The significance of the natural form and arrangement of the dental arches of man : with a consideration of the changes which occur as a result of their artificial derangement by filing or by the extraction of teeth / by Isaac B. Davenport.

17.

WITH COMPLIMENTS OF THE AUTHOR.

THE SIGNIFICANCE OF THE NATURAL FORM AND ARRANGEMENT OF THE DENTAL ARCHES OF MAN, WITH A CONSIDERATION OF THE CHANGES WHICH OCCUR AS A RESULT OF THEIR ARTIFICIAL DERANGEMENT BY FILING OR BY THE EXTRACTION OF TEETH.

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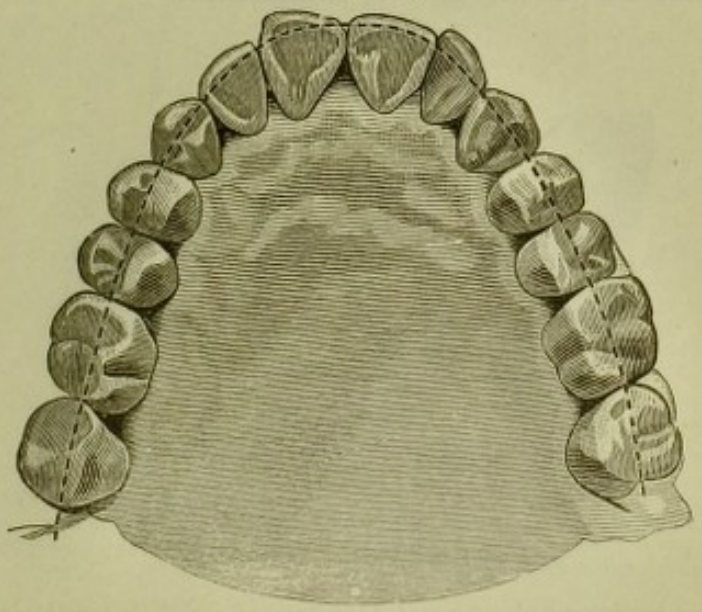
BY ISAAC B. DAVENPORT, M.D.S., M.D.

To the Honorable President and Gentlemen of the New York Odontological Society:

Nature has furnished man with two dental arches, so formed and so placed in relation to each other as to be best supported at every

Fig. 1—A.

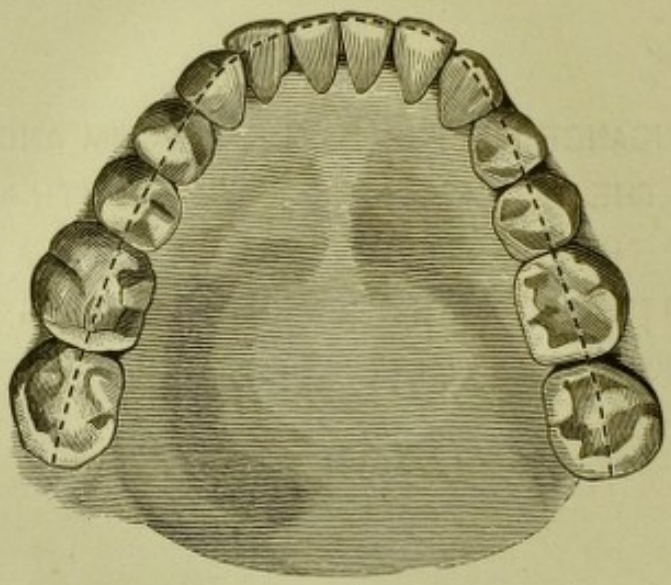


Superior Arch. Dotted line indicates normal line of contact between the teeth.

point, while permitting all the movements necessary for the perfect comminution of his food.

Each side of both arches, upper and lower, is furnished with its double row of molar cusps, so arranged that the outer, lower row works between the two upper rows, and the inner, upper row works in the irregular groove between the two lower rows.

FIG. 1—B.

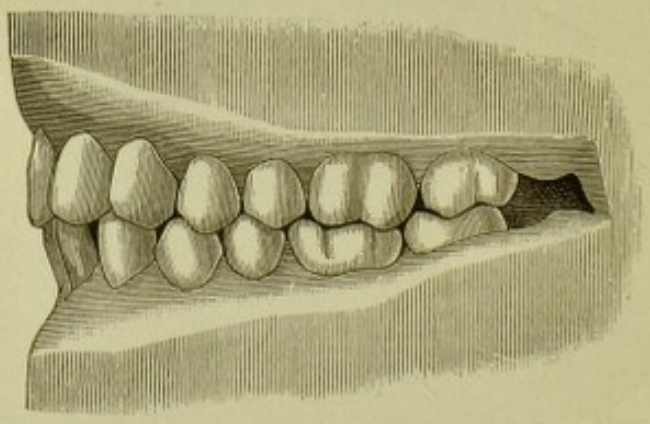


Inferior Arch.

The double cuspid arrangement ceases at the angle of the mouth, by the suppression of the inner row of cusps and the modification of the outer row into cutting-edges.

This suppression of cusps prevents an interlocking which would defeat the normal movements of mastication.

FIG. 1—C.

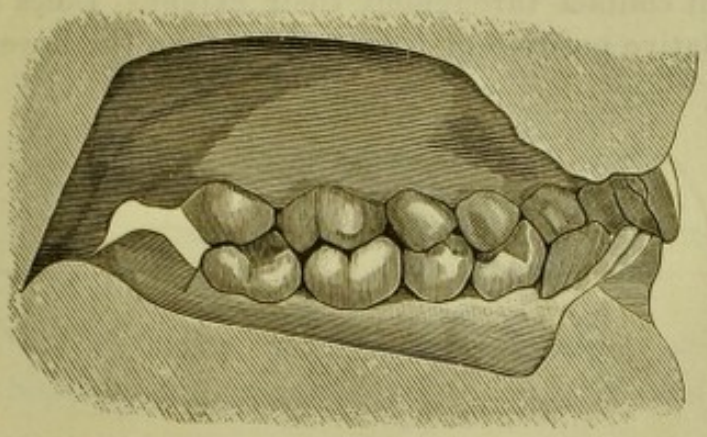


Exterior View of Articulation.

The upper incisors shut past the lower perhaps a little more than the height of the molar cusps. This permits of the cutting movements of the incisors without too much striking of the cusps. (See Figs. 1—C—D, and Fig. 8.)

When the teeth articulate well, the lateral arrangement of cusps and furrows permits the greatest freedom of motion with the least separation of the grinding surfaces. (See Fig. 2—I.)

FIG. 1—D.



Interior View of Articulation.

The palatal surfaces of incisors and cuspids are so directed, and have such relations to the inclines of the molar cusps, as to permit contact at different planes of the surfaces.

FIG. 2—I.

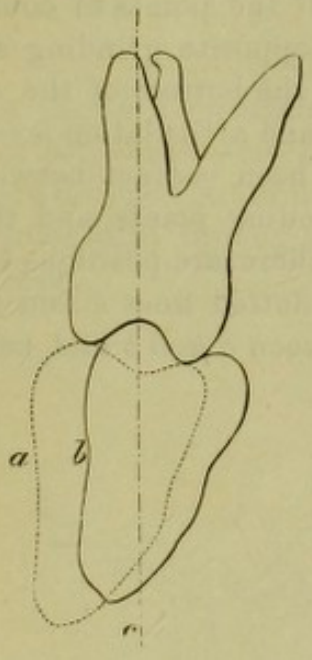


FIG. 2—I shows the normal inclination of the axes of the molars, and the normal relation of the cusps and furrows—*i. e.*, the grinding surfaces.

FIG. 2—II.

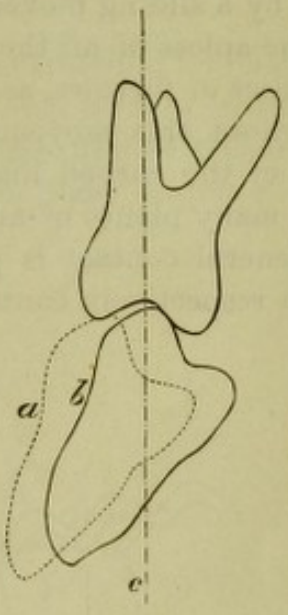
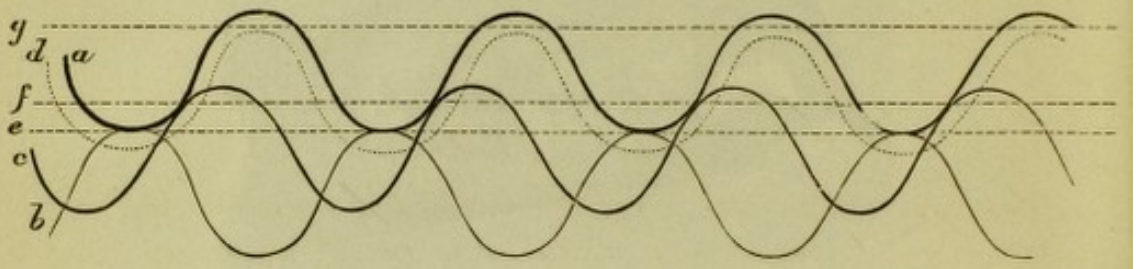


FIG. 2—II shows the increased inclination of the axes of the molars, and the separation of the inner cusps which occurs when the arches are broken and the teeth fallen inward.

To make myself clear upon this important matter of the general relation of the grinding surfaces of all the teeth, you are referred to Fig. 3, which is a diagram intended to represent the arrangement of the grinding surfaces of both arches.

The curved line *a* represents the grinding surfaces of one side of the superior arch with its cusps and depressions, and the dotted curved line *d* the corresponding grinding surfaces of the inferior arch, while the two are shown in such perfect relation to each other as to permit contact throughout their extent. Lines *a* and *b* indicate the relative position of both arches when the lower is forward,

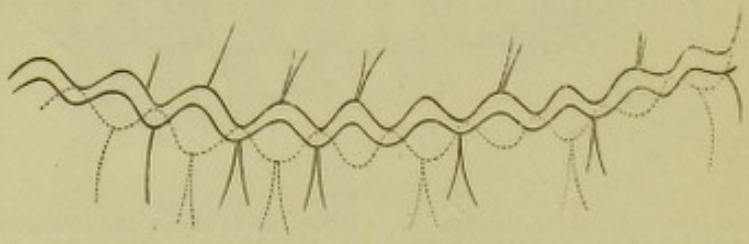
FIG. 3.



in the act of cutting, in which position the points of the cusps are just ready to strike. These several points of contact taken together—*i. e.*, when there is touching between the edges of the incisors and at the same time touching between the cusps of several or all the other teeth, as indicated by dotted line *e*—may be considered as the first plane of articulation.

As the lower jaw moves backward, all the points of contact are shifted by a sliding movement over the opposite grinding surfaces, until the apices of all the cusps rest at the bottom of the opposite concavities or furrows, as with *a* and *d*, and articulation is complete. Throughout this movement there has been contact between each section of the curved lines at corresponding points, and there are just as many planes of articulation as there are positions in which such general contact is possible. See dotted lines *e* and *f*, which connect respectively contact points between *a* and *b* and between *a* and *c*.

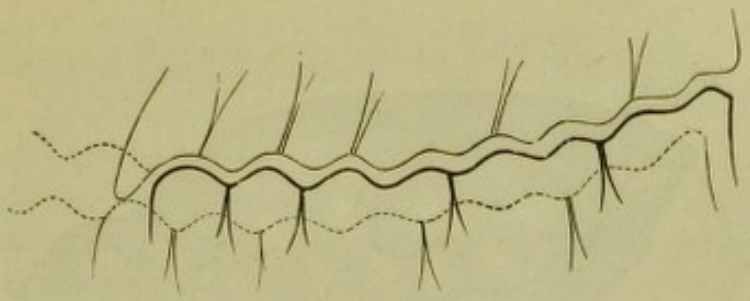
FIG. 4.



In Fig. 4 we have the same curved lines as in Fig. 3, adapted to the general form of the dental arches, with the teeth roughly outlined, and all of the articular planes of the two arches in perfect relation. The dotted lines indicate the position of the lower teeth on the first plane of articulation.

Fig. 5 is the same as Fig. 4, excepting that the first planes of articulation are out of relation, owing to an over-projection of the front teeth, so that contact of the molars is lost on all the first planes of

Fig. 5.



articulation. With such a condition mastication is effected principally by a chopping motion, with but a limited lateral and rotary movement.

Fig. 6.

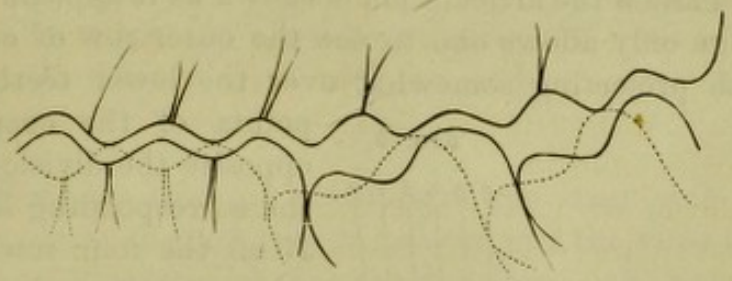


Fig. 6 shows a *fortunate* result after extraction, for the general planes of articulation are not disturbed; only certain grinding surfaces have dropped out of position, and become useless in consequence of the downward tipping of the molars in their search of support for the arch.

Fig. 7.

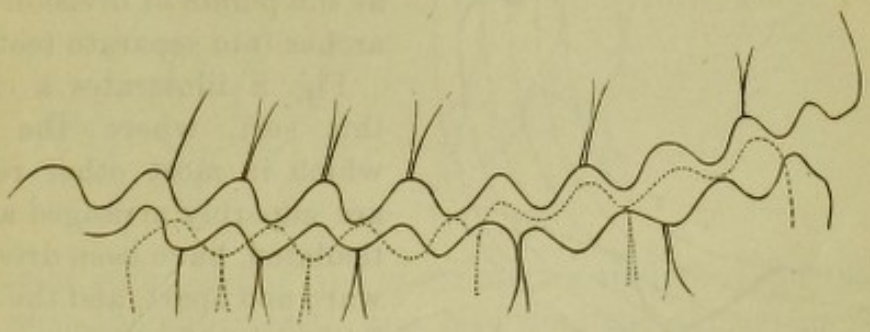
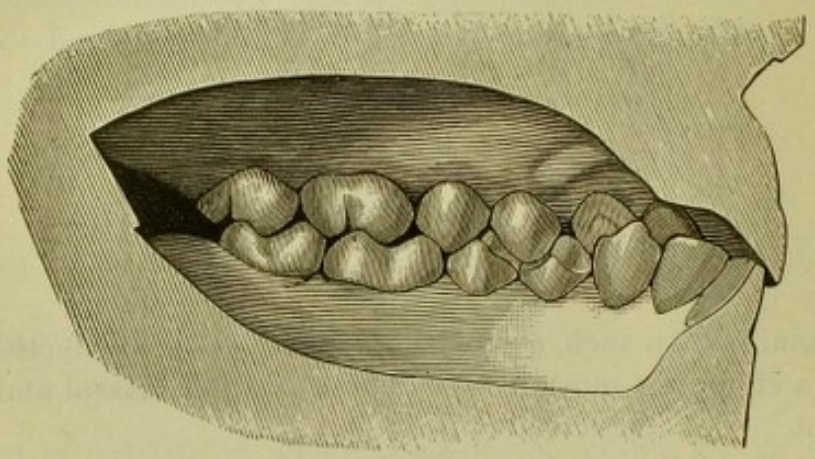


Fig. 7 shows the curved lines so much out of relation that there are *no* general planes of articulation. The striking of the points of the cusps of the second and third molars prevents what otherwise would be a *perfect* articulation of the bicuspids and first molars, and *vice versa*. We sometimes find patients with this condition doing most of their eating with the front teeth, for otherwise mastication

is merely a punching of the food upon perhaps not more than one-half of the first plane of articulation. A few prominent cusps strike and throw all the articulating surfaces out of gear. This result is very easily produced by the free use of the file.

Fig. 8.



In Figs. 4 and 5 the articulation is shown as it appears exteriorly, but that plan only allows one to see the outer row of cusps of the upper teeth projecting somewhat over the lower teeth, with the points of the cusps directly opposite the divisions between the corresponding lower teeth. If all the four rows of cusps on one side were thus related to each other, there would be a tendency of the teeth to be forced apart by the wedge-shaped cusps driving into the opposite depressions, deepest at the points of division of the arches into separate teeth.

Fig. 9.

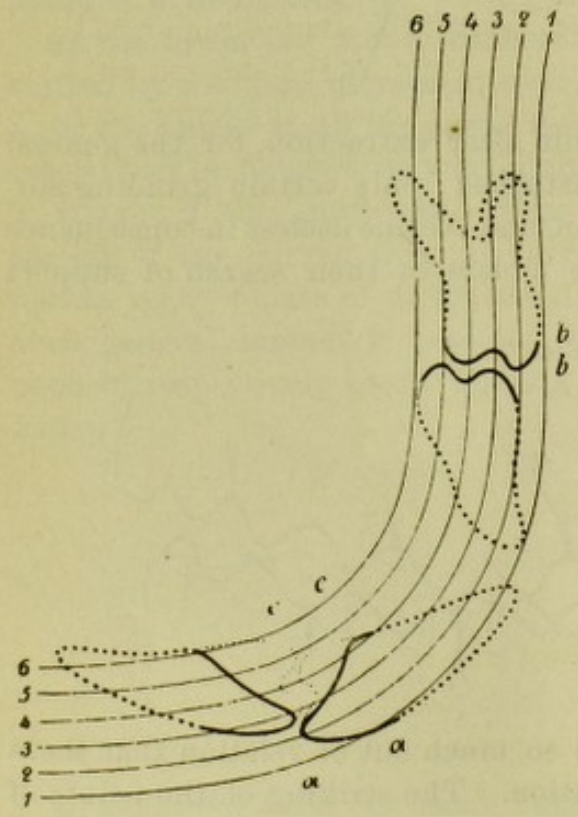
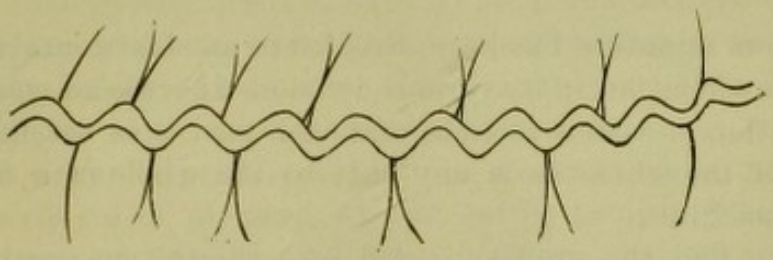


Fig. 8 illustrates a case of this sort, where the teeth, which in most other respects are superbly arranged and articulated, have been driven forward and apart, and the arches broken by the wedging articulation. As the continuity of the arches is normally preserved to a very great degree by the articulation, and as the manner of its preservation is of great practical importance to us, you are referred to Figs. 10 and 11, which represent vertical sections through both arches, on the lines 3 and 4 of Fig. 9.

Fig. 9 is a series of curved lines supposed to be drawn at the level of the articulation between the upper and lower teeth of one side of the mouth. On these lines are indicated the relative positions of the molar cusps and groove, *b b*, and also the relative positions of the edges of the incisors, *a a*. The roots of the teeth, in dotted outline, are supposed to project above or penetrate below the contact level. The small dotted lines, *c c*, indicate the outline of the suppressed inner cusps of incisors and cuspids.

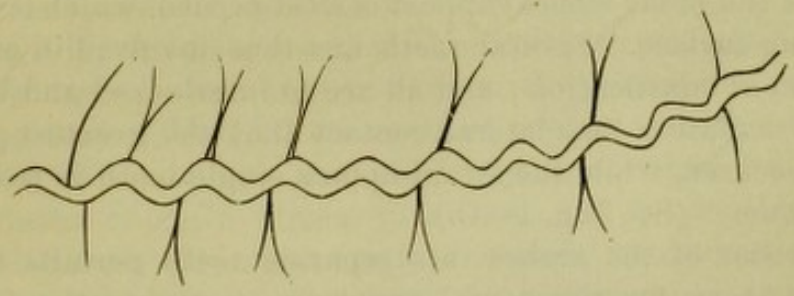
A vertical section of the two arches made upon the line 3—3 would pass through the bottom of the groove between the outer and inner cusps of the upper molars and bicuspids, and through the apices of the outer cusps of the lower molars, bicuspids, and cuspid, and the edges of the incisors, and would appear as in Fig. 10.

Fig. 10.



In Fig. 10 we see that the divisions of the *lower* arch into separate teeth begin at the *bottom of the curves*, just the same as do those represented by Figs. 4 and 5, but the divisions in the *upper* arch are at points on the curved line about *midway between the greatest depth of the concavities and the point of the cusps.* The evident effect of this arrangement is, that the outer cusp of the second lower bicuspid and

Fig. 11.



the anterior outer cusp of the lower molars strike beyond the division between the upper teeth, and into the little depression formed by the rim or ridge situated at the posterior border of the grinding surfaces of upper molars and bicuspids.

A section on the line 4 of Fig. 9 would give Fig. 11, where we have almost exactly a reversal of the same conditions described in Fig. 10. This double crossing of the lines of division of the arches by the articulating teeth, as indicated by Figs. 10 and 11, is in one effect to *bind the teeth into firmer contact* in the arch.

Finally, the general arrangement of the surface inclines throughout the mouth is such as to permit antagonism of the teeth over from about three-fifths to the entire extent of the dental arches, on every plane of articulation (excepting for the first part of the cutting motion), and to afford the greatest amount of contact surface for the attrition of food.

One appreciates the beauty of the general relation of the articulating surfaces as one notes the effects of wear upon the teeth. For example, as the cusps wear down the lower jaw moves forward, and the inner surfaces of the upper incisors become thinner and thinner. When the flat surfaces of the molars alone remain, the cutting edges of the incisors, which projected over the lower teeth, have also been worn away, and we have the characteristic grinding surface called "double teeth" all around.

So far our attention has been directed to an ideal dental apparatus taken as a whole, but in its various divisions there is an equal beauty of adaptation of means to ends, and each part is as essential to the working of the whole as is any part to the whole of a finely-constructed machine.

First, we find the arches divided into thirty-two portions, each portion a tooth, having that form, size, and strength best adapted to its special office in the completed arch. Each tooth forms with the jaw a compound lever, intended to transmit its proportionate amount of force from the masticatory muscles to the object in contact with its grinding surface, the fulcrum being at the dento-maxillary articulation. The free end of each tooth antagonizes with two teeth of the opposite arch, while it is supported laterally by contact with its fellows, at the point where support is most needed, which is near the articulating surface. Several teeth are thus involved in every important act of mastication; and all are so interlocked and bound in by the articulation and lateral contact that the greatest grinding power is secured, while the strain upon a single tooth is reduced to the minimum. (See Fig. 1—C.)

The division of the arches into separate teeth permits the elasticity necessary for the dental apparatus, lessening the danger of shocks and accidents; but its principal object seems to be to allow the slight movement essential for the accommodation of the irregular-shaped masticating surfaces to hard substances in process of reduction. This elasticity is rendered more positive by the inclination of the axes of the teeth, instead of their being stubbornly fixed in a vertical position. (See Fig. 2—I.)

The inclination of the teeth in one portion of the arch is exactly compensated by an opposite inclination at another portion, or else

by the inclination of the antagonizing teeth, and so tends to preserve the general form of the arch. Thus, we find that the upper molars are inclined outward, the lower molars inward, and the lower cuspids outward. All the teeth are inclined forward just sufficiently to overcome the opposite forces exerted by the orbicular and buccinator muscles.

When we examine the structure of the teeth we find nature not less wise. The hard, resisting, non-sensitive enamel exists not only on articulating surfaces, but covers the entire crown down to the gum attachments, as though intended as a barrier against those corroding agents whose greatest havoc is upon the more highly-organized substructure of the teeth.

Attention is invited to these facts, as they have a bearing upon some of the dental practices of to-day.

While analogy teaches that nature's form and arrangement of the dental organs are those best fitted to preserve them, evolved as these organs were under the general law of adaptation according to the need, it is true that diseases have appeared which oftentimes have overcome nature's provisions; but as we have only just begun to learn the causes of diseases, we can hardly jump to the conclusion that man has so changed all of his conditions that nature is disposing of his dental organs, nor can we suppose that he would be better adapted to his present conditions by extraction of teeth, or by so filing the teeth as to secure for them isolation and such a conical form as was necessary during his reptilian stage of evolution. This position is strengthened by practical experience and observation, which prove not only the wisdom shown in the form and arrangement of the dental organs, but that this form is to-day the best form known in which to preserve the teeth and their usefulness.

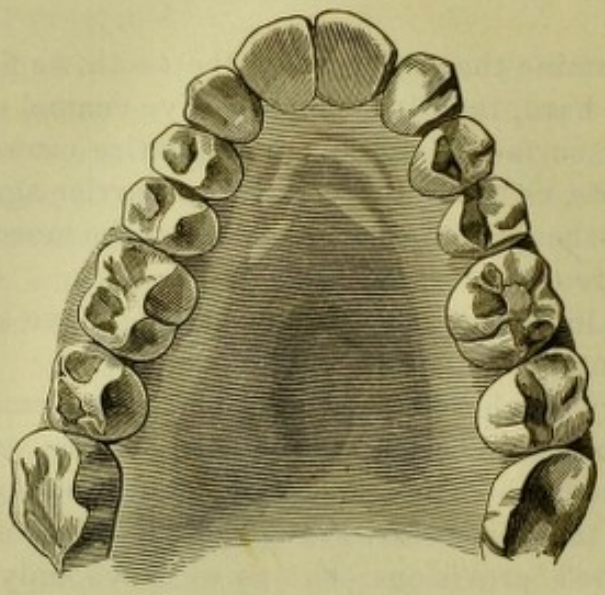
While it is not pretended that the teeth can usually be saved by any easy method, and without care on the part of the patient, yet, notwithstanding the old doctrine that "contact is always dangerous," I am fully of the opinion that they may be more easily saved by the preservation of their normal functions; and to do this we must imitate the form of perfect teeth, and their manner of support by *firm contact* with one another, however "dangerous" that may *seem* to be.

Extractions Considered.

If any *one* tooth be extracted from the above described ideal dental arches, with their *perfect articulation* (excepting this *one* be from among the six lower front teeth), there will occur no important change in the position of the other teeth: the space will remain nearly the same, as the remaining teeth will be held in position by occlusion with the teeth of the opposite jaw.

If one of the *lower incisors* is lost, contact will again be secured by flattening of the lower arch, with the appearance of over-prominence of the upper front teeth; or, the entire lower arch will, be-

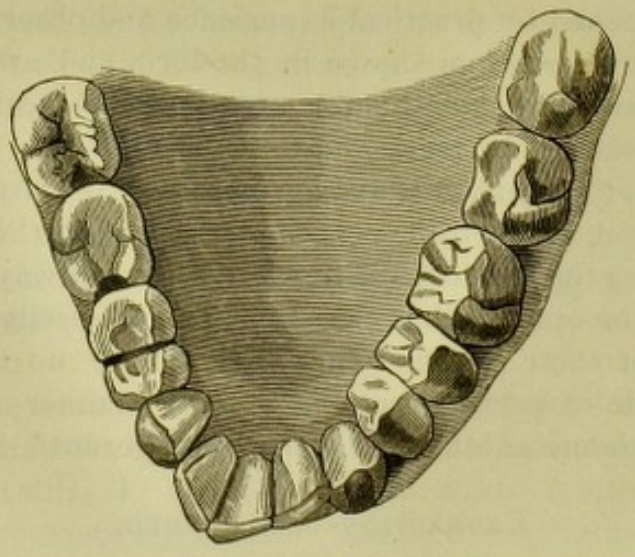
Fig. 12—E.



Superior Arch. Lateral incisors lost.

cause of loss of central support, drop inward and become narrower. This will be accompanied by a similar narrowing of the upper arch, and the forcing forward of the upper incisors and cuspids.

Fig. 12—F.



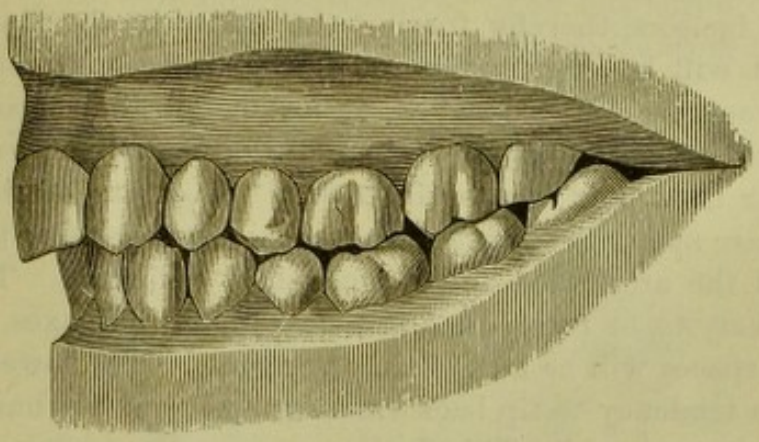
Inferior Arch. Left lateral incisor and right first molar lost. Arch still overcrowded; only one space exists, and that, a filed one between the bicuspids, is held open by the upper teeth.

The contraction of the lower arch in Fig. 12—F is a typical illustration of what may follow the extraction of a lower incisor.

The upper arch, Fig. 12—E, is also contracted, no doubt partly because of the contraction of the lower arch,—while an excessive

projection of the upper front teeth has been prevented, owing to the loss of the superior lateral incisors.

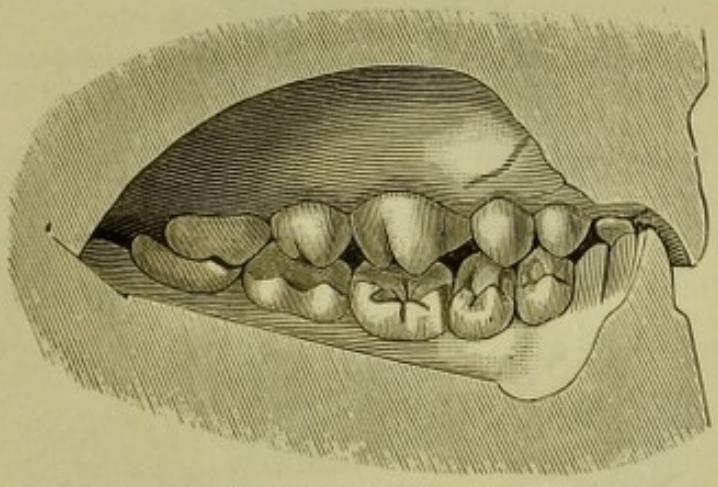
FIG. 12—G.



Profile, Left Side, Exterior View.

Exteriorly the articulation appears good (Fig. 12—G), excepting for the "jumped bite,"—*i. e.*, when the lower teeth strike one cusp too far back of their normal position.

FIG. 12—H.



Profile, Left Side, Interior View.

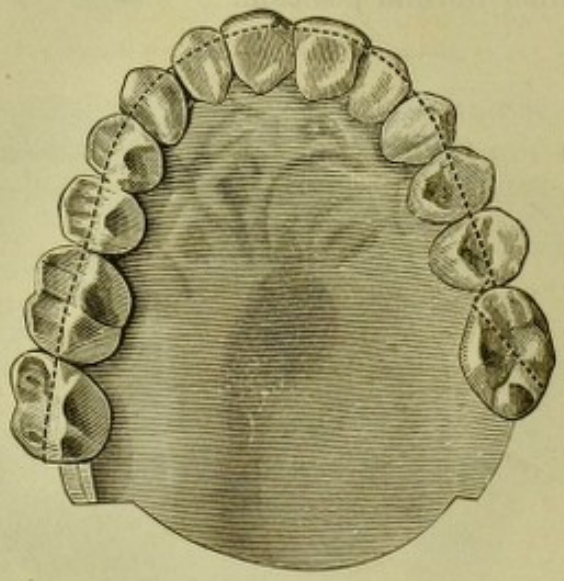
The same seen from the inside of the mouth, as in Fig. 12—H, shows how the inward tipping of the teeth has separated their grinding surfaces, rendering mastication impossible for that side of the mouth. (See Fig. 2—II, and compare Fig. 12—H with Fig. 1—C, and Fig. 8.)

But now let us suppose a more common case, viz., that of the extraction of all the first molars from the same ideal mouth. What happens will vary much according to the time at which it is done.

The extraction of the first molars at any time previous to the appearance of the second molars is the removal of at least one-half and often a much greater proportion of the entire grinding surface

of the teeth, and the health of the little patient may be undermined from inability to properly chew its food. If the first molars are lost before the eruption of the bicuspids, the bite will be shortened, and the lower incisors will drive harder than normal against the upper incisors, thereby forcing the latter forward and apart. This result will be greatly favored if the deciduous molars, as is often the case, are badly decayed, or lost before their proper time. The bicuspids finally come down in a straggling sort of way, generally too far back, and too far in toward the cavity of the mouth. The teeth are apt to get caught in these false positions by the articulation, and the arches are left permanently deformed. The bicuspids are likely to be rotated more or less upon their axes, and here and there spaces will be held open during life. The lower incisors will have a tendency to tip backward, owing to the too hard driving against the upper teeth. This finally causes a sharp angle, and overcrowding in the lower cuspid region. Therefore, extraction at this time is likely to cause contraction of both arches, over-projection of

FIG. 13—I.



Upper Teeth in contact all around. Dotted line shows deviation from normal li ne of contact.

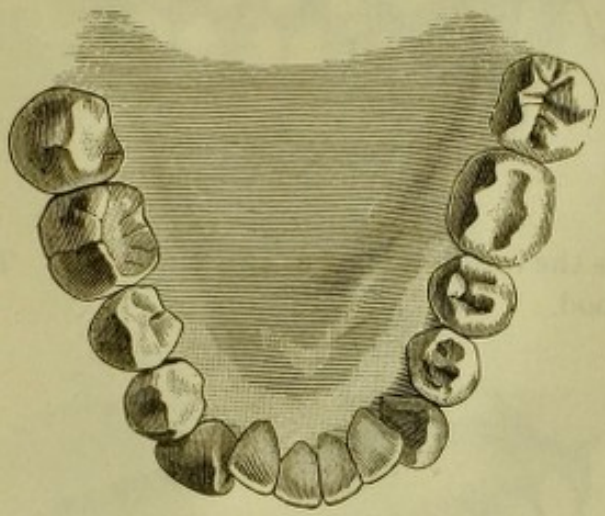
the upper front teeth, flattening of the lower incisors, and irregularity in the lower cuspid regions. The second molars will touch the bicuspids, and soon all spaces will close up where not prevented by a faulty articulation. The molars may *appear* to articulate fairly when viewed from the outside.

In some cases of great overcrowding with irregularities, it seems as though more was gained by this early extraction than if it were done later; but we must remember that time during the period of development is a great regulator of teeth; so it becomes a question whether we accomplish more even in the most favorable case than to contract the arch and do other harm.

Figs. 13—I—J—K—L—M—N are taken from the mouth of a patient about eighteen years of age. The *first* molars of the *left side only* were lost at nine years of age. The lower wisdom-tooth of the same side is the only one yet erupted. The left side of the face is much flattened, causing a lack of symmetry amounting to a serious deformity.

Fig. 13—I shows the teeth of the upper arch, all in contact. The

Fig. 13—J.

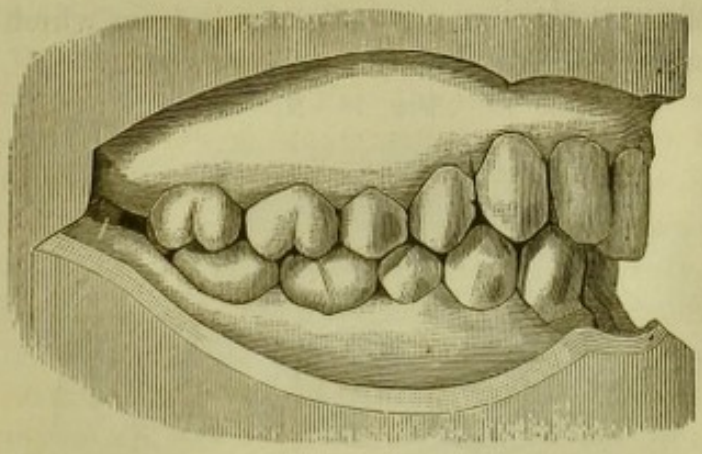


Lower Arch—badly illustrated. The teeth on the left side of the engraving—which corresponds to the right side of the mouth—appear tipped inward, whereas they ought to be normally erect.

left side is contracted, and the second molar has turned on its axis during its forward movement, as indicated by the dotted line.

Fig. 13—J shows the lower arch much contracted on the right side, and the wisdom-tooth in position. (The right side of the cut corres-

Fig. 13—K.

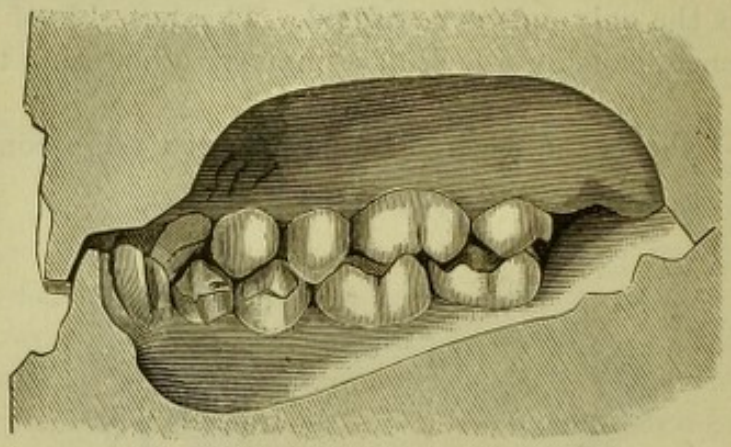


Right Side. Exterior View.

ponds to the left side of the mouth.) The spaces are almost entirely closed, yet the front teeth are evidently crowded just the same as they were before extraction of the molars.

Fig. 13—K shows the articulation (exterior view) of the right side of the mouth.

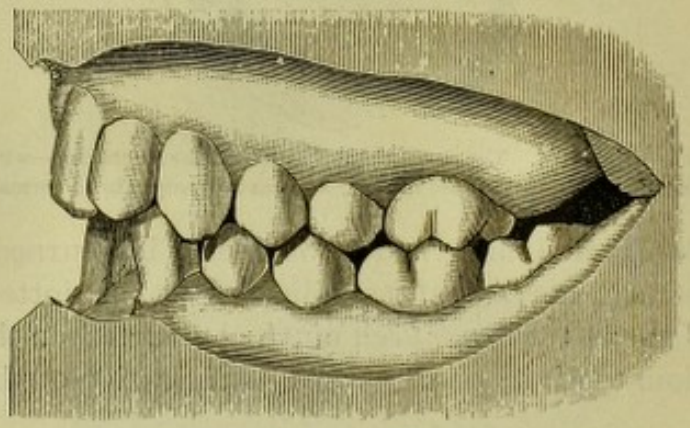
Fig. 13—L.



Right Side. Interior View.

Fig. 13—L is the interior view of the same side. The articulation is unusually good.

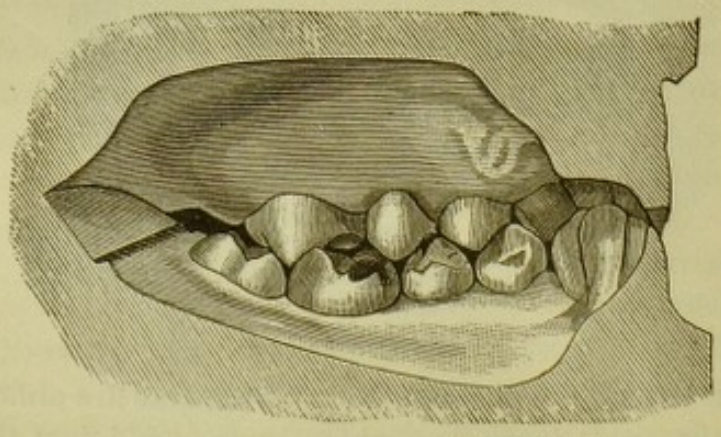
Fig. 13—M.



Left Side. Exterior View.

Fig. 13—M is an exterior view of the side from which the extractions were practiced. Articulation *appears* good.

Fig. 13—N.



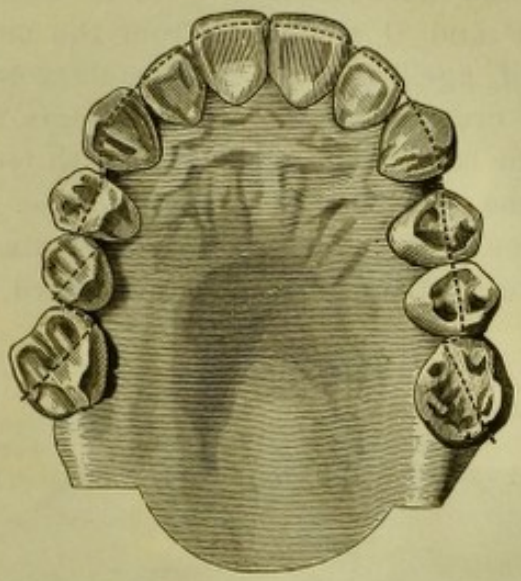
Left Side. Interior View.

Fig. 13—N is an interior view of the case last described, and

shows that most of the grinding surface of the second molar is lost. Compare the articulation of N with L, and see how inferior it is, even with its wisdom-tooth in position, whereas neither is present in L.

If the first molars are extracted at about the time of the appearance of the second molars (the lower perhaps a few months earlier than the upper), probably the least injury will be done. At first the *bicuspids, if well formed and articulated, will drop back together*, leaving a space back of the cuspids; but if not well articulated, they, too, may separate a little. (See Fig. 14—O.) The second molars

FIG. 14—O.



Upper Teeth. Spaces all closed excepting those next to the eye-teeth. Dotted line shows the amount of rotation of certain teeth.

soon touch the bicuspids, sometimes without much forward tipping, and the articulation from the outside appears good, and the case is considered a success. But if you will examine the articulation from the inside, you will usually find that the inner rows of cusps do not articulate at all. (See Figs. 14—Q and 15—S and T.) This is not surprising when we reflect that after the arch is broken its sides contract; and this means that the molars have leaned in a little more toward the cavity of the mouth, causing the inner rows of cusps to separate, while the outer rows remain in contact. (See Figs. 12—G and H.) Any little dropping back and apart of bicuspids and cuspids will be overcome in a few years (if the arch were normal), either by a return to their former positions, or by narrowing and flattening of the anterior portion of the arches, and will end in contact all around.

This I believe to be the best possible result after such extractions, it being nearest to that of nature's unbroken arch.

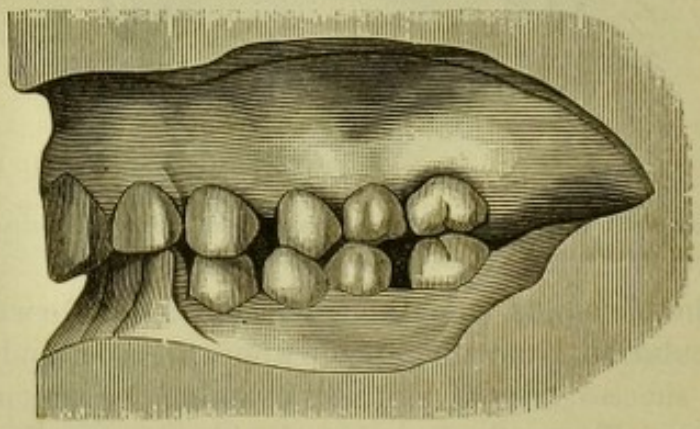
Unsupported teeth are sure to move till support is secured by contact or by a friendly articulation. Secondary contact, although never so good as primary, is the best we can hope for after unnatural spaces have been made in the dental arch, for the gum is again protected and the teeth supported.

The upper molars always rotate during their forward movement, the buccal portions moving fastest (see Fig. 13—I and Fig. 14—O), causing the new articulation to become a mere hit or miss (mostly miss), owing to the changed relation of the natural planes of articulation. This cannot be otherwise, when the principal grinding surfaces have been removed, leaving bicuspids to antagonize with second molars and cusps and indentations twisted out of their just relation.

Figs. 14—O—P and Q are taken from the mouth of a person eighteen years of age. All the first molars were extracted at about the time of eruption of the second molars.

Fig. 14—O is the contracted upper arch with teeth all in contact, excepting that the eye-teeth still stand alone. The dotted line shows the deviation from the normal line of contact, and how much the molars have rotated thus far in their forward movement.

Fig. 14—P.



Left Side. Exterior View.

In Fig. 14—P we see the upper second molars in contact with the bicuspids, and their articulation with the lower molars *appears* to be good. The lower molar, as is usually the case, has been slower to close up to the bicuspid, but by the time the wisdom-tooth has erupted all spaces will doubtless be closed. If a space ever existed between the upper bicuspids, it has been closed by the bracing contact of the upper second molar; while a corresponding space between the lower bicuspids must have been closed by the articulation with the upper second bicuspid.

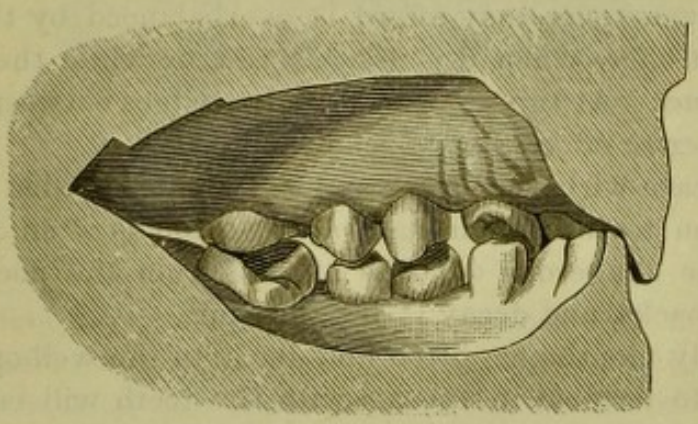
Fig. 14—Q, a view from the inside, shows how bad the articulation really is. This condition will be still worse, owing to the further

tipping of the molars, which must occur before the remaining spaces are closed, and the arches find a position of equilibrium.

Never after the eruption of the second molars can extraction of first molars be considered other than a misfortune.

After the first molars have been extracted the enormous strain of mastication is brought to bear upon the unsupported second molars, whose yielding sockets allow them to tip till they touch the bicuspids. The time required for this result varies from a year or two in young

FIG. 14—Q.



Left Side. Interior View.

persons to several years, after late extractions of strongly-set teeth.

The upper molars rotate upon their axes and tip forward till the outer corner of the second molar touches the middle of the distal surface of the bicuspid, while the anterior approximal surfaces of the third molars rest in the concavity of the distal surface of the neck of the second molars. The articulating surfaces of each, reduced to one or two points, do not permit of any proper grinding movement. During the time occupied by the closure of the spaces mastication has been difficult, for added to the defective grinding surfaces is the great discomfort caused by the irritation of the gums by hard substances, and by the strain upon the sockets of unsupported teeth. The changed relations of the second and third molars renders their cleansing difficult, and when decay occurs, as often happens, it is most difficult to treat, especially when it appears in the mesial surfaces of the third molars.

After late extractions the teeth are often found so braced in their manner of contact, and so much tighter than they ever are when in their natural positions, that it is difficult to pass even fine waxed silk between them.

If the author of the expression that "contact is always dangerous" made his study and observation upon such cases as this, there was a show of reason for his conclusions. But the fact is that the

cause of recurring decay in such mouths is not *contact*, but the *changed relations of the teeth*, which, besides impairing their functions, *renders cleanliness extremely difficult* if not impossible.

But why extract at all? For, as is shown above, besides the loss of important organs, we shorten the bite, contract the mouth, disturb the facial expression, and secure at last an arrangement of the teeth less favorable for their preservation than existed at first.

It is not denied that in some cases decay is lessened between certain teeth during a part of the time that the spaces exist after extraction; yet I am inclined to think that the temporary advantage which any given space may afford is overbalanced by the greater danger that it offers when it is *nearly closed*, or while the teeth are *loosely in contact*. At this time food easily wedges between the teeth and requires *extra* efforts for its removal.

The same care with the brush and silk that is needed to prevent decay between teeth in their natural condition is often insufficient to remove the dangerous deposits of food from the pockets about the exposed necks, and decay is apt to occur.

In uncleanly mouths we often find decay in the well-open spaces, for food left to ferment in contact with the teeth will cause decay as soon upon surfaces not in contact as it will between those that are in contact, and even *sooner* if quantity of fermentable products is a factor in the problem. Now, if extraction were practiced to *prevent contact*, it is a failure, for there has been contact all the time between *many of the teeth*, and finally we have it between all. The few spaces that were secured—say between bicuspids and cuspids—only existed for a time, and perhaps fortunately if the patient were not cleanly.

Really there seems to be but one excuse for the extraction of the first molars: If their structure were so bad that they were sure to be lost later in life, we have done well in choosing a time for their extraction when the spaces will close with the least tipping of the teeth, and with the least derangement of the grinding surfaces.

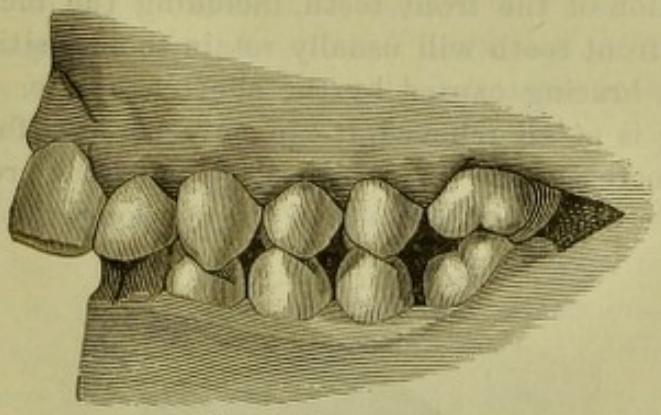
I will leave for a moment our typical denture, to which until now we have mostly confined our studies, to incidentally speak of one deformity, hoping to more clearly elucidate certain principles which ought always to be borne in mind whenever irregularities are to be treated by the extraction of teeth. I refer to those cases of marked forward bracing of the anterior teeth where the lower incisors strike the necks of the upper incisors, forcing them horizontally forward.

While I will thank the man who will show me how to treat this condition, I pity the patient who has been subjected to the loss of all his first molars, or, worse yet, to the loss of the first *lower* molars

only. The bite is shortened by this treatment, and the lower incisors drive harder against the upper gums, and the ugly protrusion of the upper teeth grows worse.

This condition is illustrated by Figs. 15—R—S and T.

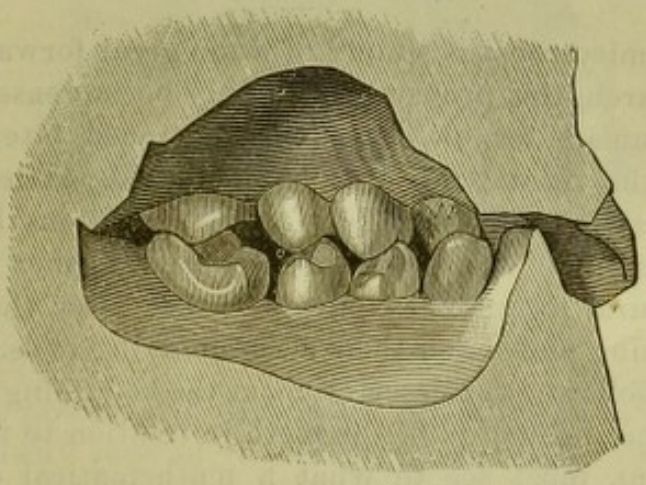
Fig. 15—R.



Left Side. Exterior View.

The patient, now fourteen years of age, lost his first molars at the age of eight or nine years. At present the lower teeth strike the gums just back of the upper incisors, while the latter have been forced forward as seen in Fig. 15—R, which is an exterior view, and shows how nearly the spaces of the left side are closed up.

Fig. 15—S.



Left Side. Interior View.

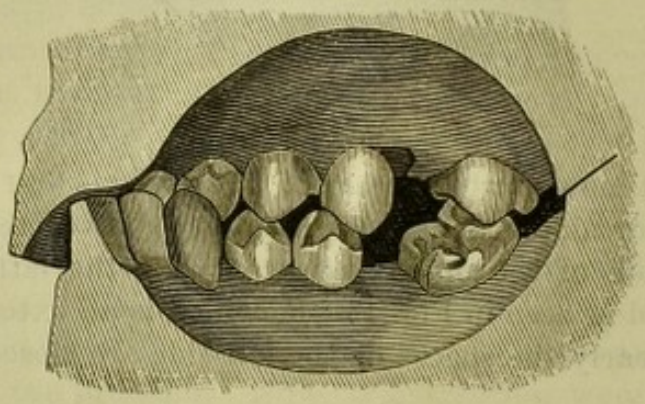
Fig. 15—S is an interior view of the last described. It shows the tipping of the molars and the bad articulation, and also the lower incisors striking the upper gums.

The spaces of the right side (Fig. 15—T) are not so nearly closed as they are on the opposite side, because the moving up of the molars has been arrested by the presence of the anterior buccal root of the first upper molar. In this case the lower arch has unfortu-

nately been still further diminished by the extraction of an incisor, and where the articulation will finally find its equilibrium is difficult to predict.

We need not hope to improve deformities at the front of the mouth by the extraction of the first molars, when there is a marked forward inclination of the front teeth, including the bicuspids. The overcrowded front teeth will usually retain their position, owing to the increased bracing caused by the shortened bite. But if such overcrowding is at all relieved, it can only be by a forward movement which increases the forward projection of the arches, and the production of a deformity worse than the one sought to be corrected.

Fig. 15—T.



Right Side. Interior View.

If the deformity consists simply of a too great forward projection of the upper arch, this projection will only be increased by the loss of the first molars, for owing to the shortened bite the forward strain upon the front teeth will be increased. After such teeth have been drawn back into their desired positions by the use of appliances they will drop forward into their former positions, because the natural forces will continue to act after the patient has tired of retaining plates and their accompanying evils.

Those who followed the description, at the beginning of this paper, of the form and inclination of the teeth in relation to the forces acting upon them, must see to what a mathematical certainty the matter is reduced. So, if one takes the trouble to acquaint himself with a given case, he may safely predict what form the arch will take after certain extractions shall be practiced.

One hardly needs to consider the results of extraction of any other than the *first molars*, since these teeth have been made to bear the penalty of most dental sins, as well as sins of dentists.

The wisdom-teeth, if of bad structure and in an overcrowded jaw, are often better lost, but the bicuspids *never*, if dental art can save

them through life, excepting possibly for the correction of certain deformities.

If the second molar ever need be lost, it should always be before the eruption of the third molar, in order that the latter may come into place with as little tipping as possible.

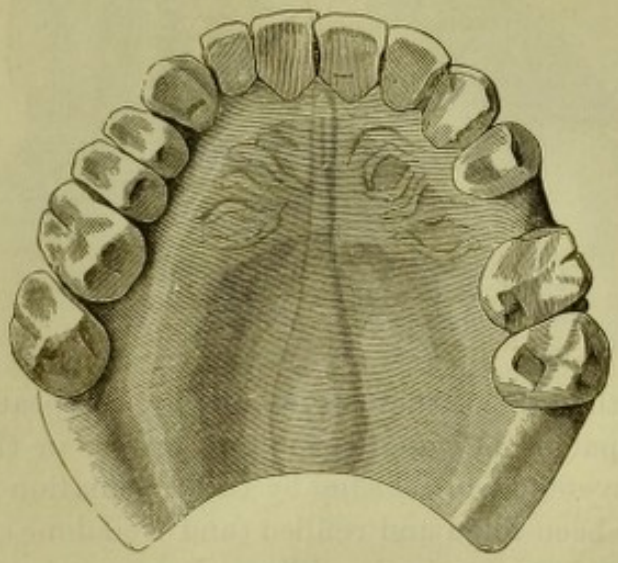
While admitting the value of extraction as a means of correction of certain irregularities of the teeth, I am forced to believe that far more irregularities have been *caused* by extractions than could ever have been *corrected by extraction.*

Filing Considered.

What has been said of the tendency of the teeth to change their places, after the breaking of the arch by extractions, may equally apply where spaces have been made by the use of the file; but for several reasons this last plan of securing *temporary* spaces is more disastrous in its results than is that of certain extractions.

Some of the immediate consequences of filing are bad enough to

Fig. 16—U.



condemn the practice, in my opinion (if I were to be the subject, and I have been), such as the diminishing of the grinding surfaces, lessening the force of mastication by the removal of lateral support, and permitting an unnatural strain upon the sockets of adjoining teeth; but more evident and annoying is the pain caused by the exposure of the terminal dentinal fibrils, and by the crowding of food into the spaces and against the gums.

A single filed space in a well-articulated arch is likely to remain through life.

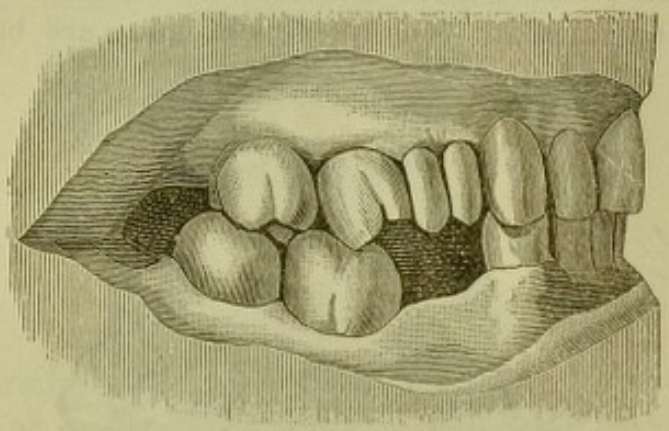
At first such a space is cleansed without difficulty, but constant crowding against the gums causes their recession, and a little pocket

is thus formed, in which food is apt always to remain, although it may be *called* a "self-cleansing space," and sooner or later new decay begins at that point, and is most painful and difficult to treat. Restoration of contour at this stage is not easy, yet patients gladly submit to it that they may be rid of an unnecessary nuisance.

When many filed spaces have been made in the arch the teeth move up until they are again in contact, just as they do after extractions, unless prevented by a faulty articulation. (See Figs. 16 and 17.)

The new contact, instead of occupying the smallest extent of the convexity of the thickest and most perfect portion of the enamel, with the space at the gum washed by the fluids of the mouth, is at or near the gum, where the enamel is thinnest, or perhaps has been filed away, leaving the dentine exposed.

FIG. 16—V.



Figs. 16—U and V illustrate a case after extensive filing has been practiced. Although all the teeth have been repeatedly filed and cut to make spaces, only one space now exists in the upper arch, and that is prevented from closing by the articulation; and although the teeth have been filled and refilled (and well done), in all but two spaces in the upper teeth the fillings have again required to be renewed or repaired, and the teeth are by no means of the poorest quality.

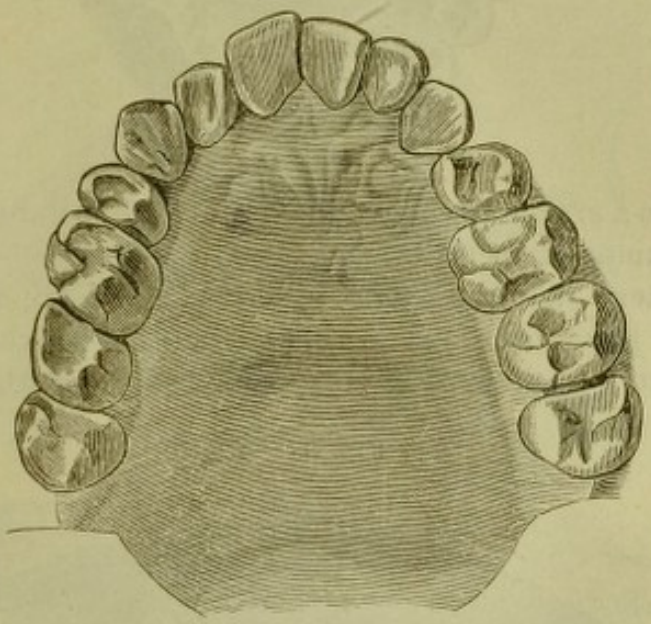
Spaces are sometimes made on the lingual side opening towards the mouth, and contact between the teeth is secured at a point toward the buccal side near the grinding surface; but the natural line of contact is a regular curve passing through the center of the articulating surfaces of each arch. (See Figs. 1—A and B.) If this line is transferred to a point passing through the outer row of cusps, the forces of the jaws will act upon the unsupported inner portions of the teeth, causing them to rotate upon the pivotal points of contact, and the broad filed surfaces of certain teeth will come flatly

together, while between others the V-shaped spaces will be opened wider.

Any plan of filing the teeth that changes the contact from the normal point will diminish the size of the arch, because each tooth occupies such a proportion of the arch that the natural points of contact are on a line passing through the greatest diameter that the teeth can possibly furnish without injuring the articulation. (See Figs. 16—U and V, and Figs. 17—W—X and Y.)

The system of filing the teeth presupposes that the spaces will be self-cleansing, and therefore the dentist is apt not to instruct the patient either in the need or in the special ways of securing their perfect cleanliness. In the long run filed teeth require more care on the part of the patient to preserve them than do teeth in normal contact. Food is sure to wedge between them, and is often dislodged

Fig. 17—W.



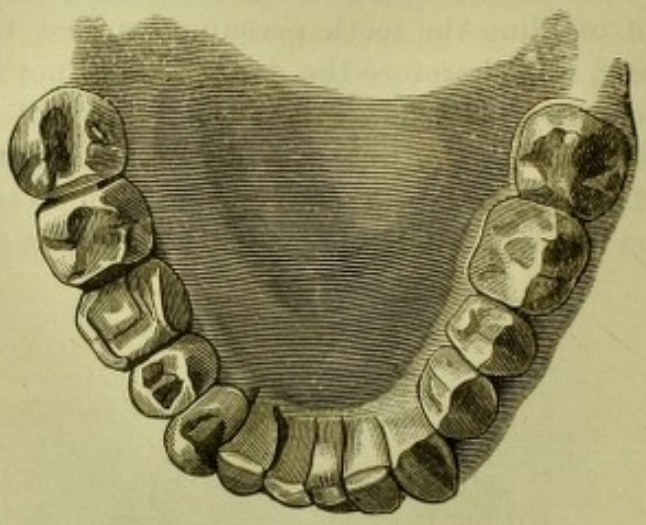
with difficulty. The filed surfaces are less capable of resisting corrosive agents, and failure to secure absolute cleanliness soon results in decay.

Caries is likely to appear and reappear at the gum-margin of the fillings, each time lower than the last. If a point of contact had been secured at or near the gum-line, it is lost by the undermining decay, and the teeth move up and transfer the point of contact perhaps far below the gum, and this in turn is destroyed by new decay.

After repeated slicing with the file for the renewal of fillings, it becomes impossible to secure adequate anchorages without endangering the pulp; or the pulp may be exposed by decay at the thin sensitive

neck, and at last must be destroyed. Weakened by decay, by filing, and the cutting away necessary for root-treatment, and robbed of their support, the teeth break down under the ever-increasing strain brought upon them. Extraction affords about the first relief to such patients, and artificial dentures are a boon to those who have been compelled for years to painfully hobble through their meals

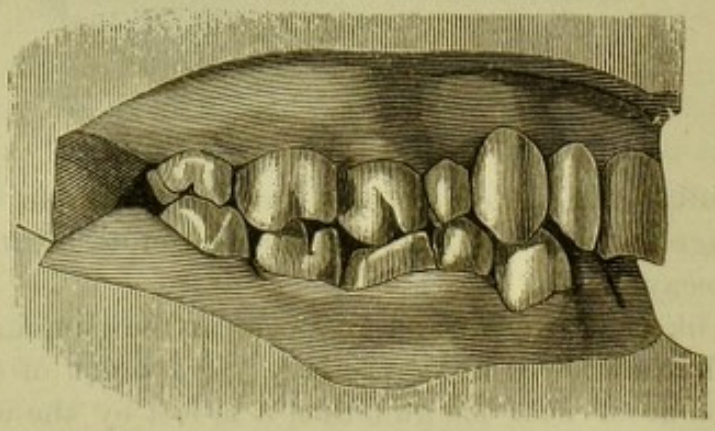
Fig. 17—X.



without even a crutch to relieve the irritated gums and the mutilated sensitive stumps of teeth.

Some pretend that the results described above are only true when separations have been made solely for the convenience of the operator, but if that is true it speaks badly for the honesty and

Fig. 17—Y.



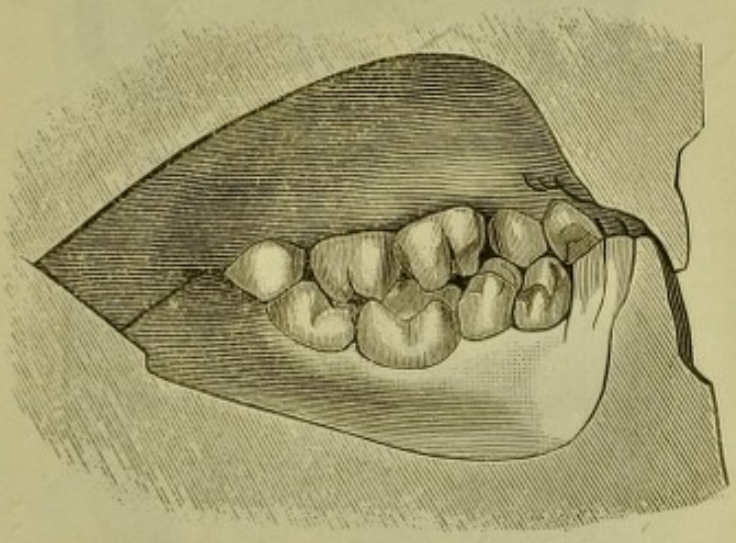
ability of the mass of those who have been or are practicing this method. As for the large proportion of cases I have seen, the above statement would be applicable,—the degree varying only as regards the time that has elasped since the filing was done. I therefore prefer to believe the fault to be in the method.

Figs. 17—W—X—Y and Z need no explanation. They represent a dental wreck. There is contact everywhere of the worst sort. The patient is a martyr to a false theory.

I have seen cases of filing done by men of great skill and ability; men well versed in the supposed foundations of the system; who have striven earnestly and long, and *saved* the teeth, yet I should consider their results as failures. The teeth were saved, but their usefulness was destroyed.

Teeth unable to properly masticate the food better be substituted or supplemented by a well-constructed appliance. The millennium is not hastened by dinners goaded on by tooth-picks and fluids to an overworked stomach. When the medical profession learns more of the causes of dyspepsia in America, an uncomfortable fact may be laid at the door of the dental practitioners.

Fig. 17—Z.

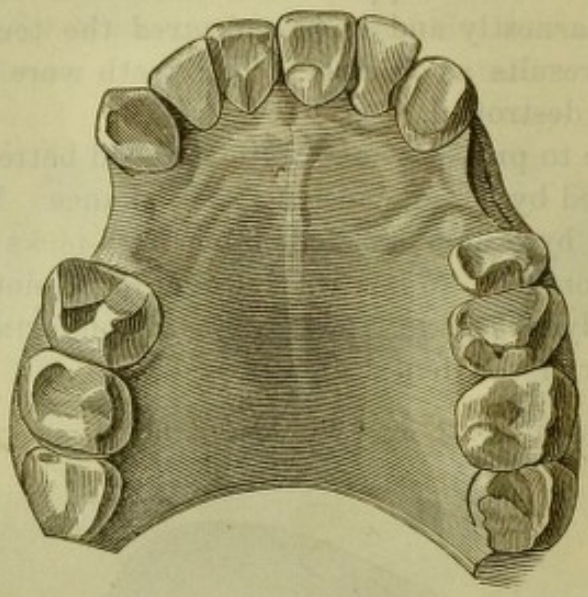


After a time teeth extensively filed cease their wandering and assume a fixed position, and then *tight contact between the teeth will be the rule;* but here and there a permanent space may be left, and that without any apparent reason, unless both arches are looked at as a whole when in articulation; but when so considered they will be found to form one unbroken line of teeth, contact being secured sometimes upon the lower and sometimes upon the upper arch, but always made continuous by the articulation.

Figs. 18—a—b—c and d show a case after irregular extraction and general filing has been practiced. The teeth in both arches have fallen together as much as is possible. All the filed spaces have secured new contact. The spaces left by the extractions are only partly closed, because the movement of the teeth has been arrested by the articulation. The filed spaces have caused the patient great annoyance, and there has been repeated failure of the fillings. A

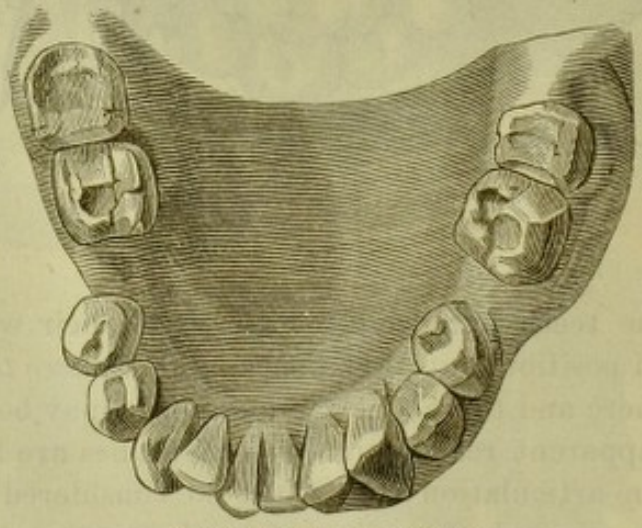
system of partial contouring is now being practiced whenever new fillings are needed, and the patient is gradually made comfortable by the knuckling of approximate surfaces at a point away from the gum.

FIG. 18—a.



Upper Teeth after Extractions and Filing.

FIG. 18—b.



Lower Teeth of Same Mouth.

While it is not usually advisable to attempt to restore the contour of all the teeth mutilated by filing, it often occurs that here and there restorations may be practiced with great benefit to the patient, relieving excessive gum-pressure or a sensitive tooth-neck.

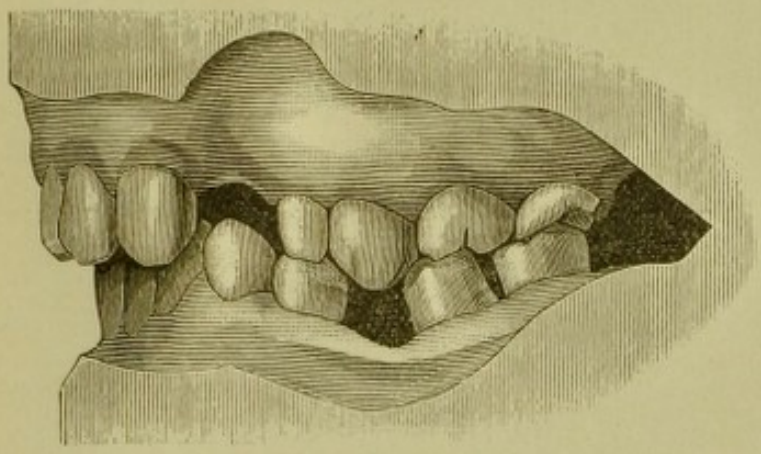
I have been begged to do this when the patient knew that it involved destruction of the pulp, and root-filling; and this, too, in one case that has been published as showing the typal advantages of free and self-cleansing spaces.

Filing of the upper incisors, in such a way as to leave a slight

point of contact near the cutting edge, has been a successful plan of treatment in some cases.

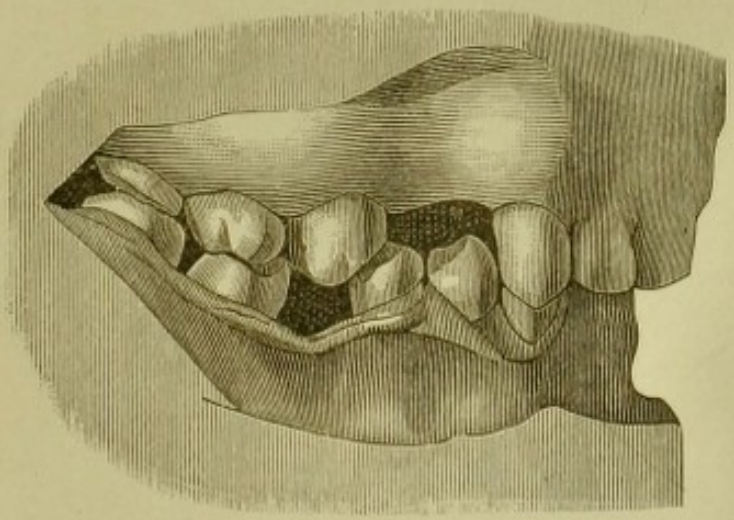
Those who still believe in the advantage of open spaces between the teeth *of their patients* may find one crumb of comfort from these studies, in the fact that if the filing is limited to the teeth of one jaw their steadfastness will be secured by the articulating teeth, and the spaces *will* remain; or they may, by skipping here and there about the mouth, make a few spaces which may be retained by the

FIG. 18—c.



Left Side.

FIG. 18—d.



Right Side.

opposing teeth; but any other plan of filing will cause disappointment, for their dreaded contact will assuredly recur.

In conclusion, I would earnestly suggest that one who is about to enter upon this method of practice should first receive instruction from the most scientific filer of teeth, and that he have made in his own mouth just one so-called "self-cleansing space," and after six months carefully observe whether he is masticating his food upon the side left in nature's form or upon the one improved by the art of man.