but that the appreciation of their services will lead the authorities eventually to grant commissions to a sufficient number of Dentists to properly care for the teeth of our soldiers and sailors. In face of the fact that over 3,000 soldiers were invalided home during the Boer War owing to defective teeth, the economic advantages of such an arrangement should be sufficiently obvious.

CHAPTER I.

STRUCTURE OF THE TEETH.

As it would be impossible for the reader to understand the remarks on Caries of the Teeth, which follow, without some knowledge of their structure, and the relation which one part bears to another, it is necessary that I should, first of all, devote a page or two to a short description of the Anatomy of the Teeth.

Structure of the Teeth.

The human Teeth are composed of what Anatomists call hard and soft tissues. The hard tissue includes (*a*) the Enamel, (*b*) the Dentine, and (*c*) the Cementum. The soft tissue comprises the Pulp, Nerves and Vessels contained in the cavities of the body and roots of the tooth.

The Enamel.

The Enamel is the hardest and least destructible tissue of the human body. It completely covers all that portion of a tooth which is above the gum, being thickest on the cusps of the molar and cutting edges of the incisor teeth, and gradually tapering off to quite a thin layer, just beneath the margin of the gum, where it is slightly overlapped by the cementum. Through the microscope it is seen to

be composed of a mass of hexagonal prisms, closely bound together, which rise at right angles from the surface of the dentine. Its colour varies in different races, and in different individuals of the same race, according to the personal idiosyncrasies and temperaments. In those of a bilious temperament we find yellow teeth, often of large size ; sanguine subjects have smaller teeth, and of lighter colour ; and in phlegmatic and nervous persons the teeth are generally of a pearly hue, with a bluish tinge, and these are the most liable to be attacked by decay.

The Dentine.

Dentine, as will be seen on referring to Fig. B of the second page of illustrations, forms the whole body of the tooth. As seen through the microscope, we find that it consists of a matrix of dense tissue, permeated by thousands of minute tubes, running in a slightly wavy course directly from the cavity of the pulp to the under-surface of the enamel. Every tubule contains a minute fibril, or offshoot of the pulp contained in the centre of the tooth ; and it is to the exposure of these tiny nerve-branches by the wearing or chipping of their protecting enamel, that much of the excruciating pain endured, expecially by those of a highly nervous organisation, is due. It will thus be readily understood how toothache may be established long before the pulp is exposed by actual caries.

The Cementum.

The Cementum is the thin bone-like sheath covering the entire roots of the teeth beneath the

PLATE II.

Magnified Section of a canine tooth and the surrounding tissues of the jaw.

A.—Enamel.
B.—Dentine.
C.—Epithelial layers of mucous membrane.
D.—Pulp.
E.—Fibrous layer of gum tissue.
F.—Cementum.
G.—Periosteum.
H and I.—Inner and outer osteogenetic layers of Periosteum.
J.—Osseous tissue.

PLATE III.

Fig. 1.

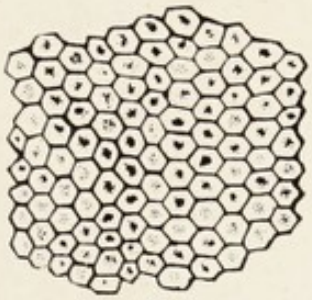

Fig. 2.

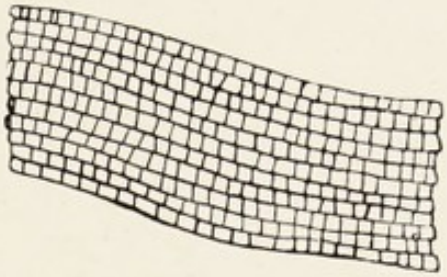

Fig. 3.

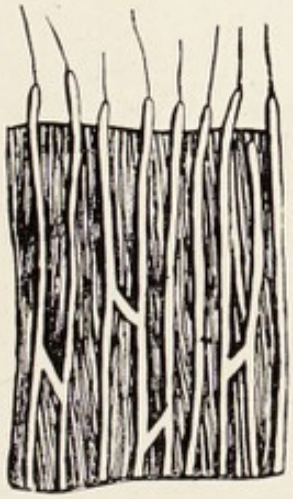

Fig. 4.

Fig. 1.—Microscopical Transverse Section of Enamel.
Fig. 2.—Ditto Longitudinal.
Fig. 3.—Section of Dentine showing Dental Fibres projecting from Tubes.
Fig. 4.—Section of Cementum disclosing the Lacunae and Canaliculi.

gums, in the same way as the enamel covers the upper and visible part. Its structure consists of a matrix nearly analogous to that of true bone, interspersed with numerous little irregularly-shaped cells, called *Lacunae*, which are connected with each other by slight prolongations or star-like processes, termed *Canaliculi*. It is through this network of cells that a nervous or vital communication is maintained between the vessels and the nerves on the inner surface of the periosteum* and the contiguous dentine. It will thus be seen that the teeth do not depend wholly, as was formerly supposed, for their vitality upon the main nerve and pulp, but possess a second and independent source of life.

Everyone knows that the living body will not tolerate any part which may have become necrosed† but at once proceeds to exfoliate or throw it off, as exemplified in the case of splintered bone or crushed finger-nail. So would it inevitably be with those teeth which are so far decayed as to expose the pulp, and so interfere with its proper function, were it not for the vitality maintained by means of the lacunae or cells, of the cementum. It is the knowledge of these facts which enables the operator of the present day to save teeth that a few years ago would have been obliged to be extracted.

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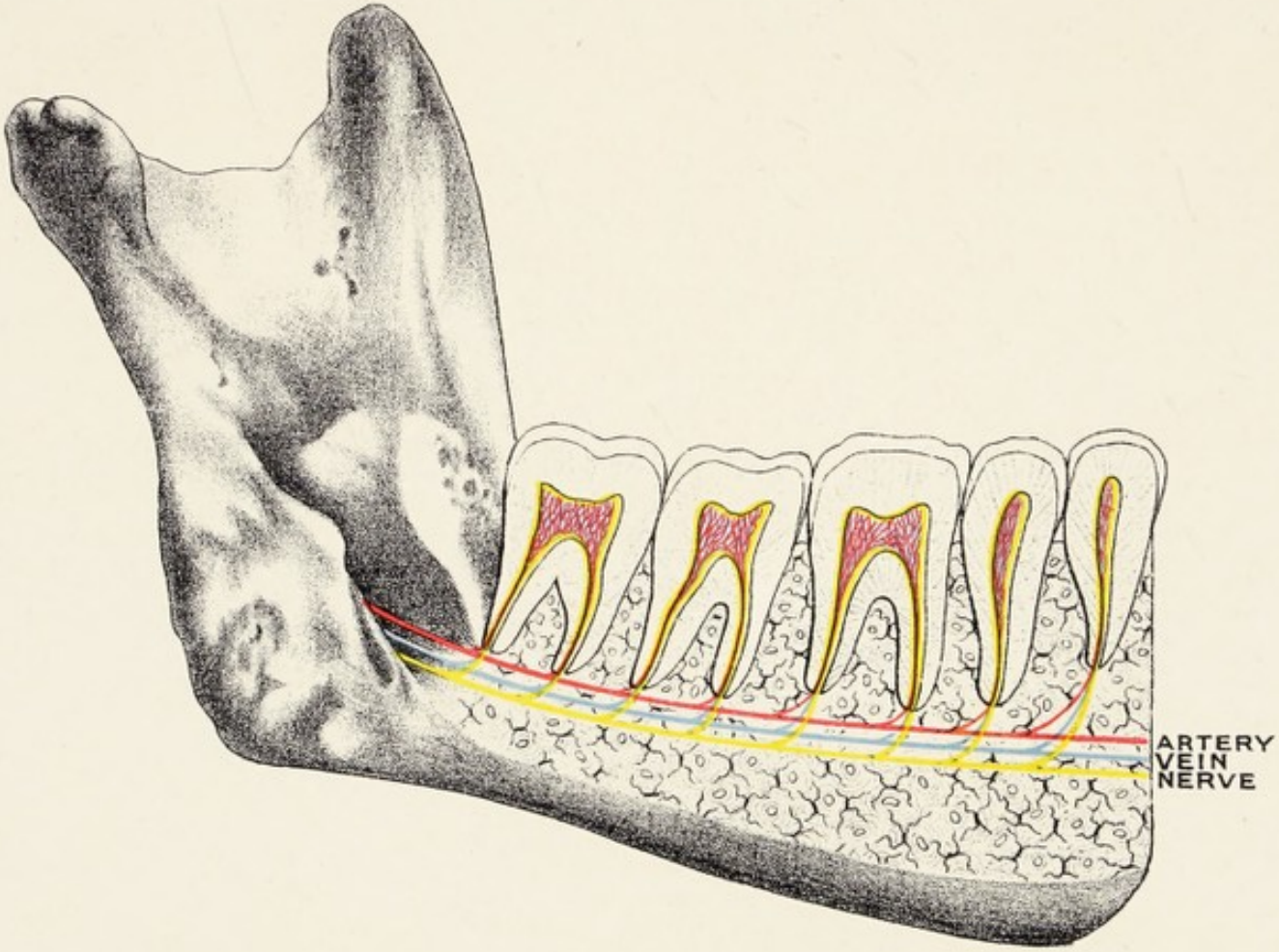
* The "periosteum" is the soft membranous skin which lines the tooth-socket.

† "Necrosed" means death of any part.

The Pulp or Nerve.

The Pulp is a reticulated mass or network of nerve fibres and minute blood-vessels, prolongations of the main nerve and blood-vessels of the jaw, which enter the tooth by a small opening in the extreme apex of the root. The several vessels which enter the apices of the roots of the teeth and collectively form the pulp, may not inaptly be likened to the Electric, water, and drain mains running along a street from which branches are taken to the houses *en route*. The electric cable may be taken to represent the nerve, the water supply the artery conveying the blood to the tooth, and the drain the channel whereby the venous blood is carried back again to the main vein after having performed its duty of nourishing the pulp. This, in other words, is the blood circulation of the interior of the teeth.

PLATE IV.



Sectional diagram of the lower jaw showing branches of the nerve and blood vessels entering the teeth.

CHAPTER II.

FUNCTIONS OF THE TEETH.

There is an increasing tendency among the medical profession generally to impose a more strict attention to diet and general hygiene, rather than to prescribe medicinal remedies in the large class of ailments attributable, either directly or indirectly, to derangement of the digestive organs ; and when the physician has reason to believe that the food is not being assimulated, it is his first care to ascertain whether the teeth of his patient are in such a condition that mastication is being properly performed, and if not, an early visit to the Dentist is recommended as a preliminary to further treatment.

The principal function of the teeth is, I need hardly remark, by mastication finely to subdivide the food, so that it may be more easily acted upon by the gastric juices of the stomach. Next, the act of chewing causes the salivary glands to pour out the saliva for incorporation with the food preparatory to its being swallowed. Three of these glands open into the mouth—the saliva from them all being alike in its alkaline character ; but in one of them, the parotid*, there is an important

* The largest of the salivary glands, having its opening in the cheek, a little above and behind the first molar tooth in the upper jaw.

constituent called *Ptyalin*, which, although present in very small quantity, possesses a powerful influence in converting starchy matter into sugar.

The alkali in the saliva, physiologists tell us, acts as an excitant to the glands of the stomach, and it is, therefore, very necessary that a sufficient quantity should be swallowed with the food. That this may be duly effected, the food should be very deliberately chewed and all hurry at meals avoided as much as possible. Children are especially prone to swallowing their food without sufficient mastication, and when this is noticed it should be immediately checked, as the habit once acquired is very difficult to eradicate, and is often maintained in after life.

CHAPTER III.

CIVILIZATION AND THE TEETH.

There can be no doubt that with each succeeding generation the tendency to caries of the Teeth is becoming more marked. The various causes of this may be summed up in the one word, "Civilization." That the teeth of civilized races should be steadily deteriorating unaccompanied by a corresponding degeneration of other parts of the physical system, has exercised the minds of the profession for many years, and a collection of what has been written on the subject would form a considerable library. To attempt an analysis of the many conflicting theories and speculations advanced would be beside my present purpose! I may, however, observe that some writers have gone so far as to assert that as a nation the British have not physically deteriorated at all. Such optimism, I regret, can no longer be entertained in face of the evidence to the contrary which is so distressingly patent to any observer, especially in our larger urban and congested centres. That it fails to be more generally observed is attributable to the fact that we have become accustomed to seeing the pale faces and weakly frames of so many of our fellow beings.

It is by contrast that one best realises the great change which is taking place. Fully to appreciate the condition of things, one needs to absent themselves from the busy haunts of men by a sojourn in the rural districts of England, or in the colonies. On coming back one cannot help being struck, as I myself have been on returning from a prolonged absence abroad, with the worn-out, anxious and prematurely old look of so many people, especially among the workers in the manufacturing centres and the poorer classes of the larger towns ; and it will then be realised what a toll nature is exacting from those whose lot it is to live their lives in such unnatural surroundings.

Improved sanitary and medical science have done much certainly to prolong life and ameliorate human suffering generally, but at the same time and from the same cause, there has been a constant augmentation of the phthisical, the scrofulous, and the physically impared amongst us, who formerly could not have lived to adult age, but would have died in childhood.

Emigration a Cause of Physical Deterioration.

Another consideration which must be kept in view in the discussion of this question is, that there is a constant drain upon our best and most vigorous blood by emigration.*

These facts which I shall presently support by others go far to confirm my opinion, and are, if not the consequences of civilization, at any rate the accompaniment of it. The assertion, therefore, that civilization is the cause of all the mischief is not

so wide of the truth after all, and the less so will it appear to be, when we consider what the word means in the sense in which it is applied.

Liability of Civilized Peoples to Dental Disease.

Civilization then, involves the crowding together of great numbers into large industrial centres, the exchange of agricultural for sedentary occupations; the substitution of less healthy and more exciting amusements; and the consumption of food, more plentiful and varied it may be, but certainly less wholesome. The life of millions have been entirely changed within the past century. The high pressure at which we now live, aggravated by the ever increasing struggle for existence, is developing, as the medical profession well know, a greater number of nervous and allied disorders;

* Table taken from *The Daily Mail Year Book* showing the enormous increase of emigration in recent years.

This table shows the number of outward-bound passengers of British nationality from the United Kingdom to countries out of Europe, distinguishing the principal countries in which the passengers contracted to land, in the years 1907–1911:—

Countries in which Passengers of British Nationality contracted to Land.

Years.	British Empire.			Foreign Countries.		Grand Total.
	British North America.	Australia and New Zealand.	Cape of Good Hope and Natal.	United States.	Other Places out of Europe.	
1907 ...	151,216	24,767	20,925	170,264	28,508	395,680
1908 ...	81,321	33,569	19,568	96,869	31,872	263,199
1909 ...	85,887	37,620	22,017	109,700	33,537	288,761
1910 ...	156,990	45,701	27,297	132,192	35,668	397,848
1911 ...	184,860	80,770	30,767	121,814	36,316	454,527

and dyspepsia—that potent cause of bad teeth—in one or other of its manifold forms, is fast becoming, I might almost say, a national complaint. The greater the mental activity of a nation, the faster the rate at which the people live, and consequently the further they leave behind them the original simplicity of life, the sooner do their teeth decay. This is proved by the case of the Americans, who are more liable to disease of the teeth than any other people in the world; while on the other hand of all Western nations, the easy-going, biliously organised Spaniards and Italians, least require the services of the dentist. That decay of the teeth amongst Spaniards should be comparatively rare is not remarkable, when we remember that they have been less affected by the progress of civilization than almost any other of the inhabitants of Europe.

Dr. Max Nordau, in writing on "The degeneration of classes and peoples," says :—"There is no doubt that degeneration has its chief home in the large town, and that the population of the large towns is condemned as a whole to degeneracy." Further that "In London and Paris—the young cities of America cannot here come into question—there are probably not a hundred persons who can show a pedigree of a hundred and fifty years, consisting on both sides, of ancestors born only in London or Paris. The large town is an abyss, in which the population which pours in from the whole country and from foreign lands, oozes and trickles away. But for that inflow from without, it would be extinct in about a century and a half

since its population is not renewed out of its own resources. For the present, the country population is still capable of feeding the large towns. But the day will come when the depopulated country will have no more reinforcements to bestow on the great city, and then the danger of national degeneration will have come very near to us. This danger will be European in its scope, since one people after another is adopting the large-town civilization." The conclusion of his article is not very hopeful, for he says :—" But I see no practical means of restraining the country population from yielding to the seduction of the town, as the moth yields to the lamp at which it scorches its wings. The only thing that the legislator can do is, by homestead laws, by the cheapest possible agrarian credit, and by other measures to make his native clod so attractive to the peasant that the seductions of the town cannot charm him into emigration. One thing is certain : in the great historic contest of the nations, the advantage will rest with those who know how to maintain a strong and tolerably prosperous and contented peasantry, and the first to go under will be those that most thoroughly transform themselves into peoples of large towns."*

Dental Disease among the Ancients.

That the liability of civilized peoples to dental disease is not peculiar to our own times is shown by the researches of Elliot Smith, whose careful examination of some 30,000 Egyptian skulls demonstrated the fact that the

* *Hibbert's Journal, July,* 1912.

peoples of the earlier dynasties, previous to and for some time after the date of the pyramids, were quite immune from dental caries. In later dynasties, however, as these ancients emerged from their primitiveness, abandoning their nomadic existence for life in cities with its corresponding altered condition of living, decay of the teeth began to make itself increasingly manifest. John Mummery's observation of a large number of skulls of the later Roman period, showed a considerable number of defective teeth, especially among the patrician classes. Among the exhibits of Pompeian antiquities at the Museum at Naples, which have always interested me greatly, when visiting that place, are a number of dental instruments. These are, in many cases beautifully designed, showing considerable knowledge of their requirements, and eloquently express the demand which had thus early arisen for the services of the ancient exponents of our art.

A comparison of the Teeth of the Peoples of the West with those of the East.

A comparison of the dental organs of the peoples of the West with those of the inhabitants of the East at the present time, shows that whereas among the former (some of the Latin races already mentioned excepted) it is rare to find a set of teeth free from caries, the natives of Central Asia, India, the Malayan Peninsular, Java, Ceylon and the islands of the Pacific are still practically immune from decay of the teeth. The habits of these races, have, however, been but little affected by Western

civilization, and they are living to-day in much the same manner as they were two thousand years ago. Personal observation, based on the examination of a large number of natives in the countries named, confirm the opinion that the more simple their habits, the coarser their dietary, and the less the culinary arts are practised, the more perfect are their teeth. The jaws generally are larger, the teeth much harder (that is more perfectly calcified) than those of Western nations; indeed, so thick and resistent are the tissues, especially the enamel, as to defy to the end of their lives the attack of bacterial activity, notwithstanding in many cases, the fact of an utter neglect of cleanliness or any special care.

Effect of Artificial Feeding on the Teeth.

A contributing cause to the degeneracy of the teeth among the white races is to be found in the increasing incapacity of the modern mother to perform her natural duty in breast-feeding her own off-spring. Professor A. S. Underwood, commenting on this subject in a recent number of the *Nineteenth Century*, says :—" The imperfect tissue formation in the modern infant is traceable to the general delegation on the part of the ultra-civilized mother of her natural duty of breast-feeding her off-spring. Whether their neglect arises from physical incapacity, laziness, frivolity, or a degraded vanity which refuses to imperil the symmetry of her figure the result to the child is the same—it is left to the wet-nurse or, still worse, the artificial substitute for natural milk. Deprived

at the start of the only ideal and perfect means of forming its tissues soundly and well, its teeth are so feebly formed that they fall an easy prey to the consequences of the lodgment of food, which only the minutest care can prevent. Care, anxiety and worry, the inevitable concomitants of the strenuous life, urban and rural poverty and overcrowding paralize the mammary functions of the poorer classes, and produce in their offspring the same weakness which the decay of the maternal instinct contrives for the luxurious classes. Thus the teeth of the ultra-civilized infants are in an increasing degree imperfectly calcified in all classes of the community."

PLATE V.

Fig. 1.

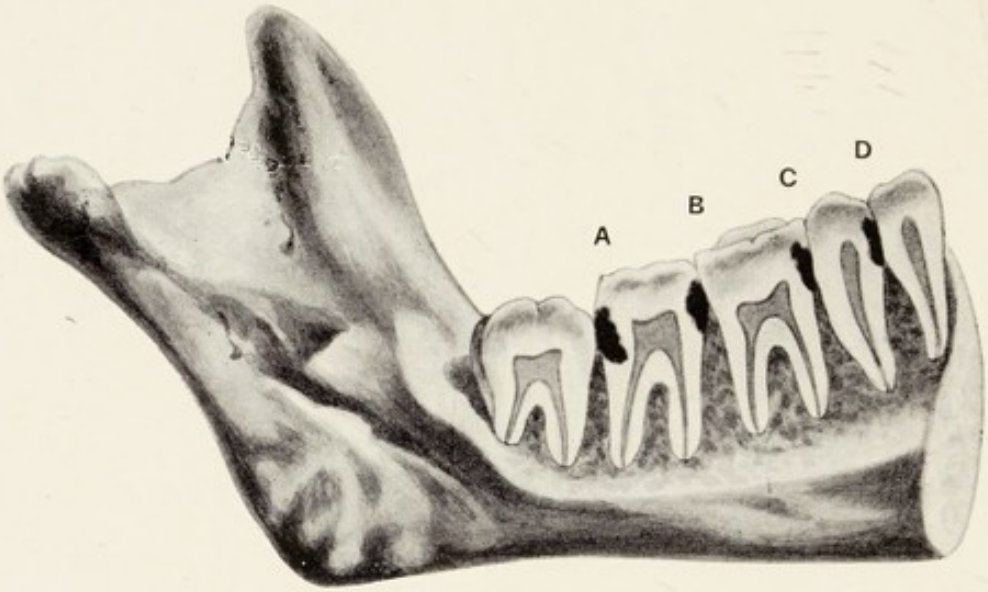
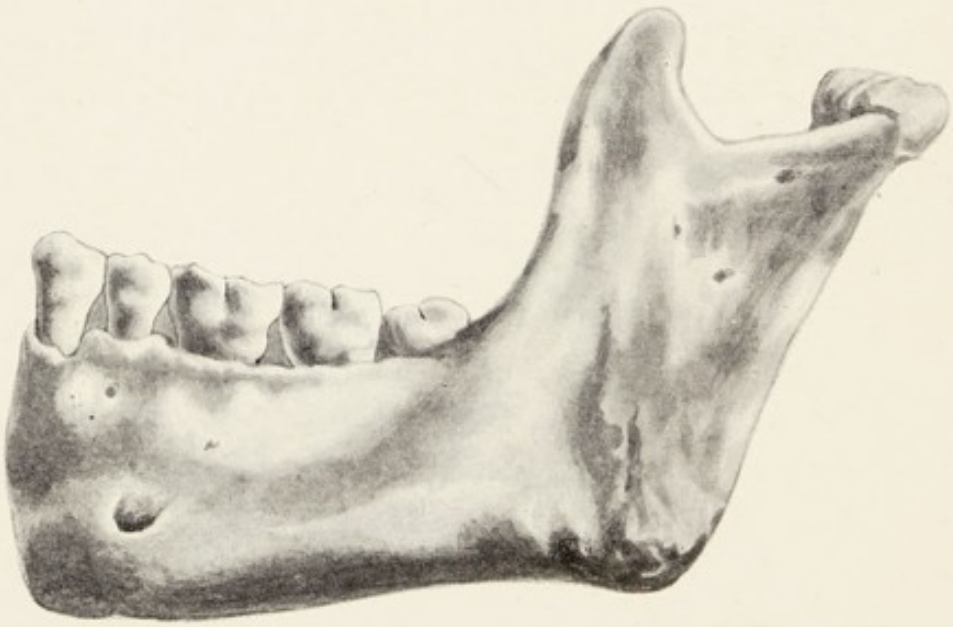


Fig. 2.



Section of a lower jaw, showing how cavities of decay may exist between the teeth without being suspected by the patient.

Fig. 1.—Inner view, disclosing the cavities, A B C D.
Fig. 2.—Outer view shows the teeth apparently sound.

CHAPTER IV.

CARIES OF THE TEETH.

Caries of the teeth, briefly, is decalcification, or, in other words, softening of the protective enamel caused by the fermentation and putrefaction of food particles, and the formation of acids effected by the resident bacteria in the mouth. That it is extrinsic—or, in other words, always commences from without—is now an accepted fact.

Caries : its Causes.

In a simple form, the ordinary causes of caries may be divided into (1) inherited predisposing, and (2) conducing.

Predisposing.
Conducing.

Among the predisposing causes may be mentioned : (*a*) inherited poverty of quality ; (*b*) structural defects, and (*c*) small size of the jaws and consequent overcrowding of the teeth.* The

* Charles Tomes, F.R.S., past President of the Odontological Society of Great Britain, in his inaugural address at a meeting of the Society, speaking of the effects of " Heredity on the size of the Jaw," says : " Another interesting field for inquiry—though not admitting of so much accuracy—lay in the question,

conducing causes are mainly : (*a*) neglect of cleanliness ; (*b*) the use of improperly shaped brushes and objectionable pastes and powder ; (*c*) the prolonged administration of medicines containing iron and acids, and (*d*) sickness of various kinds, such as eruptive fevers, derangement of the digestive organs, the altered condition of the system during pregnancy, and, in short, any derangement of the system which produces a vitiated state of the secretions.

Weak Teeth not always a sign of a Delicate Constitution.

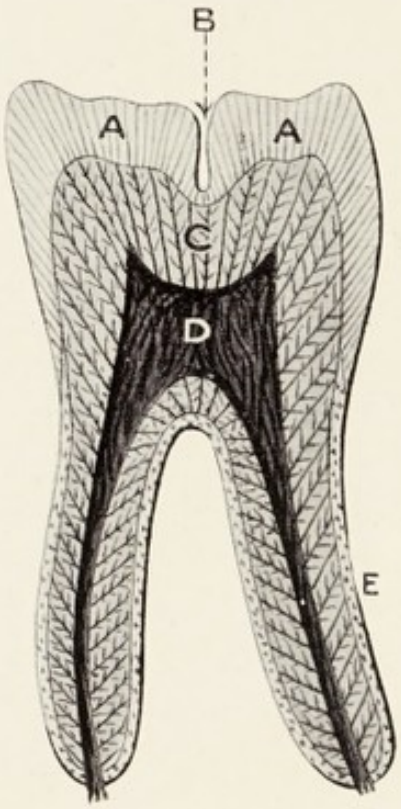
Although no doubt in many cases, where the quality of the teeth is poor, a delicate condition of health may be looked for, this is by no means the

how far heredity played a part in the genesis of dental irregularities and of dental caries. There were some irregularities which were obviously the result of accidental circumstances in the individual ; but there were also a vast number which, *a priori*, would seem to be quite as likely to be influenced by heredity as were other personal peculiarities. Old family portraits were of much interest in this connection. He was acquainted with one family in which, with rare exceptions, the mouth was very small, and the jaw contracted and V-shaped to such an extent as to be plainly discernible on the outside of the face, and this, which formed a marked feature of the strong family likeness which distinguished all the members, was clearly visible in the family portraits for many generations back.

" In the example of transmitted deformity just mentioned, the influence had, of course, been derived from the male line, in spite of various inter-marriages into other families ; but he had also met with similar transmission from the mother. The problem was evidently a complex one, but it appeared to him that a close examination of the mouths of children of large families, taken in conjunction with their parents, might not improbably throw light upon vastly wider questions of inheritance. At all events, it was ground which was hardly explored, and which gave room for what Prof. Tyndal had happily termed the ' scientific use of the imagination.' "

PLATE VI.

Fig. 1



A.—Enamel.

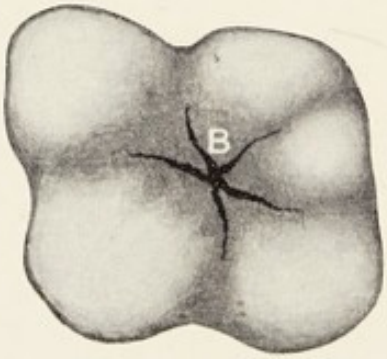
B.—Structural Defect.

C.—Dentine.

D.—Nerve.

E.—Cementum.

Fig. 2



B.—Structural Defect.

Fig. 1.—Section of Lower Molar with Typical Structural Defect.

Fig. 2.—View of Crown of same Tooth.

Fig. 1.

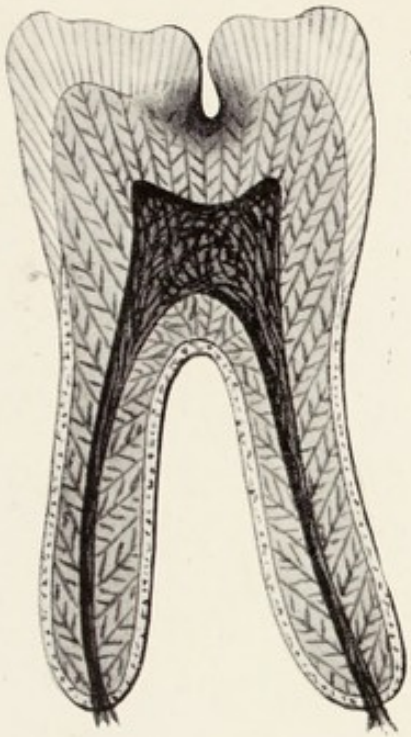


Fig. 2.

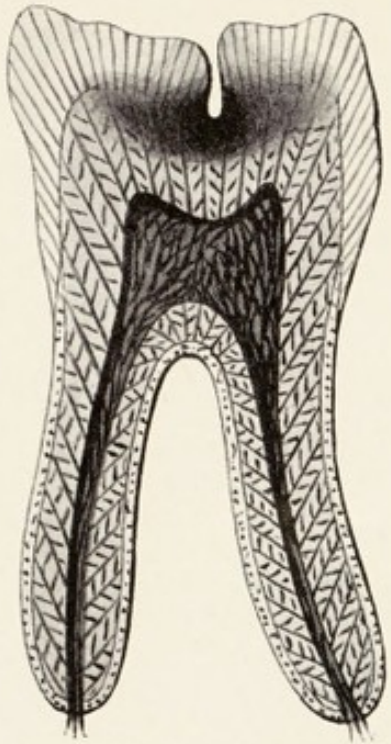


Fig. 3.

PLATE VII.

Sections of a tooth showing the progress of decay originating in a structural defect or fissure in the enamel of the crown.

Fig. 1.—The commencement of the decay. Fig. 2.—The decay further advanced though without any external indication to the patient.

Fig. 3.—The crown broken down with exposure of the nerve.

rule, for I have seen many persons in robust health afflicted with bad teeth, which are usually of a bluish-white colour, with a very thin coating of soft enamel, covering a still softer dentine, easily acted upon by the acids from without. Inherited structural defects may or may not accompany inferior quality; when this is the case, the most scrupulous care will not always preserve the teeth; but, on the other hand, if they are of fair quality, the likelihood of preservation is much greater, for, in nine cases out of ten—the defects being situated on the crowns of the molars—the weak portions are easily cut away and replaced with amalgam, gold, or one of the other approved fillings in use.

Pain very often the First Indication of Decay.

Unfortunately, these lesions of the coronal surface of the molars, which generally assume the form of minute fissures or pits, are not very easily detected, there being in most cases only a faint black spot or line to betray their existence (*see* Illustrations, Plates Nos. 6 and 7). The dentine being so much softer than the enamel, the whole of the interior of the tooth may be eaten away before any enlargement of the external fissure takes place; and the first intimation the patient may have of the amount of mischief which has been wrought will be the sudden crushing in of the top of the tooth, and the consequent acute pain due to the exposure of the pulp.

Of the inherited predisposing causes of Caries,

the next in order is the overcrowding of the teeth, owing to the increasing inability of the jaws to give them the lateral space for their development, and the malformation occasionally of the jaws themselves. This is accounted for, to a great extent, by their comparative disuse, and the non-exercise of the muscles of mastication, among civilised races.* It thus often happens that one, or more, of the teeth in either jaw are forced outside the natural arch, causing disfigurement of the face and jambing the other teeth so tightly together that thorough cleansing is rendered impossible. It is a common practice now in pronounced cases of this kind to remove one or more teeth from each jaw, or, if æsthetic reasons permit, the necessary room may often be obtained by the mechanical expansion of the jaws.

---

* Darwin, in the *Descent of Man*, speaking of the effects of the increased use and disuse of parts, says : " It is well known that use strengthens the muscles in the individual, and complete disuse or destruction of the proper nerve, weakens them. When the eye is destroyed, the optic nerve often becomes atrophied. When an artery is tied, the lateral channels increase not only in diameter, but in the thickness and strength of their coats. It is asserted that the hands of English labourers are, at birth, larger than those of the gentry, and from the correlation which exists, at least in some cases, between the development of the extremities and that of the jaws, it is possible in those classes which do not labour much with their hands and feet, the jaws would be reduced in size from this cause. That they are generally smaller in refined and civilised men, is certain, but with savages, as Mr. Herbert Spencer has remarked, the greater use of the jaws in chewing coarse uncooked foods, would act in a direct manner on the masticatory muscles, and on the bones to which they are attached."

It is probable that the foregoing modifications become hereditary in successive generations.

The neglect of thorough Cleanliness the most potent Cause of Decay.

The first and most prevalent conducing cause of caries is neglect of that thorough cleanliness which is essential to prevent the permanent adhesion of particles of food ; to remove debris from the teeth, especially from the indented coronal surfaces of the molars, and the interstices between them. As this point, however, falls to be noticed more appropriately in the chapter which follows, on Preservation of the Teeth, I shall not further remark on it here.

Increased Care of the Teeth very Important during Sickness.

Whatever feats of strength our remote ancestors performed with their dental organs—and we read of many such astonishing exploits—it is very certain that such practices as biting threads, cracking nuts, &c., cannot be continued long without injuring the enamel of the modern tooth. Iron tonics and acids are very damaging to the teeth, as many patients, who have been under the necessity of taking lengthened courses of such medicines, have found to their cost ; though the use of a quill and afterwards carefully rinsing the mouth, will do much to counteract their evil effects ; or, better still, these medicines should, if possible, be given in capsules or cachets. Extreme care of the teeth is necessary in sickness, because of the consequent increased acidity, and generally vitiated state of the oral secretions ; and if this is not observed, caries is almost certain to be a result of prolonged illness.*

* See chapter on the " Importance of an Asceptic Condition of the Mouth," p. 69.

Adenoids and Enlarged Tonsils.

Before dismissing this subject I think I ought to mention Adenoids and enlarged Tonsils as conducing to caries of the teeth in a much greater degree than is commonly supposed. Cases of Adenoids and enlarged Tonsils are increasingly prevalent, and this is yet another mark of the artificial age in which we live. Their presence injuriously affects the teeth in two ways. First, by inducing mouth-breathing, which leads to contraction of the dental arch and arrest of its proper development ; this, in its turn, causes irregularity and crowding of the teeth, producing protrusion of the upper incisors, which is so often met with in these cases. Secondly, as is well known, mouth-breathing causes undue dryness of the mouth, favouring decomposition of food particles, especially in the region of the upper front teeth, by depriving them of the preservative influence of the alkaline saliva, with which, in their normal state, they are constantly kept moist. Further, the eruption (*i.e.*, cutting) of a sound and regular set of teeth is seriously prejudiced by the ill effects which Adenoids have on the general health of the child. Should Adenoids be suspected, I need scarcely add, that the sooner the surgeon's attention is called to the matter the better for the future welfare of the child.

Abuse of Artificial Teats and Comforters.

It should be remembered, however, that Adenoids are not alone responsible for mouth breathing, as this is often produced by the abuse of artificial teats and comforters. The late Dr. Thomas Pedley,

who gave much attention to the subject, blames rubber teats and baby comforters as a cause of many oral deformities by pushing out the front of the upper jaw and inducing Adenoids and enlarged tonsils. He recommends as a substitute for the rubber teat the use of a good sized soft rubber finger-stall. He adds, "A baby a week old can accommodate the end of one which will fit a man's thumb. Such a teat may be used on the spout of a vessel like a feeding-cup or an ordinary feeding bottle; but a baby a few months old can easily be taught to drink from a cup." At this age he recommends all teats and bottles to be thrown aside and the old-fashioned metal pap bowl, with the long open lip, used instead.

Mr. Frank Harrison, writing on the same subject, says: "I am confident if mothers did but know the effects produced by the abuse of artificial teats, I should find them in the forefront of any attempt to put a stop to the evil practice. Take notice, I say 'abuse.' I have every sympathy with the poor mother, worn out and tired by a long day's work, and badly in need of rest, resorting to any legitimate means to pacify the irritable and restless babe. The teat acts as a comforter, then use it; but, and it is a very big 'but,' when the baby is well asleep, gently and very slowly remove the teat; do not attempt to close the lips, but gently support the sides of the lower jaw with the thumb so as to shut the mouth. The lips will without any further help also close, and a restful nose-breathing be established.

"This is an excellent practice with children of all ages. The parents or nurses, before going to rest, should peep into the beds of the little ones, and if any are found with the mouth open, turn the sleeper, if lying on the back, on to the side, and gently close the lower jaw against the upper one, by supporting it with the fingers and thumb of both hands, and retain the support until the air is passing rhythmically through the nose." In every case where a child persistently breathes through the mouth it may reasonably be supposed that some mechanical obstruction exists, and resort to the surgeon should be had to determine the cause.

Unhealthy Breathing the cause of many Evils.

Unhealthy breathing leads to many other evils, the nostrils and upper air passages from want of proper execise are arrested in development, leaving a permanent mark on the features and stamp them, if I may be permitted the expression, with the unmistakable hall-mark of the mouth breather. The mucous membrane of the air passages in these cases is generally found to be more or less in a congested condition, often simulating a condition of chronic cold, which becomes aggravated upon exposure to the slightest atmospheric change. Whatever the cause of mouth-breathing may be there is no doubt that a child so afflicted is seriously handicapped from the start. It is generally more or less anæmic, peevish and irritable. The appetite is uncertain, and as it grows older it neither plays nor can it settle down to its lessons as an ordinary normal child should. Of course, mouth-breathing

does not pre-suppose that Adenoids or enlarged Tonsils are always present, but neglect is no doubt in many cases a fruitful cause of this condition. Neither must it be supposed that a child who has Adenoids must necessarily be a mouth-breather in a noticeable degree, although in pronounced cases it generally accompanies this condition.

When Adenoids are known to exist parents should not hesitate to have them removed as early as possible, the beneficial result of which will be soon apparent in the improvement in the child's health, mentally as well as physically.

As a summary of what I have said, it may be asserted, first, that decay of the teeth always commences from without ; and is due entirely to external causes ; and, secondly, that caries of the teeth exists in direct proportion to the degree of civilization of the race.

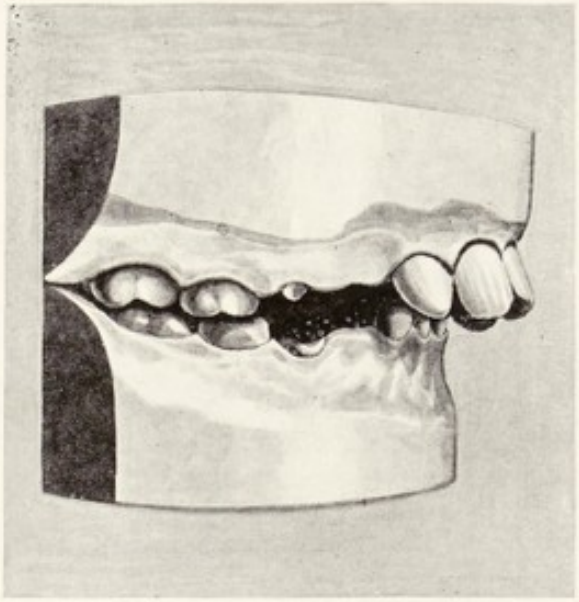
" *We cannot stay the progress of civilization for the sake of our teeth. but it is in our power to adapt the means placed at our disposal by civilization for their preservation.*"

PLATE VIII.

Fig. 1.

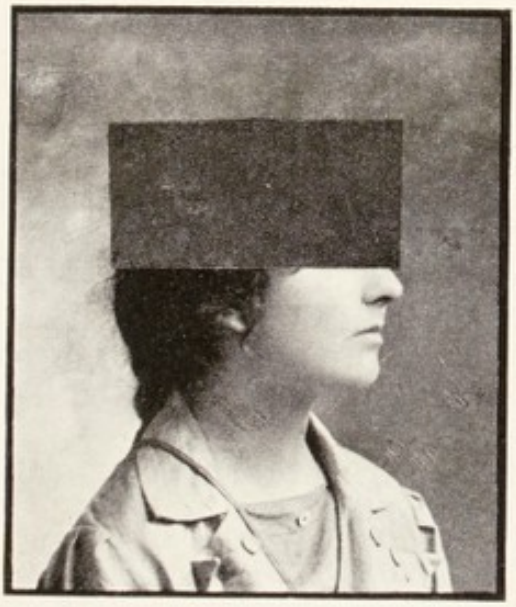
A typical case, in the Author's practice, of protrusion of the upper jaw of a child, aged 9, who had adenoids and enlarged tonsils.

Fig. 2.



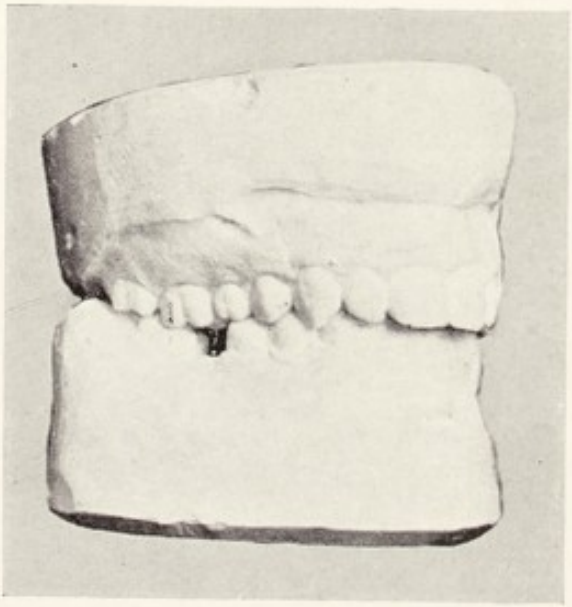
Model of the mouth taken at the same time.

Fig. 3



The same case 7 years later, after removal of the adenoids and tonsils followed by mechanical treatment. The profile is now perfectly restored.

Fig. 4.



Model of the mouth taken after the lapse of the same period, showing that the normal relationship of the jaws has also been restored.

CHAPTER V.

THE PRESERVATION OF THE TEETH.

The bones of the human frame are at first represented by cartilage, which, being infiltrated with lime salts, in course of time, become calcified. This process, however, goes on so slowly, that it is not until twenty-three or twenty-four years of age that all the bones become consolidated.

The Teeth in Childhood: Consolidation of the Teeth not Complete until Adult Age.

It is very similar with the teeth, which although apparently as strong in a child as in an adult, are really not so; and it is some considerable time after they (that is, the permanent teeth) appear above the gums, before the roots become fully developed; the teeth do not acquire their mature hardness until many years after. But unlike the bones, which, in the body of a healthy child, go through all their stages of development unchecked, protected as they are from external danger by thick coverings of muscle and sinew, the teeth of the young are to a great extent exposed, and have to encounter many enemies; for it is well known to physiologists that the oral secretions of a child are much more favourable

to the rapid decomposition of food than are those of adults. This is owing to the greater activity of all the organs in youth, and the additional amount of labour they have to perform. It thus happens that *when the teeth are passing through their most critical stage, they possess the least capability of resistance.* I would, therefore, impress upon parents and guardians the importance of exercising the most watchful care over the mouths of the little ones confided to their charge. Were such an event to occur as a child's hair becoming grey, would not the natural anxiety of the parents be at once awakened, and every means adopted by them to obviate, if possible, the abnormal appearance? Yet for a child to lose its teeth almost as soon as they appear, is of more importance than losing its hair, because of the effects on its general health. A careful examination of the mouth ought regularly to be made, and for this purpose the mother should possess a small mirror, which may be purchased at the chemist's for a few shillings. By this means the earliest symptoms of dental decay would at once be detected; moreover, the child would thus be taught from infancy to take a personal interest in its teeth, and so, in many cases, avert the necessity of consulting a dentist: should this, however, become necessary, the very general dread felt of such professional aid would, by so easy a course of self-instruction, be greatly modified, if not entirely abated; inasmuch as prevention of decay by stopping would then become the rule, and extraction of irrevocably decayed teeth the exception.

Dental Supervision whilst at School.

As I have already stated in the Introduction, the majority of well-regulated schools have a dentist engaged to periodically examine the pupils' teeth ; but many private seminaries have not. It is, therefore, incumbent on parents to make special inquiries on this point when sending their children to school, and if they find that no such engagement has been made in the school selected, they ought to arrange themselves for proper dental supervision. This remark applies specially and very directly to Anglo-Indian parents, who are often unavoidably separated from their children for years at a stretch. By doing so, the good habit which maternal solicitude in childhood had engendered would develop into a regular rule of the toilette. To emphasize the importance of what I urge, I may add that 70 per cent. of the teeth I am employed to fill are those of patients under 30 years of age, and that of 200 children under 16, whom I recently examined, 164 had been attacked by dental caries.

The advanced state of formation of all the temporary and most of the permanent teeth before birth, have led physiologists to suppose that some control might be exercised over their growth during this period, particularly when the parents themselves are the subjects of defective dentition, or there is reason to suspect a deficiency of the pabulum necessary to the development of sound bones and teeth. This, however, is a matter for the physician, as is also the question of treating children with the same object, which has been discussed so much of

late. The fact that the enamel of many of the teeth is fully formed at the time of birth has led some to doubt whether a process termed by the Americans "feeding the teeth," can result in much good. The general opinion, however, I think is, that whilst the quality of the teeth may not be capable of any direct modification after birth, yet the hardening process of the dental tissues will be materially assisted by a more judicious choice of foods than is the rule at present.

Choice of Bone-making Foods.

The jaws and teeth of the young require more exercise than they generally get. For this purpose well-baked bread made from whole-meal with plenty of crust, should be given, and hard ship's biscuit occasionally is a good thing. Porridge made from Scotch oatmeal, properly cooked, with a liberal supply of new milk should form an important item in the daily menu—than which there is no better diet for children, among the softer foods.*

I observe, with regret, that since the price of flour has been so much lowered by its increased importation, the Scotch are gradually giving up their most wholesome national dish of porridge and oat cakes in favour of white bread. In consequence of this change of diet dental disease is almost as prevalent across the border as it is in England.

* It is becoming increasingly the custom to give one of the much advertised breakfast foods as a substitute for porridge. This, no doubt, saves time in a busy household, but it is a decided loss to the child.

Food Habits of Semi-civilized Races.

My own observations of the food habits of the less civilised races of Asia, including Afghans, Tibetians, Bhutias, Nepalese, Malays and many nomad peoples on both sides of the Himalayas as well as the natives of many of the lesser known islands of the Pacific, confirm my belief in the law as laid down by Darwin (see page 52) of the effects of the increased use and disuse of parts. Therefore I cannot but conclude that the inherent excellent quality of the teeth of all these races is due in a large measure to the much greater use of their jaws in chewing coarse and frequently uncooked food. This law of use and disuse as applied to our bodies, implies that the more active the organ the greater the stimuli and concentration so to speak of the natural processes of the part, and consequently the more the jaws are used, the stronger and more resistant the teeth become. This view is now supported by all the most recent writers. Among others Pedley and Harrison, who say :—" The proper use of the muscles of mastication, and the pressure exerted on the teeth and gums by the grinding of food, increase the supply of blood which nourishes both jaws and teeth, and thus favour their growth and development. Further when food is slowly and deliberately chewed, a nervous influence is exerted upon the salivary glands ; they are induced to secrete an abundance of healthy saliva, containing sufficient of the ferment ptyalin to perform the necessary change of starch into sugar. Little as we may think it, the character of the saliva has much to do with disease in teeth."

Sugar cane, a product of all tropical countries is almost universally chewed in its fresh state in enormous quantities by young and old in the East. I have seen it given by mothers to their children when only a few months old, in lengths varying from a few inches to pieces as long as the children themselves ; it takes the place of a comforter, and is no doubt splendid exercise for the gums, conducing as it does to the easy eruption of the teeth. Directly the child is able to masticate, the succulent cane is vigorously chewed to extract its juices, until nothing is left but a mass of vegetable fibre, which is only cast away to attack a fresh piece.

When we consider the enormous amount of dental activity necessary to dispose of a few feet of this useful plant in its raw state, is it a wonder that our teeth which are so little used should suffer by comparison ? The finely divided fibre serves the purpose moreover of a natural tooth brush, and keeps the teeth beautifully polished and clean. Peas, beans and other seeds of various kinds sometimes roasted, but often eaten raw, form other staple articles of diet of these peoples.

Tooth Powder.

As a general rule, for healthy mouths, I have been in the habit of prescribing a powder composed of the following ingredients :—Powdered orris root 1 oz. ; white castile soap $\frac{1}{4}$ oz. ; precipitated chalk to 4 oz. ; flavoured with otto of roses or oil of cloves. This powder should be used regularly night and morning, taking care immediately after its use, to rinse the mouth with pure water, or that to which

a few drops of salicylic acid have been added; or better still, with the mouth-wash recommended by Professor W. D. Miller, the prescription for which is given on page 70.

How to use the Tooth-brush.

Few patients, I find in my experience, know how to use the tooth-brush, so as to secure the best result. The plan generally in vogue is to pass it rapidly to and fro with a uniform movement, the effect being that the rounded surfaces, which are constantly undergoing the cleansing action of the lips and tongue, and consequently least require brushing, are alone benefited by the process. In the worst cases of neglect, and in very weak kinds of teeth, it is rarely that caries has its origin in these parts. To effect a thorough cleansing and to ensure the complete removal of all particles of food debris from the interstices of the teeth, and from the depressions in their crowns, various movements of the brush are necessary. The best plan is to grasp the brush firmly in the right hand, and commencing on one side of the mouth, first pass it up and down in such a manner that the bristles may be made to enter the spaces between the teeth, instead of passing ineffectively over them. The same action should be repeated on the other side, as well as on the inside and outside of the teeth. A somewhat similar movement of the brush will insure the thorough cleansing of the coronal surfaces as well. A professional friend of mine, in describing his mode of using the brush to his patients, likens it, not inaptly, to the way in which we would clean

a piece of Maltese filigree jewellery. As an extra means of precaution, the regular use of the tooth-pick is highly desirable. It should, however, be a quill or wooden one ; and care should be taken not to prick the gums. In all cases where the teeth are of a delicate structure, the practice of passing a piece of floss silk between them, is to be preferred to the use of a tooth-pick, and will do much to lessen the risk of caries.

As I have previously said : " *We cannot stay the progress of civilization for the sake of our teeth ; but it is in our power to adapt the means placed at our disposal by civilization for their preservation.*"

CHAPTER VI.

THE IMPORTANCE OF AN ASCEPTIC CONDITION OF THE MOUTH IN THE PRESERVATION OF THE TEETH.

Value of Antiseptics in preventing Decay.

There can be no doubt that however careful a person may be in the cleansing of the teeth—even though they brush them after every meal—there are always some minute particles of food left behind, which ferment and produce, what I have elsewhere termed, the first elements of decay. Professor W. D. Miller says: "The fact that decay of the teeth is of parasitic origin, having once been established, we ought to be able, by antiseptic materials, to arrest decay and prevent its re-appearance." His experiments have satisfied him that very few of the many mouth-washes at present known make even an approach to accomplishing this, the majority of them having at most only a slightly astringent action and an agreeable odour. He says further, that "the sensitiveness and delicacy of the mucous membranes of the human mouth exclude the use of escharotic materials, except in very weak solutions," but as it is seldom that anyone in rinsing the mouth will retain the wash longer than one

minute, an antiseptic mouth-wash, to be efficient, should be able to devitalize the micro-organisms with which it comes in contact within this short time. The prescription recommended by Dr. W. D. Miller, and of which I give a copy, has a decided effect, he tells us, in a quarter to half a minute, and in one minute the sterilization is complete :—

R	Thymol	i. grain.
	Acid, Benzoic	xii. grains.
	Tinct. Eucalypt.	i. drachm.
	Eau-de-Cologne	i. ounce.
	Oil of Peppermint	x. minims.
Mix.	Water, add to	vi. ounces.

A teaspoonful in a wineglass of water.

NOTE.—Should there be any dislike to the taste of peppermint, the same quantity of oil of wintergreen may be substituted, though not so valuable as the former.

Where the teeth are of delicate structure, the wash may be used with advantage after every meal ; but in ordinary cases it will be sufficient if used before retiring at night.

Only effective in Carefully kept Mouths.

Although this wash will effectually neutralise the fermentative process in *carefully kept mouths*, experiment shows that it has but a temporary effect where there are large cavities of decay, which often contain compact pieces of decomposing food. To effect complete sterilization in such cases it would require fifteen minutes, or possibly even a longer time than that.

The most powerful wash will accomplish but little where there are centres of decay stuffed full of food.

Therefore the use of the mouth-wash should always be preceded by the thorough use of the brush and floss silk, removing all larger particles of food and opening the spaces between the teeth, so that the wash may penetrate to the vulnerable point.

I would add that an experience of more than twenty years of the preventive measures suggested, have conclusively proved, that wherever they have been adopted and systematically carried out, there has been a very marked diminution of caries of the teeth, both as to their number and extent. I have especially noticed this in the case of members of the same families, some of whom (generally ladies) have taken the trouble and been faithful in following my advice. The difference has been so marked, that whilst those who adopted the hygienic measures referred to have succeeded in preserving their natural teeth intact—except perhaps for a few small fillings—the others have been obliged to resort to extensive crown and bridge work or artificial dentures.

Effect of an Ill-kept Mouth on the General Health.

Few people are aware of the evil influence which diseased teeth and stumps have on the general health ; occasionally the consequences are very serious. Dr. Miller, in a contribution to the British Journal of Dental Science, on pathogenic bacteria of the human mouth, says : " The human

mouth, when not clean, is capable of infecting a healthy individual. Hence arise many cases of loss of appetite, nausea, dyspepsia and consequent general ill-health." He quotes many authorities in support of his statements, among them James Israel, who gave much time to the study of transportation of bacteria from carious teeth, and who describes a number of cases of abscesses in the neck, chronic pyaemia, &c., in which he was able to find the primary source of infection in the mouth. Next, Poncet, who describes a case of osteitis, which, originating in a carious tooth, led to a general septic infection, which terminated fatally in forty-eight hours. Also Tripp, who observed a case of inflammation of the brain following alveolar abscess; and Ritter, a case of septic blood-poisoning, which also terminated fatally. Only the other day a case was recorded of a child who lost its life through pyaemia supervening on Dental Caries.

Professor Miller's experiments have shown him that rabbits and other small animals, if inoculated with saliva taken from the mouth when in an unhealthy state, die from blood poisoning in from twenty-four to forty-eight hours.

A large percentage of cases of cancer of the tongue—that most appalling of all the ills which flesh is heir to—is directly attributed to the irritation caused by carious teeth.

So intimately connected are the teeth with the human organism that many other disorders may arise from their diseased condition, namely, strabismus and other affections of the eye. Various

affections of the ear and nose also owe their origin to bad teeth.

When one considers how many people there are who, suffering from a diseased state of their teeth, do not appear to think it necessary to have their mouths attended to, it seems strange that there is not a longer record of serious cases. This comparative immunity can only be accounted for by the known capability of the system to assimilate a certain quantity of poison if taken in minute doses, without immediate ill-results. There can be no doubt, however, but sooner or later, it must have a detrimental effect on the general health, although, in many instances, the cause may never be suspected.

I could mention many cases of serious trouble arising from neglect of the teeth which have come under my own observation; but I think enough has been said to show that perfect health cannot be said to be present when the teeth are carious, or the surrounding tissues diseased.

PLATE IX.

DR. PIERREPONT'S PERFECT CLEANSING TEETH BRUSHES.

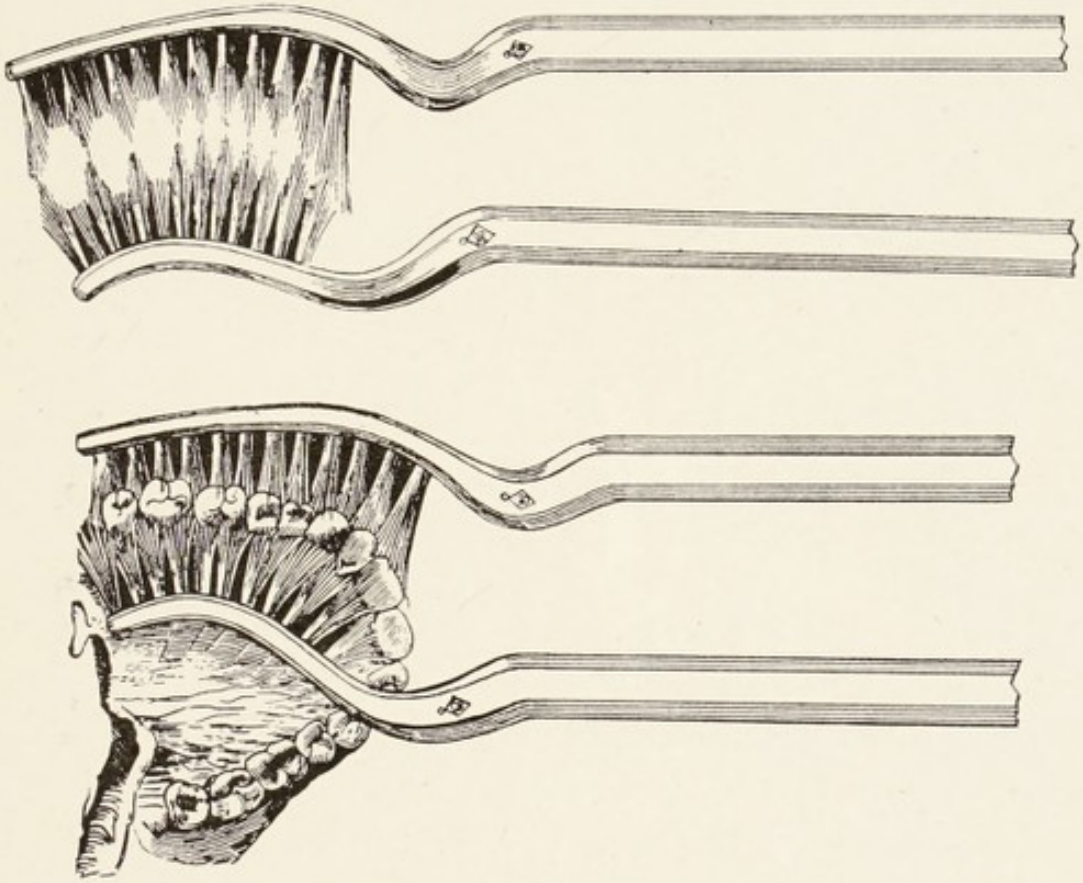
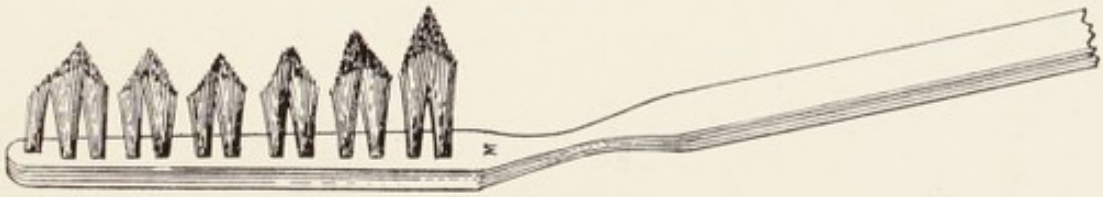


Illustration showing the perfect adaptation of the Brushes, both to the inside and the outside of the dental arch.



WESSLER'S PATTERN TOOTH BRUSH.

CHAPTER VII.

TOOTH BRUSHES.

It seems somewhat singular when one reflects, that so little attention has been devoted in the past to improving the most important instrument for the preservation of the teeth, "the tooth-brush."

Various new shapes have certainly been made from time to time; but none appear to have recognised the fact that it was impossible to produce a single brush, equally efficient for cleansing both surfaces of the teeth, until Dr. Pierrepont took the matter in hand. This gentleman found, upon studying the tooth-brushes in common use, and comparing their shapes with the anatomical formation of the jaws, that the better adapted any particular pattern was to the outside of the dental arch, the less likely was it to be of service for cleansing the inner surfaces of the teeth, and *vice versa*. He says: "Any person who will give the matter a moment's thought must be aware that it is perfectly impossible to cleanse the inside of the teeth (*i.e.*, the surfaces in contact with the tongue) with the same shaped brush as is adapted to the outside. It must be remembered that the teeth (in both the upper and the lower jaws) are set

one beside another, in the form of an arch, to fit, or to be adapted to the outside of which, a brush must be hallowed out on its surface, whereas to be of any practical utility in the inside of the arch, the surface (or free-ends of bristles) of the brush must be convex in form, or in other words, exactly the reverse of the outside brushes."

This fact seems hitherto to have been entirely ignored, or lost sight of, both by dentists and those under their care, and though many persons have been educated to employ all available means to preserve their teeth, they have frequently found all their best efforts prove futile—the cause has been unsuspected, and consequently no remedy has been sought for.

To remove food &c., from between the interstices of the teeth, the brushes must be used upwards and downwards, or perpendicularly, as that is the direction the teeth themselves assume after passing through the gums, for no amount of transverse brushing can dislodge food &c., from between the teeth. It must, therefore, be apparent that a radical change in the construction and method of using Teeth-brushes is imperative, and those persons who value their teeth will fully appreciate the means that enable them to attain this desirable end.

Efforts have recently been made to improve the form of the single brush, the best of which is undoubtedly the "Wessler's model tooth-brush," named after the designer, which is obtainable at most chemists.

Tooth- brushes are made too large for the work they have to perform. Care should, therefore, be

taken to select the smaller sizes. As a general rule the size known as the "child's size" is quite large enough, and will be found not only more comfortable to use, but much more efficient.

CHAPTER VIII.

THE PROGRESS OF CONSERVATIVE DENTISTRY.

The progress which conservative Dental surgery has made, allowing operations to be performed which a few years ago would have been considered beyond the bounds of probability, is the result of the conjoint labours of scientific men in all parts of the world, dating back to the time of John Hunter the celebrated English surgeon, to whom surgery in general owes so much.

It is seldom that a new invention or principle destined, though it may be, to alter the aspect of a country and change the lives of millions makes much progress at first, and there are instances of the greatest ideas remaining undeveloped for generations. Steam, for example, which has revolutionised the world, as a power was known ages ago to the Chinese, but it was left to Watt to discover its adaptability to the convenience and progress of mankind.

It was very much the same with Dentistry, which was practised, we are told, in the days of Herodotus and Hippocrates, many years before the Christian era. It was reserved, however, for John Hunter more than 2,000 years afterwards, to discover

that although a human tooth had been removed from the mouth, it was not altogether deprived of its vitality, and he demonstrated the fact by getting a tooth, which he had previously extracted, to grow, or in other words, to take root in the comb of a cock.

He had made a great discovery, but had no conception of its value to posterity, for beyond being regarded as a curiosity of surgery, it excited but little attention till many years afterwards. Leeuwenhoek, one of the earliest microscopists, had previously suggested in a somewhat vague manner that the teeth possessed a definite structure, though with the very rough apparatus at his command, he was not able to arrive at any definite conclusion.

The Teeth as Highly Organised as many other parts of the Body.

It was not until the middle of the last century that these early investigations were furthered by the researches into the more minute anatomy and Physiology of the teeth by Purkinje and Retzius, and it was left to men contemporary with our own time, notably among whom I may mention Sir John Tomes, Professors Owen, Huxley, Weld of Vienna, Magitot of Paris, Miller and Mummery, to prove that the teeth are as highly organised as many other parts of the body. They established the fact that the whole matrix of a tooth (the dentine and cementum, *see* Plate 3) was permeated by a network of cells and tubes filled with living matter, which, by its connection with the living membrane of the socket (the

periostium), maintains, as it were, what I have elsewhere termed "the circulation of the root." Thus intimately connected with the surrounding vascular tissues of the jaws, the teeth are liable to become affected by any severe disorder of the system, and their treatment when diseased should be according to the laws of general surgery.

In enumerating the names of those savants whose researches have been of such signal service to dentistry, I must not forget Lord Lister and his study of antiseptic surgery, as it is by the rules laid down by this great teacher that we are enabled to treat successfully some of our worst cases.

With the more exact knowledge of the physiology and structure of the teeth, conservative dentistry has advanced with such rapid strides that a dentist of the present day would no more extract a tooth because it ached, than would a surgeon sacrifice a limb for an attack of rheumatism.

Limitation of Extractions.

I may add that men who have taken the trouble to keep records of their cases, have conclusively shown that it is possible to limit the number of extractions to two per cent. of the total number of cases treated ; and it is quite possible that even this small percentage may, by and by, be still further reduced.

In conclusion, it behoves all of us in the meanwhile to exert ourselves to the utmost to prove to our patients that the true mission of the dentist is *to save rather than to sacrifice.*

CHAPTER IX.

FILLING TEETH.

I cannot dismiss the subject, neither do I think it would be complete, without a brief reference to the operation requisite for the preservation of unsound teeth.

A popular fallacy regarding the Operation of filling. The difference between a Simple and Complex Filling.

While there are many intelligent patients, who, having had the subject explained to them, understand and appreciate at its proper value the operation of filling, there are many more who suppose that it is simply the cleaning and drying of a decayed cavity with a piece of cotton wool, or other absorbent fabric, and stopping the lesion with gold, amalgam

A.—Simple Filling.

B.—Compound Filling—Nerve removed and root filled as well as cavity in tooth.

or other material. In endeavouring to convey such information as may tend to remove this false idea,

I will first point out the distinction between a *simple* and a *compound* filling—a distinction not generally understood. With more exact knowledge on the subject, patients would see the necessity of having their teeth stopped at an earlier stage than many of them do at present.

Simple fillings are those in which the decay, although well-pronounced, leaves a covering of healthy bone over the nerve. The complicated kinds are those in which decay has so far advanced as to leave the nerve exposed. The treatment of these latter cases varies with the length of time the nerve has been exposed, and the state in which this organ may be at the time of operation.

Destruction of the Nerve or Pulp.

One fundamental fact should be noted, viz., that a nerve cannot be long in a state of exposure without undergoing some retrogressive change. When, however, it has been only recently exposed, it may be carefully capped with ivory, or other non-conducting material, to relieve pressure, and the tooth filled forthwith ; but in cases of more lengthened exposure it will be necessary to treat the nerve for a varying period, in order to restore it to its normal healthy state, before proceeding with the final operation. Sometimes the nerve, from long exposure, is found to be so hopelessly diseased that any attempt to restore it to health would be futile. In such case the sole alternative left is to destroy what remains with an escharotic—an operation seldom attended with much pain since

the introduction of cocaine *—*and fill the roots as well as the tooth itself*, having previously disinfected the former to their very apices.

Importance of proper precautions when Filling badly Decayed Teeth; and the treatment of Teeth in which the Nerve is already Dead.

To fill a badly decayed tooth, the nerve of which is in any way diseased, without these precautions, invariably results in some after-trouble, as the pus, no longer able to find vent through the cavity, accumulates until the resulting pressure forces it out at the roots. Generally the tooth becomes so tender that mastication is effected with difficulty, and if not soon relieved, an abscess is likely to follow.

There is yet another condition not unfrequently met with, which involves more trouble and requires even greater care in its treatment than the foregoing, viz., teeth in which death of the nerve has taken place from inflammation, due generally to exposure, or, as sometimes happens, to long-continued irritation kept up by large metal fillings, when placed in too close contact with the nerve. In these cases the putrefying matter arising from the dead nerve has so soaked into the substance of

* *Cocaine.*—In no branch of surgery has this drug found more uses than in dentistry. A small quantity mixed with the escharotic when destroying a nerve, anaethetizes it so completely, that its destruction and subsequent removal is hardly felt at all. In some cases the nerve may be painlessly removed under the influence of cocaine at the first sitting, without any preliminary treatment. It is also useful to obtund (*i.e.*, to dull) the sensitiveness of a tooth when preparing a cavity for filling. In the use of cocaine in this manner there is no danger as it does not pass into the system.

the tooth, that several applications of the most powerful germicides (antiseptics) are required at intervals of several days, to overcome the foul state, before filling can be safely proceeded with.

With a simple cavity all is plain sailing, the operation being easily and painlessly performed at one sitting, and, what is of more importance, in a quarter, or even less of the time it takes to fill a complicated one. Further, in those cases where decay has not advanced too far, the walls of the teeth are still strong and solid, and are not likely to give way under the filling, which, if carefully executed, should render the tooth treated as lasting as any other in the patient's head. On the other hand, teeth extensively decayed, and the nerves exposed or dead, setting aside the extra time and trouble and the necessarily larger fee, cannot possibly be so durable as in the former case.

PLATE X.

Fig. 1.

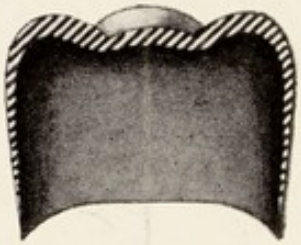


Fig. 3.

Fig. 2.

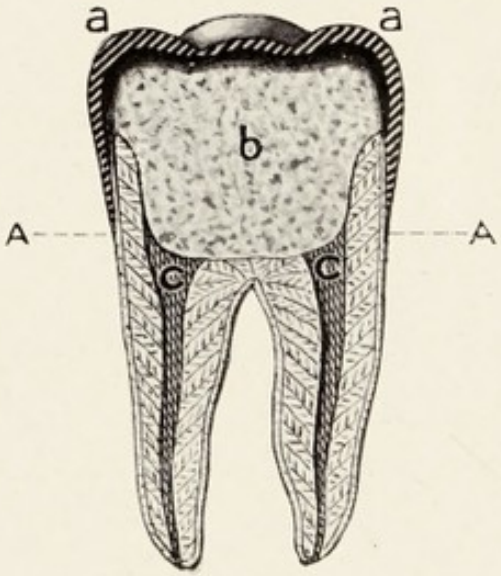


Fig. 4.

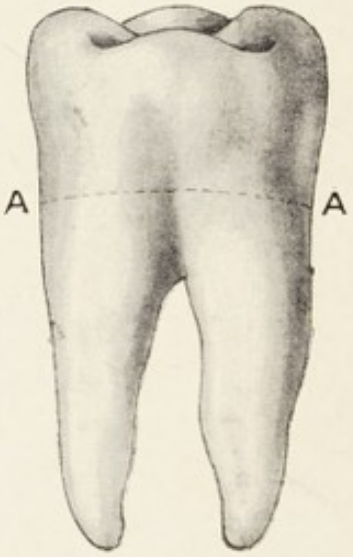


Fig. 5.

A

Fig. 6.

B

Fig. 7.

C

Fig. 8.

EXPLANATION OF PLATE No. X.

Fig. 1.—View of a lower molar too broken down for filling.

,, 2.—Same tooth with edges trimmed for crowning.

,, 3.—Section of gold crown.

,, 4.—Sectional drawing of stump showing gold crown *in situ* :— (*a*) The gold crown : (*b*) cement used in fixing : (*c*) the nerve canal filling.

,, 5.—Outside view of same.

A. Represents the level of the gum.

Note.—In cases of anterior teeth or where the crowns are likely to be observed, the gold is faced with enamel porcelain to match the colour of the natural teeth, or they are made entirely of porcelain.

Fig. 6.—Root of front tooth prepared for a porcelain crown.

,, 7.—Porcelain crown ready for fixing.

,, 8.—Porcelain crown permanently fixed to root.

PLATE XI.

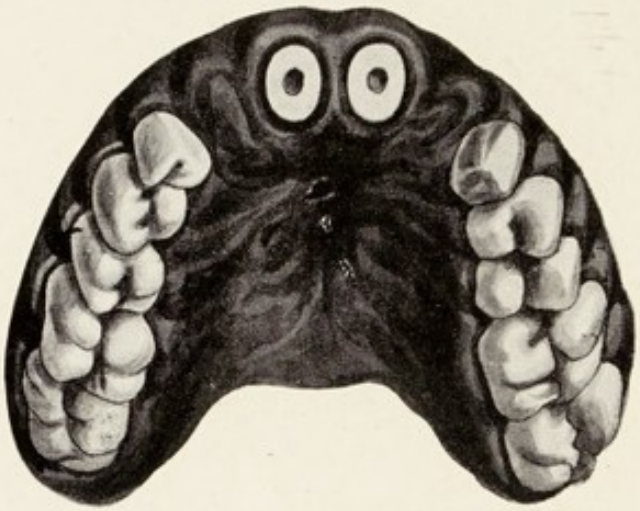
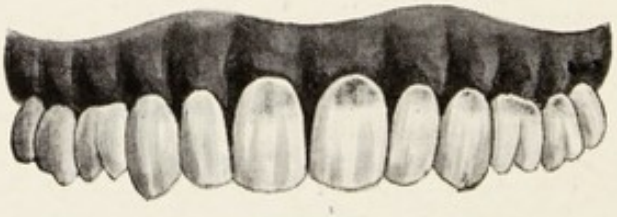


Fig. 1.—Model of a mouth in which the two lateral incisors have been extracted, and the central incisors are too far decayed for filling.

Fig 2.—The Bridge case prepared for this mouth.



A B C D

Fig. 3.—Model of the same mouth showing the Bridge fitted.

CHAPTER X.

CROWN AND BRIDGE WORK.

It is now more than twenty-five years since crown and bridge work was introduced. The idea was so novel as to cause it to be received with a good deal of reservation at first, but the most sceptical have long since acknowledged its usefulness. This work seems to fill the gap which had previously existed between operative and mechanical dentistry, placing a new power in the hands of the profession for the conservative treatment of the teeth even when beyond preservation by filling.

Crowning Teeth when too far decayed for Filling.

The co-operation of the two branches of the Dental Art (operative and mechanical), as now understood and practised by dentists of the advanced school, postpones the time almost indefinitely when the possessors of weak teeth need have recourse to artificial substitutes, as the term is commonly understood—that is, mineral teeth fitted upon plates of either vulcanite or gold. For when, in course of time, the decaying teeth become too far broken down to be rendered serviceable for filling, a new crown can be so adjusted as to permanently restore the organ to its natural appearance and efficiency.

I need hardly remark that such teeth, or, rather, stumps, are generally pulpless, or, in other words, the nerve in them is no longer alive, and, in the ordinary course of events, if allowed to remain in the mouth, will sooner or later—as many of my readers have no doubt proved by experience—produce abscesses and other inflammatory troubles, and will have to be removed before an ordinary plate can be worn with comfort. Besides, where there are decaying stumps, the mouth cannot be kept in a properly aseptic condition, and injury to the remaining teeth must follow, if nothing more serious.

Explains how Stumps, if neglected, are liable to become Abscessed.

To enable one to understand why a nerveless stump, if allowed to remain in the mouth, on the one hand, often results in an abscess, and, in the other case, if crowned, becomes once more a useful member of the oral cavity, it will be necessary to advert briefly to the histological truths which have been discovered in connection with pulpless * teeth, and upon which the modern treatment is based.

I have referred briefly, on page 29, to the fact that teeth do not depend wholly, as was formerly supposed, for their vitality upon the main nerve and vessels or pulp ; but possess a second or independent source of life in the immediate connection between the lacunae and canuliculi, or little cell spaces contained in the roots of the tooth, and the

* The terms pulpless and nerveless, as here used, are synonymous.

vascular system of the surrounding tissues (*see* Plates 2 and 3). Through this network of cells, a supply of pabulum is, no doubt, constantly passing, which, in a manner, might almost be called the circulation of the root. This circulation is, however, only maintained so long as the blood-vessels of the socket are excited to healthy action by the process of mastication. Thus it follows, that directly a tooth from extensive decay becomes so broken-down as no longer to fulfil this function, from that moment a retrogressive change sets in. The blood-vessels in the lining membrane of the socket become congested ; the fluid in the cells of the root stagnates, and chronic inflammation of the socket supervenes, which, in course of time, depending upon the state of health, either cause an abscess, or the stump becomes so loose and painful as to necessitate its removal.

Stumps re-crowned become again Healthy.

The success of the new method consists in that the new crown is made to take the place of the lost portion of the tooth, and so by re-establishing the articulation the normal action of mastication is one more brought into play, and the health of the stump is assured.

The usefulness of this work cannot be too highly extolled, for, besides doing away with artificial palate plates, it allows the patient to retain the stumps in the mouth in a perfectly healthy state,* whereby the natural expression of the face

* Stumps decayed much below the level of, or covered by the gum, cannot of course, be crowned ; nor is it desirable to retain such in the mouth.

does not suffer through absorption of the tissues which follows extraction.

Whilst crowning of the teeth is the rational treatment which may be safely adopted in most cases when they are past preservation by filling, the exceptions only being sore and tender roots of teeth or those which are much below the level of the gums, bridge-work, on the other hand, is of comparatively limited application, and can only be successfully employed in certain well defined cases. It should, moreover, never be undertaken unless all the conditions are found to be favourable. In cases where bridge-work is indicated, and is carried out by experienced hands, nothing more beautiful can be conceived in the restorative work of Dentistry.

Bridge Work! what it is.

A bridge-case I may briefly explain, consists of two or more crowns forming abutments or supports to which mineral teeth are attached to fill the intervening spaces where teeth have been extracted, no plate being required.

The durability of Crown and Bridge Work.

As instances of its usefulness and durability I may mention two cases which have been constantly under my notice. The first case is that of a small bridge which I fitted for a near relative many years ago, and which only recently became loose after doing service for twenty years. As the roots supporting it were found to be still perfectly healthy and sound, a new bridge was fitted with every prospect of a similar long life of usefulness before it.

The second case is that of a gold crown fitted for another relative twenty-three years ago which is apparently as sound to-day as when it was first fitted. I ought perhaps to add that in both these cases the patients were young healthy persons, and the conditions favourable to lasting work.

A good deal of approbrium has, in the past, been cast on this work owing to many failures, and the trouble and annoyance occasioned to patients in consequence; but I would point out that it is not the system which is to blame, any more than one would condemn the science of engineering, for instance, because a bridge collapsed owing to its having been built on insecure foundations, or without due regard to the stresses it was called upon to bear.

Much of the discredit to which crown and bridge work has been subjected is due, no doubt, to the army of numerous quacks, who, under various titles in which "American" something or other is generally written large, have circulated the fiction that plates are no longer required, causing endless misery and disappointment to those credulous enough to believe in their specious promises. For the honour of my American confrères I would state that no qualified dentist would allow his name to be associated with such establishments.

CHAPTER XI.

DENTAL PROSTHESIS IN ITS RELATION TO ART.

Dental Prosthesis considered from an Artistic Standpoint.

It may seem strange when one considers the great advance made during recent years in all that relates to conservative Dentistry, to find that comparatively little attention has been given to the other branch of Dentistry, namely: "Dental prothesis," especially when considered from an artistic standpoint in contradistinction to the purely mechanical.

Many improvements have no doubt been made in the technique of Dental Mechanics, but from an artistic point of view this important branch of the dentists' work has scarcely received the attention it deserves. As I have already mentioned in the preface, our profession is not altogether responsible for the divorce of art from so much of the work of the present day.

The causes are many, and may generally be attributed to the growing utilitarianism of the age, which if not actually antagonistic to art certainly does not give it the encouragement by which alone art generally is able to flourish.

To enable the reader to arrive at a better understanding of the subject, it will, perhaps, be as well to explain, that although the artistic and mechanical are so closely allied in the general term "Dental prosthesis," yet it is seldom that the former receives separate recognition ; nevertheless, the words artistic and mechanical have widely divergent meanings in Dentistry as in other branches of the applied arts.

Success of Artificial Dentures dependent on Artistic Treatment and Design.

Although mechanical proficiency is, of course, necessary in the prosthetic work of the Dentist, it is primarily in the artistic design and treatment that the success of an artificial denture depends—aesthetically as well as for comfort and utility. In proportion as a Dentist brings artistic taste to bear in the execution of his work, the more closely does he assimilate his productions to nature, exemplifying the truth of the classical saying "*art est celare artem.*"*

General misconception of the Dentist's Work.

With the majority of patients the idea prevails that this important work of the Dentist consists merely in the fitting of artificial substitutes in the place of the missing natural organs with more or less mechanical precision depending on the skill of the operator ; and is regarded by many as being in the same category as the replacement of the broken parts of a watch, or clock, or indeed, any similar

* True art is to conceal art.

or purely mechanical process. It is the few only who appreciate the artistic possibilities of this branch of the Dentists' work.

Difference between Art and a purely mechanical Process.

It is the mechanic who prepares the paints and other materials for the use of the artist, but it is the latter who applies the colour to, and gives life to the canvas. Similarly, it is the mason who prepares the marble to be afterwards wrought into beautiful forms by the sculptor. Again, it is the architect to whom we are indebted for all that is beautiful in architecture, and not to the bricklayer, carpenter or mason, whose duty it is merely to carry out his (the architect's) designs. Many other instances might be cited, were it necessary, by way of illustrating the difference between Art and a purely mechanical process.

It is owing to the fact that art is so often divorced from the mechanical in Dentistry, that one sees so many obvious anachronisms of Dental work. One need not go very far for proof of this assertion, for who is not constantly meeting people with examples of the most flagrant breaches of every canon of art, which is as painful to the beholder as it is disfiguring to the patient.

Why many persons are content to wear unnatural-looking Dentures.

That so many persons are apparently content to wear unaesthetic looking dentures, would be difficult to understand, were it not for the fact that

it is permitted to very few "to see ourselves as others see us." Something inharmonious, it is true, may have been noticed in the beginning; but constant use and association will gradually accustom one to almost anything, however incongrouous it may continue to appear to others. Occasionally some observant friend may be found bold enough to convey a hint, but more often than not, the unfortunate patient is allowed to suffer his disfigurement unheeded.*

Restoration of the Features.
Importance of preserving the Normal Relations of the Jaws.

It is almost to be regretted that a more general criticism is not permitted in this as in matters of a less personal nature. The most glaring cases are those in which small unnaturally white china-looking teeth are arranged in even rows, fitted without the slightest regard to either the age, sex, or temperament of the patient; and in others again to the too liberal use of unnatural looking gum resembling painted wood rather than the living

* To be natural in appearance teeth must be inconspicuous, in the sense that they must not attract unusual notice. What then could be more startling to the friends and relatives of a patient whose teeth had always required constant attention on the part of the Dentist, than for him to suddenly appear with a denture of pearly whiteness, painfully regular, and in all respects better suited to the age of 16 or 18 than middle life?"—"In the arrangement of teeth serious errors are constantly made. The work is usually considered well done if a perfectly symmetrical arch has been obtained, whereas in life we rarely find a faultlessly regular arch." *The American Textbook of Prosthetic Dentistry*, by Dr. Charles J. Essig, Professor of Prosthetic Dentistry at the University of Pennsylvania.

tissue it is intended to replace. Some teeth are made too, which, looking bad by day, assume an even worse appearance by night, when they become either an unnatural blue or inky colour. Artificial teeth are often observed fitted side by side with natural ones, in which no attempt has been made to match either the colour or form of the latter. Such cases suggest additions to a building in which the new bricks and tiles are in striking contrast to the original portion. There is this difference, however, that whereas in course of time the new bricks and tiles become toned down restoring to some extent the general harmony, the new teeth remain unchanged and continue to challenge unwelcome attention, no matter how long they may be worn. Again, there is the all important matter of the restoration of the features, to insure which it is not only necessary that the new teeth should occupy precisely the same position as those which have been lost,* but also that the exact amount of the gum tissue which has been lost by absorption, should be accurately replaced. How seldom, however, do we find this to be the case! Thus we see some cases where the teeth are far too prominent, and others in which the teeth of one or both jaws scarcely show at all. Sometimes the jaws are held too widely apart; but more often they approximate too closely. Great judgment is necessary to determine the normal distance the jaws should be kept apart, especially when there are no natural teeth

* Except in cases where the natural teeth are out of their proper position when, of course, this must be corrected in replacing the artificial ones.

remaining as a guide. Any departure from the normal relationship of the jaws when closed, seriously interferes with the usefulness of the case, destroys its aesthetic appearance, and what is worse, causes facial distortion, which unless remedied in time may lead to permanent disfigurement of the whole of the face.

The following two cases which have come under my notice recently will serve to illustrate the above remarks :—The first was the case of a big burly, large jawed man who consulted me, complaining that he was unable to masticate his food. Upon examining his mouth, I found that he was wearing a complete set of teeth, but they were much too small to be of any service—the back teeth especially, were actually smaller than the temporary molars of his five-year old son, who accompanied him, and whose presence I made use of as a practical illustration of my remarks to his father who, I may add, was not long in realising the necessity for a new set.

The second case was that of a middle-aged lady, also wearing a complete upper and lower set, of which neither the colour nor shape were at all suited to her temperament. Her chief trouble, however, had reference to the very obtrusive and unnatural pink gum which as she put it "any little child could see was artificial." In her endeavour to conceal the deformity as much as possible, she had been in the habit of suppressing any inclination to laughter, and had contracted the habit of tightly compressing her lips whenever she spoke or smiled.

She was naturally of a pleasant and happy temperament, but this studied control of the facial muscles which had been going on for some time, had completely changed the expression, and would, no doubt, if allowed to continue, have lead to a premanent distortion of her features.*

An intelligent and observant patient asked me recently why, as she put it, "so many people seemed to be wearing the same set of teeth." She had unconsciously hit upon an unfortunate truth: the too great resemblance of artificial teeth. In nature the teeth of one person no more resembles those of another than do their noses or indeed any other feature. Just imagine what we should look like if they did! It would of course be ludicrous in the extreme!

In pointing out the necessity for a wider appreciation of art in the constructive work of the Dentist, and in drawing attention to the shortcomings in that respect of so much of the Dental work of the present day, I would not wish my remarks to be construed to imply a too general condemnation; for there are many men, I am glad to say, who, by their example and teaching are doing their utmost to counteract the tendency to lower the artistic standard of our work.

Art the First Principle in the Prosthetic Training of the Dentist.

Art being accepted as the first principle in the prosthetic training of the Dentist, it may seem

* In this case several months elapsed after treatment before the patient's normal expression was restored.

strange that it is so often conspicuous by its absence, and that mechanical mediocrity flourishes in its stead. There are many reasons for this regrettable state of things. Among others, competitive commercialism which is proving so destructive to the higher ideals of art generally, has very directly affected the prosthetic productions of the Dentist.

The wholesale production of machine made articles may be necessary or even an advantage in some things, such as, for instance, cheap watches and clocks, coloured prints ready-made clothing and boots, and hundreds of similar things which are capable of being made in tens of thousands from the same patterns; but the attempt to apply the same methods to Dentistry, where every case demands the most careful individual study and treatment (like painting or sculpture) is an anachronism which would not be tolerated, were it not for the fact that the public taste generally is spoilt by so much that is bad as seldom to be able to appreciate that which is really good.

Individuality.

Dentistry, no less than painting, sculpture and the fine Arts generally, offers a wide field for the exercise of the individuality of the Dentist. There can only be one common end in view by all artists who would represent nature in art, and although many who make the attempt must perforce fail in reaching the goal of their desires, yet it may safely be assumed that *the nearer the ideal is approached, the more does their work bear the impress of individuality.*

A Dentist recognised by his Work.

We all know that experts are able to recognise most painters of any merit, ancient as well as modern, by their work. To be told that it is possible that a dentist can also be recognised by his work, may seem strange perhaps to those who have not given the matter a thought; but it is nevertheless perfectly true. I do not suggest, however, that every set of teeth bears the impress of individuality sufficient to distinguish the designer, any more than one could hope, or would indeed care to find out who is responsible for the numberless cheap travesties of art known among painters and dealers in works of art as "pot boilers."

No recognised Standard.

Dental prosthesis occupies a peculiar position, altogether different from that of any other art; inasmuch as there is no Royal Academy, or other public exhibition where Dentists can court the criticism of experts who are usually looked to to guide public opinion in matters relating to art. Therefore, failing any recognised standard, and having no opportunity for comparison, patients (unless in the case, perhaps, of a few who possess sufficient artistic perception to allow them to form an independent judgment for themselves) must perforce accept what is provided for them, be it good, indifferent or bad.

Our dental educational bodies, I am glad to see, are affording greater facilities for the study of dental prosthetics than was formerly the case. More remains to be done, however, and I hope it

will be found possible by-and-bye to create a permanent chair of Dental Prosthetics at the various centres, carrying salaries sufficient to attract the best men; and further, special diplomas might be granted for this branch of the Dental Art. If this were done, the way would be made easier for men whose bent lies in this direction to specialize in a greater degree in Dental Prosthesis, and at the same time it would be a real and practical step in educating the public to a wider recognition of its claims, to be regarded as being in close kinship with the fine arts, instead of a mere mechanical calling.

Greater discretion necessary in the Choice of a Career.

If the true position or inwardness of things were more generally recognised, we should have fewer failures in after life, especially among those who adopt artistic callings; because parents would then exercise greater discretion in the choice of a career for their sons than they do at present.*

The Dentists' Act of 1878.

An evil which has done much to lower the standard of dentistry in the eyes of the greater public, is the prevalence of quackery and the practice of the unqualified. It is not so generally known as it might be, that an Act of Parliament was

* In this connection it is a significant fact, that in the recently published report of the departmental committee of the Royal School of Art, it is stated, "that out of a batch of nearly 500 students only 39 have applied their teaching to practical purposes."

passed as far back as 1878 for the better protection of the public; but so badly was the Act drawn, that although it was made a penal offence, punishable with a fine not exceeding £20, for anyone to make use of the word "Dentist," either alone or in combination with other words, unless legally entitled to do so, the field was, and is still left open to anyone, be he barber, blacksmith or whatnot, to exploit the public by the assumption of any other title sufficiently misleading to induce the belief among the more ignorant or careless, that they also are qualified Dentists.*

As a consequence, the anomaly is to be met with all over the country of establishments bearing the names of Dental Surgeries and Dental and Teeth Institutes and Companies run by men who are not Dentists, who, moreover, would be liable to a fine of £20 if they used the latter title. It is not my intention to enlarge on this subject further than to express the hope that, with better education, the coming generation will acquire sufficient powers of discrimination to prevent them from placing themselves in the hands of the irregular and unqualified practitioner.†

Having shown the importance of the study of Dental Prosthesis from an artistic standpoint, and

* In a reference to "quack" dentists in a leading London daily it was rightly said that "Animals, owing to the Veterinary Surgeons' Act, have more protection against quacks operating upon them than have human beings from quack dentists."

† It is time that the public understand that no properly qualified dentist, be he British, American or of any other nationality, would advertise under any circumstances, any more than a Doctor or Lawyer.

the relation that art bears to the work of the Dental Surgeon, I hope that a brief description of its methods and application may not be considered out of place.

Temperamental Characteristics.

In considering the design of a new case, the temperamental characteristics is one of the first and most important to be taken into account. Next, the age and sex of the patient have to be considered, as also the colour of the hair, eyes and complexion, and other details of the features, especially the facial outlines peculiar to the individual.

From such data the Dentist decides upon the size, form and colour of the teeth to be made, and arranges their relative positions on the models which ultimately they are intended to take in the mouth. Next the amount of the gum tissues lost by absorption has to be carefully gauged, as it is upon a correct estimate of this, and the accurate placement of the teeth, that the ultimate restoration of the patient's features depends. This is equally true as regards mastication and articulation. I have frequently met with cases in which the voice has been entirely altered by an ill-designed set of teeth.

"*Temperament*," says Dr. D. H. Jacques,* "is a constitutional condition produced by mixing in different proportions various physical elements. The functions of life are not performed in all persons

* *The Temperaments, &c.*, by Dr. D. H. Jacques, Fowler & Wells, 1878.

with the same degree of force or rapidity. These differences are the results and indications of what is called *temperament*, the *corpori habitus* of the ancients. It is by the combination of these constitutional elements in various proportions that the body is *tempered*, the predominating element determining the prevailing temper or temperament, and the others the modifications which may be present. A particular temperament is the result of the preponderance of one of these elements over all the others. The Ancients, assuming the possibility of these elements all being equal in a given case, were accustomed to speak of the *temperamentum, temperatum*, the temperable, harmonious, or balanced temperament ; but it is scarcely to be conceived of a single instance in the human species in which there is perfect equilibrium in all parts, although near approach to this condition may be found. It is evident that in an ultimate analysis, the temperaments must be as numerous as the individuals of the human race—no two persons, probably, having precisely the same physical organization or the same proportion of each elemental ingredient of the compound structure in which each lives, moves, and has its being."

"It is essential for practical purposes, therefore, to reduce these numberless individual peculiarities to their simplest elements, and group together such persons as resemble each other in certain particulars, or who have a similar organization."

According to the modern classification the basal temperaments are divided into four main divisions

as follows :—Bilious, sanguine, nervous, and lymphatic.

Bilious temperament :—

Colour of teeth : Creamy to golden yellow.

Shape of teeth : Flat face, large and angular.

Sanguine temperament :—

Colour of teeth : Straw or soft yellow.

Shape of teeth : Round face and bold.

Nervous temperaments :—

Colour of teeth : Transparent blue or grey.

Shape of teeth : Graceful, semi-round face.

Lymphatic temperament :—

Colour of teeth : Opaque white.

Shape of teeth : Broad and rather flat.

Perfectly pure types of the basal temperament are rarely found alone, but are generally modified by combination with other elements. The compounds are usually a base with one prominent modifying element, and is known as a Biniary temperament. For instance, the Bilio-lymphatic signifies that the bilious temperament predominates and the modifying factor is the lymphatic. Other elements are, of course, met with in the same type, but are not readily distinguishable.

Dr. C. J. Essig gives the following table of ordinary combinations :—

(1) Sanguo-bilious.
(2) Bilio-sanguine.
(3) Lymphatico-bilious.
(4) Bilio-lymphatic.
(5) Nervo-bilious.
(6) Bilio-nervous.

(7) Nervo-sanguine.
(8) Sanguo-nervous.
(9) Lymphatic-sanguine.
(10) Sanguino-lymphatic.
(11) Lymphatic-nervous.
(12) Nervo-lymphatic.

It is only by a close study of the temperamental characteristics of the individual, that one is able to arrive at a correct conclusion of the size, form, and colour of the teeth required. As Dr. J. W. White said : "What is needed is such an appreciation of the laws of correspondence, that the dentist can cypher out, as by the rule of three, the character of teeth required in the case of an edentulous mouth, with the same precision that the comparative anatomist can from a single bone, indicate the anatomical structure of the animal to which it belonged. The probability that in many, perhaps in most, of the artificial dentures, the fault is not in the carelessness or indifference of the dentist, but in his failure to recognise the requirements of temperament. A certain family resemblance to each other in a set of teeth is considered essential, but the adaptability of the set as a whole to a given case should be esteemed of even greater importance. A set of teeth in which not only the relative length and breadth, but every line and curve, characterizes it as belonging to a certain temperament, may be made of a colour never found in nature connected with such forms. Thus are seen repeatedly such incongruities as the association of the massive tooth of the bilious temperament with

the pearl-blue colour of the nervous temperament, and the long narrow tooth of the nervous temperament with the bronze-yellow never seen in any but those of a bilious temperament—showing that the laws of correspondence had not been sufficiently observed.

The first study of the dentist when proposing to replace a lost denture should be how to restore the natural appearance of his patient, and this can only be effected through an appreciation of the temperamental characteristics and the law of correspondence and harmony. Age and sex may somewhat modify the requirements in a given case, but the basal fact on which he should proceed is temperament. A failure to recognise its demands will result in failure from an aesthetic standpoint. *A knowledge of the distinguishing characteristics of the various temperaments and the style of teeth which conform to Nature's type in the physical organization, marks the difference between the dental mechanic and the dental artist.*"

CHAPTER XII.

HINTS TO PATIENTS WHO WEAR ARTIFICIAL DENTURES.

However satisfactorily a case may fit when it is made, it will in course of time become less efficient, owing to the natural changes which are ever occurring in the mouth. The period during which a case will remain reasonably efficient, must of course depend upon a variety of circumstances ; for instance, the time which has elapsed since the loss of the natural teeth will be a determining factor. The age and the general health of the patient have also to be considered. It may, however, be taken for granted, that there are but few cases in which some alteration is not called for after the lapse of 4 or 5 years. This may not be apparent to the wearer, and indeed in the early stages is seldom noticed by the patient, as the changes are so gradual as to occasion but little inconvenience. Nevertheless, not only does the case become less efficient in every way as time goes on, but what is even of greater importance, the normal relationship of the jaws is gradually changing, causing a change in the facial muscles, and consequently an alteration of the face and expression.

Periodical Inspection of all Dentures necessary.

For this reason, I cannot too strongly emphasize the importance of a periodical inspection of all dentures after say 3 or 4 years wear, to ascertain what change has taken place, so that if found necessary, steps may be taken to bring the case, so to speak, "up to date."

If this rule were more generally adopted, we should see fewer of the oral deformities which are, undoubtedly, induced by neglect, neither should we be distressed by witnessing the dental gymnastics in eating and speaking, which are (unconsciously though they be) resorted to by those whose teeth have ceased to fit.

Considering the strenuous manner in which so many strive to combat the raids of "Father-time" and the trouble and money spent in other directions in the endeavour to retard fleeting youth, it seems strange that more attention has not been directed to the necessity for greater watchfulness of the mouth, than which no other feature, if perfectly preserved, is such an asset in the beauty of the face.

I do not hesitate to assert, that by the timely intervention of the dentist, it is possible to keep pace with and to make good, the inevitable and ruthless changes of nature in the mouth and adjacent parts; so that as has already been said, the faces even of those who have lost all their natural organs —however early in life—may be preserved with but little change until quite late in life.

The longer a case has been neglected the more difficult it becomes to restore the features.

Whilst so much is possible if taken in time, I would wish it to be understood that Dentistry has its limitations. The fact cannot be too forcibly stated, *that the longer a case has been neglected, the more difficult it becomes to restore the normal condition of the features.* I believe that at one time it was not uncommon for patients to be told upon having a new set of teeth, that they would last a life-time, a pleasant thing no doubt to hear, but a specious and foolish statement, which cannot be too strongly condemned, as lulled by a sense of false security, it has led many patients to continue to wear useless and derelict cases, until their features become so altered as to make restoration almost impossible. In this connection is included the lips, cheeks and all the controlling muscles of this part of the face, as well as the jaws and teeth—the outside as well as the inside of the mouth. A set of artificial teeth might possibly last as long as the pyramids of Egypt. It is nature that gives out.

The hair, eyes and complexion may have all the freshness of youth, but if the mouth be out of shape the face is utterly spoiled. On the other hand, the hair may be turning grey, the eyes may even have lost their original brilliancy, but so long as the symmetry of the mouth remains unchanged, a person will never appear to be really old. That the mouth more than any other feature determines age, is a fact equally well known to painters and actors ; and photographers also are aware how far a happy

portrayal of this feature goes towards the making of a successful photograph.

People often make the remark: "How well so and so wears," or "Have you noticed how old so and so is getting ' " little realising that in very many cases, it is the condition of the mouth of the person criticised which is responsible for these conclusions.

Simple Method for ascertaining whether a Denture requires Alteration.

One of the first signs of oral changes calling for alteration in artificial teeth, is to be found in the back teeth of either one or both sides of the denture failing to meet the teeth in the opposing jaw when the mouth is closed. A ready means of testing this, is by placing a narrow strip of paper between the molars and closing the mouth, when if it is found that the paper can be readily drawn away, the earliest opportunity should be taken to have the sunken teeth raised to their proper level. If this is not attended to, the denture soon begins to get what is termed "sloppy," and consequently less and less efficient.

Change takes place so gradually that the Patient seldom realizes the fact.

I have met with many people who were getting but a fraction of the benefit they might have done had their teeth fitted properly; some were so hopelessly bad, that those wearing them might just as well have been without any teeth at all—and this in many cases where it would have been an insult

to suggest that financial reasons stood in the way of having things put right. One can only assume, as I have elsewhere pointed out, that the change takes place so gradually in the mouth, that the patient seldom realises how very approximate their teeth have become, unless their attention is called to the fact. It is obvious that such cases possessing as they do but a minimum of stability, must wobble about in the mouth like a storm tossed ship at sea, and can never be really comfortable or useful to the wearer. Besides which, the jaws having lost their normal relationship, allow the chin and nose to approximate too closely ; and the whole weight of mastication being borne by the front of the mouth, any natural teeth which remain are loosened and pushed outwards by the unnatural stress. When I see such dentures continuing to be worn, I scarcely know which to admire the most, the courageous tenacity of the wearer, or the wonderful adaptability of nature. Some persons with obviously ill-fitting cases will give as a reason for not having had them attended to before "that they have not hurt." That may be unfortunately true. I say unfortunately advisedly, because if they had "hurt" they would not have been allowed to drift, but would have been attended to sooner. Generally speaking it may be said, that in nothing are people inclined to be so indifferent or careless as in matters connected with their artificial dentures.

Chattering of the teeth : A condition so distressing to sensitive patients is sometimes present in an entirely new set of teeth, but is more often met

with in dentures which have ceased to fit. In the former case it is generally attributable to faulty design, but in all cases it is happily remediable. The same remarks apply to the difficulty, not a few patients' experience, in pronouncing certain letters, such as, for instance, S or Sh, and also to a disagreeable whistling sound which is involuntarily made in speaking.

Bands and wires : The use of bands and wires to a limited extent is justified in certain cases, and if accurately fitted and kept perfectly clean will be productive of but little if any harm, to the remaining natural teeth ; but they should never in any case be allowed to show, even when the mouth is open to its widest extent.

Masticating Surfaces of Artificial Teeth.

Nature supplies us with molars the curves or prominences of which are well marked. The more closely artificial teeth are made to conform to nature in this respect the more useful will they be for mastication.

Weight of Artificial Teeth.

As a general rule partial dentures should never be made heavier nor of greater bulk than is consistent with a due regard to strength. In complete upper cases, however, where the upper depends for its retention in the mouth on suction or atmospheric pressure, and the lower on gravity, the former should be made as light as possible, and the latter purposely weighted to nearly, if not quite double the weight of the upper, to insure the best results. Many

cases have come under my notice where directly the opposite obtained, the uppers in not a few cases being double the weight of the lowers.

The lower jaw in the edentulous (toothless) state being represented by a very narrow ridge or saddle, it does not permit of the suction principle being applied to anything like the same extent as in the upper jaw.

Domestic Servants and their Teeth.

In bringing my notes to a conclusion, I would say a few words about our servants who, as a class, suffer terribly with their teeth, the result no doubt of neglect in earlier years. It is very rarely indeed that one sees anything approaching a sound set of teeth among domestics, and this condition is accountable for much of the anaemia, loss of weight, and general *malaise* which is so prevalent among them. It is impossible for any girl to do her duty properly with a mouthful of aching teeth and hopelessly diseased roots, which poison her system, preventing her sleep at night, and making her life miserable by day. Unfortunately very few take the initiative of having their mouths attended to in time, and so they go on from bad to worse, until gastric or some other serious trouble supervenes, compelling them to abandon work altogether.

Mistresses would not only being doing a kindly act, but indirectly benefiting themselves, by encouraging any suffering member of their staff to have the trouble attended to as soon as possible ; and at the same time to warn the girl against the army of quacks who flood our areas and back doors

with their speciously worded cards and circulars, appealing especially to this class of patient. They should be advised to consult the family dentist, who, if unable to attend to them himself, will no doubt be able to recommend them to some brother practitioner, from whom they may be sure of receiving the consideration which their position in life demands. In the case of nursemaids or others who have the charge of young children, the condition of the mouth is a very important matter, and it is the duty on the part of the parents to insist on oral hygiene being strictly maintained.

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