H W C Bödecker

A TREATISE ON

IRREGULARITIES OF THE TEETH

AND THEIR CORRECTION

INCLUDING, WITH THE AUTHOR'S PRACTICE,
OTHER CURRENT METHODS.

DESIGNED FOR PRACTITIONERS AND STUDENTS.

Illustrated with nearly 2000 Engravings.
[NOT EMBRACING THE CLASSIFICATION OF MECHANISMS IN THIRD VOLUME.]

BY

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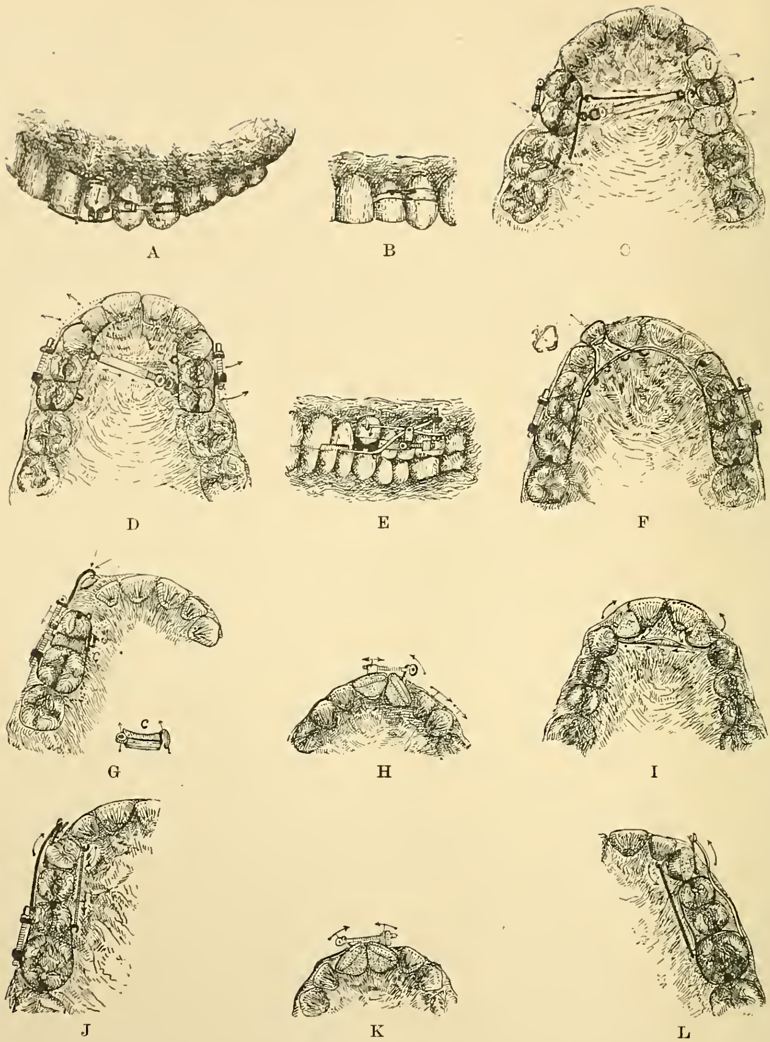

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Vol. II.

PARTS XV.–XVII.

Minor Operations.

Correction of Irregular Incisors, Cuspids, Bicuspids, and Molars, Singly or in Small Groups,

By Various Kinds of Mechanisms.

Inclined Planes, Strings, Elastic Rubber, Metallic Springs and Screws.

Historical Notes.

PREFATORY REMARKS

CONCERNING PARTS XV., XVI., XVII.

THE ORDER AND CLASSIFICATION.

(CASES.)

IN the first fourteen parts of this treatise are given a comprehensive consideration of Irregularities of the Teeth and the *theory* of their correction, including the *principles* of mechanisms that are necessary for carrying out operations. In the following three parts (XV., XVI., XVII., which are devoted to cases) the application of these theories and principles to practice may be found. It was originally intended to include in this volume Parts XVIII. and XIX. (also devoted to cases); but finding that the book would be too large for convenience, these parts were reserved to be included in Vol. 3 (cases, esthetics, and notes upon various points). The opening of each of the parts here given, as well as the beginning paragraphs of nearly all the chapters, gives the reader an outline of that which is to follow. Some of these remarks are upon etiological phases not presented in previous parts and chapters, and some are upon points that were omitted in order to present them here to show more clearly the application of the principles presented in the first fourteen parts. In other words the aim has been to aid in the advance of this branch of dentistry by so clearly explaining the most important steps in operations, that the reader will have little or no difficulty in understanding the entire processes.

From Working Notes.—These parts, like the preceding parts, are the reproduction of a mass of classified notes covering a practice of about a quarter of a century. These notes upon operations, and the mechanisms used, were kept upon sheets of legal cap paper, and afterward classified under appropriate heads.

Many of the operations are explained in detail, but there are a considerable number which, for lack of time, were not recorded in detail, and consequently but little more than brief minutes, accompanied with pictorial sketches of the principal stages, are given.

In the not long ago past the claim of successful correction of irregular teeth was regarded with suspicion. Indeed so strong was this suspicion that operators felt it to be necessary to have witnesses and documentary evidences to cause belief; but now the doubting class is small and embraces only the ignorant and the envious. Dentists who are alert to all that is going on in the profession know very well the possibilities of the expert regulator of teeth, and are anxious to know the best plans and best mechanisms for accomplishing the highest possibilities in the most scientific way.

Conservatism.—Throughout the treatise conservatism in everything has been the intention. By conservatism I do not mean "old fogyism." The teachings are strictly confined within scientific limits—a range which, if understood, is intended to enable the progressive student to accomplish the best results in the easiest way, with the least inconvenience to the operator and patient.

In order to present the most useful of the different phases without going into unnecessary detail, the majority of the cases have been explained in a plain, brief way, mainly showing the starting stages of the operations, with perhaps a few suggestions in regard to the alterations in the mechanisms that are requisite to meet the varying changes in the positions of the teeth during the progress of the operation. To avoid numerous repetitions of terms and phrases that would not only unnecessarily increase the size of the book, but would make it tedious and dry, the text is made terse, leaving the figures to help somewhat, by showing the principal conditions of cases and the approximate ages of the patients; when, however, the age and sex of the patient would seem to be of especial importance to the student, they are given.

Credit Given.—In these parts, as in the previous ones, great care has been given to correctly record the names of inventors and the dates of their inventions. In fact, every case here presented that was not corrected by a mechanism devised especially for it by the author has been fully credited to the operator. Besides the large number of operations explained, and the representations of a still larger number of mechanical auxiliaries used, these parts contain important information, direct and collateral, upon all the different phases of practice in vogue; indeed, this treatise may be regarded as containing more matter of this kind than all other works of the kind combined.

Effort also has been made to show in diagnosis and prognosis the distinction between that which *ought* and that which *ought not* to be attempted, and that which *can* and that which *cannot* be done, and that which is *possible* to do and that which is *best* to do. So, also, there is shown the difference between regulating machines that will accomplish the desired result (though at great inconvenience to the patient) and those that will easily and conveniently accomplish the best results in the least time consistent with safety to the teeth and sockets. This has been done to show the difference between low skill and high skill, low art and high art. These grades are mainly based upon the differences in mechanisms and their action for accomplishing the same results. There are represented many operations by those that act by continued force, and many that act by intermittent force.

In Part IV., and in Part XV., Chapter LXXI., p. 765, is explained how intermittent force, when applicable, is more easily made to accurately conform with the physiological functions of the tissues than by continued force, and why it is that the former, when properly applied, will cause little or no pain. Conversely in various places there is also explained how it is that screw-acting mechanisms are not practicable in all cases; also why mechanisms causing continued force are sometimes more practicable and less inconvenient to wear. The latter mechanisms are constructed upon all the different plans of the system, the more approved ones being constructed with a view to obtaining from elastic materials a value more nearly approximating that derived from the screw than has been obtained from elastic mechanisms made in the old-fashioned way. These are generally operated by elastic rubber, but there are several mechanisms in which the force-giving parts are metallic springs.

In Part VI. are presented the plans of different elementary sections of the mechanisms, but in Parts XV., XVI., and XVII., illustrating operations, there are presented the combination of these elements into practicable wholes, and their application to irregular teeth.

It might possibly be thought that there are more kinds of mechanisms represented than is necessary. As said in some preceding parts, the author thinks that too many practicable mechanisms cannot be represented. Especially does this seem true in regard to the screw-acting kinds. To be sure, the screw-acting class has found favor mainly among experts, but that is generally because they are somewhat difficult for the tyro to make. This tyro objection, however, will not long continue.

To fully appreciate the present status of some of these machines, it is not only necessary to understand their philosophy, but also to know something of their history, much of which is evolutionary. Some of this history, as well as some of the philosophy, is given in the main text, but further elaboration has been given in foot-notes, under their appropriate heads. For instance, historical notes on mechanisms for widening the arch are given under the head of Widening the Arch, and those upon short- and long-bands are given under the head of Operations for Correction of Anterior Teeth. The principal object of these notes is to designate the persons to whom the credit of originating the mechanisms belongs. This the author has been led to do because of the astonishing inclination shown by some writers to give credit to wrong persons.

Classification.—Throughout this original work (for it is in no sense a compilation) the aim has been to place together all similar operations, by all kinds of mechanisms. The order of classification was mainly governed by the *location* of the deformity; those in the upper arch being considered before those in the lower, and the anterior teeth before the posterior. For illustration, the upper incisors are considered first, the cuspids next, then the bicuspids, and lastly the molars. After these the teeth of the lower jaw are considered in the same order.

To further simplify the subjects and to make the treatise more convenient for reference, some of these parts are subdivided into sections and divisions designated by capital letters or figures; for instance, Section A, Division 1, etc.

To make the different parts of the treatise harmonize, the classification of all cases treated by similar mechanisms is arranged so as to correspond, so far as practicable, with the classification of the mechanisms illustrated and explained in the parts treating upon the construction of mechanisms. First, for example, are presented the cases that were corrected by plates, and then those corrected by strings and elastic rubber (alone or in combination with ferules, clamp-bands, and strips of metal), after which those corrected by wire springs in combination with various kinds of anchors, and finally those corrected by screw-acting mechanisms.[1]

To cover all, or even nearly all, the phases of the different plans of operations without embodying an enormously large number of cases has, in the past, been regarded as an impossibility. To show clearly every step in the process for the correction of all cases, repeating every detail, giving the various movements this way and that, turning, elevating, or lowering individual teeth or groups of teeth, would make a book not only confusing, but of little value to the student or the general practitioner. To overcome this difficulty, to simplify and make clear all phases of operations, the author has dissected and divided some of the more complicated cases and classified the parts. For illustration, where teeth on one side of the dental arch required turning, and those on the other side required elevating, the former have been placed under the head of

[1] Some of the operations illustrated and explained that were performed by other dentists have been incorporated because they have one or more points of merit, or because of their scientific value. The great majority, however, were treated by the author, and by other dentists under his instructions.

Turning of Teeth, and the latter under the head of Elevation of Teeth. There has, however, been presented bodily a considerable number of simple, and also complicated operations, and all kinds are profusely illustrated.

The dissection of operations and the classifying of similar parts are radical departures from the usual custom; but if by them, the problem of embracing all details, and all the different requirements necessary to success, the whole field has been made plain, the departures must be regarded as valuable. It should not, however, be inferred from the term "dissected" that the *parts* presented are in any way incomplete. Each part is in itself a complete operation, and is treated as fully as are those of a more complicated nature that embrace several parts. By this plan the reader is enabled to quickly find explained any kind of an operation without being obliged to wade through a mass of repeated details in a multitude of complicated cases. The reader is also enabled to find plans of different kinds of the best mechanisms for overcoming the same kind of deformity—a matter of importance.

Details vs. General Principles.—Some writers believe that to teach "principles" in the abstract or in a "far-off" way is sufficient. This may be true for the older practitioner, but for most students it would be vague and consequently of little benefit. The author's aim has been to make *principles plain by giving special attention to details.* He believes that there can be no clear understanding of principles except through clear knowledge of details. Without this clearness no one can be master of even a single branch; in fact, so closely related are details to general principles—and, conversely, general principles dependent upon details—that they may be regarded as one.

Useless Minutiæ.—In the explanation of cases it is customary to go to the other extreme and indulge in details that have little or no bearing upon the operations. To mention the temperament, the weight of the patient, color of the teeth, the conversation, etc., might be interesting in offhand remarks at a society meeting, but to drift into irrelevant details in a book would be tiresome and a waste of the reader's time.

In expressing thought, not only has the simplest of English been used, but brevity of style has been encouraged. Brevity, however, has not been carried so far as to make the language dry and repellent. Latin and Greek terms have never been used when English would serve as well or better. To be of lasting benefit to students, the author believes that a work should not only be *clear*, *direct*, and *assimilative*, but interesting. When "thoughts are packed" too closely, and there is in them little more than an array of dry facts without sufficient association of lubricating ideas to entice the reader on, he naturally becomes weary in their perusal.

Nomenclature.—A matter adhered to is the use of correct terms: such, for example, *widening* of the dental arch, instead of the usual incorrect term "spreading" or "expanding" the arch; *antagonism* instead of "articulation" of the teeth; *turning* instead of "twisting" a tooth; *elevation* instead of "elongation" of teeth; *screw-jack* instead of "jack-screw." In place of Latin terms "superior" and "inferior" the English terms *upper* and *lower* are used, because in English "superior" implies something better than "inferior." To "weed out" all improper terms, now so common in our professional language, may not be easy and perhaps would not be prudent, but to aid in perpetuating terms that are ridiculously wrong ought not be encouraged. By this remark it should not be inferred that no terms are retained which are not strictly proper. Our professional nomenclature is so scanty that occasional use of terms, such as "device," "appliance," and even "apparatus" for "mechanism," has been retained simply to avoid monotony of expression.

Diagnosis, Best Plan of Operation, etc.—Considerable attention has been given to the importance of starting operations upon the right path. A detailed presentation of blunders made by operators, through lack of ability, are seldom referred to and never dwelt upon. The aim has been to point out *straight* paths to success, and *not* the crooked and roundabout ones, though they may have finally led to success. As is well known, the most essential requisites to success are correct diagnoses and correct plans of work. The importance of knowing the causes, and beginning an operation on the right line, and not starting until that line has been found, cannot be overestimated. Of course there may arise unexpectedly little difficulties, in some cases, that will necessitate slight variation from the best of plans or in the best of mechanisms. But to start out blindly on a course, and then find it necessary to abandon it for another that is entirely different, is not an evidence of clear insight into the future. An operator may be successful after having passed through swamps of difficulties, but it is doubtful if such annoyances to the patient ever redound to the credit of a dentist.

Size of the Book.—In preparing the book the progress has been slow, because the author was obliged to rely almost entirely upon his own observations, experiences, and investigations. Up to the time of its publication there had been but little written upon the subject of irregularities of the teeth and their correction, and only a small part of that little could be regarded as scientific. To be convinced of this fact it is only necessary to read the literature of the subject published prior to 1888. Notwithstanding the enormous labor that has been required to build from the foundation a treatise upon orthodantia, the author has spared no labor or expense to make this branch of dentistry equal to any of the others.

It may be thought by those familiar only with the meagreness of this branch of dentistry in the past, and unfamiliar with the real depth and breadth of the possibilities of the present status, that the subject might be fully and clearly treated in a work of one-third or one-fourth the size of this treatise; in other words, "The whole story might be published in one very small volume." It is true a small book might be written by treating the subject superficially, depriving its language of all assimilative qualities, and scrapping the remainder so that there would be left only skeleton diction, "dry bones" of language, and then printing this skeleton upon thin paper, in very small type, close lines, and omitting two-thirds of the figures; but no person having more than a vague conception of the subject could possibly so think, for there is no branch of dentistry that requires deeper and more extensive knowledge to be master of it. Small books, however, have the merit of cheapness, but they cannot give a perfect digest of the subject.

Typography.—In the letterpress the author has presented the work in the size and style of type that would most likely be agreeable to those members of the profession who are obliged to read evenings, after the labors of the day have wearied both the mental and the physical eye.

Engravings.—The pictures of cases and mechanisms, being autographical, place the reader in closer touch with the author than would pictures made by another person.

Regarding the quality of the drawings, no attempt has been made to give fine artistic effects; the aim has been simply to present exactly the positions of the teeth, and the different parts of mechanisms, showing also the relation of both. Many of these figures are given as an artist would represent architectural work—simply a top view or a side view of a whole or a part. In some representations the more essential parts of the mechanisms are made clear at the expense of the less essential; the less essential, however, are generally made clear later by subordinate side figures.

In drawings of machinery the appearance of clumsiness is sometimes unavoidable; to render the smaller parts easily understood they are represented on a somewhat larger scale. In order to make plain all parts, it has occasionally been necessary to draw some of them slightly out of their correct positions. For illustration, in drawing a mechanism as seen from a direction that would entirely hide a screw behind another screw, the hidden one is made partly visible, but only sufficiently so to enable the reader to understand all parts.

The engravings in the main text are indicated by figures, and those in foot-notes by letters. The term "Figure" generally means one case or one mechanism, but there are several figures which represent groups of cases or mechanisms.

The mechanisms and modifications of mechanisms devised by the author are designated by the letter A (standing for author) at the end of the inscriptions. In the same way many of his operations are also indicated. Any foot-notes referring to them indicate when and where the mechanisms were first publicly made known, at society meetings or in professional journals. Those not thus noted (though privately known earlier to a few friends) are here given publicly for the first time.

JOHN NUTTING FARRAR.

NEW YORK CITY.

PART XV.

Correction of Incisors, Cuspids, Bicuspids, and Molars, Singly, or in Small Groups. By Various Kinds of Mechanisms.

PART XV.

CLASSIFICATION OF OPERATIONS.

SECTION A. . . . . UPPER INCISORS.

SECTION B. . . . . LOWER INCISORS.

SECTION C. . . . . UPPER CUSPIDS.

SECTION D. . . . . LOWER CUSPIDS.

SECTION E. . . . . UPPER BICUSPIDS.

SECTION F. . . . . LOWER BICUSPIDS.

SECTION G. . . . . UPPER MOLARS.

SECTION H. . . . . LOWER MOLARS.

(Some of these Sections are subdivided into Divisions, I., II., etc.)

UPPER INCISORS.

SECTION A.............................DIVISION I.

CHAP.	LXXI.	Special Considerations Preparatory to Operations.—Brief of the Author's Theory on Regulating.
"	LXXII.	Remarks regarding { Irregular Deciduous Teeth. Supernumerary Teeth.
"	LXXIII.	Moving Upper Incisors by Inclined Planes.
"	LXXIV.	" " " " Strings and Elastic Rubber.
"	LXXV.	" " " " Elastic-rubber Rings in Combination with Plates as Anchors.
"	LXXVI.	" " " " Rubber Rings in Combination with Cribs, Ferules, Clamp-bands, and Extension-rods.
"	LXXVII.	" " " " Metallic Short-bands.—Their Relation to Modern Plans.
"	LXXVIII.	" " " " Metallic Short-bands in Combination with Strings and Rubber Rings.
"	LXXIX.	" " " " Metallic Springs in Combination with Plates.
"	LXXX.	" " " " Metallic Springs without Plates.
"	LXXXI.	" " " " Spring-wire anchored to Cribs and Clamp-bands.
"	LXXXII.	" " " " Plain and by Scallop Wire without Plates.
"	LXXXIII.	" " " " Metallic Long-bands.
"	LXXXIV.	" " " " Screws in Combination with Roof-plates.
"	LXXXV.	" " " " Screws anchored by Ferules and Clamp-bands without Plates.

CHAPTER LXXI.

SECTION A . . . . DIVISION I.

SPECIAL CONSIDERATIONS PREPARATORY TO OPERATIONS.—PHILOSOPHY AND ESTHETICS.—BRIEF OF THE AUTHOR'S THEORY UPON REGULATING TEETH.

GENERAL REMARKS UPON APPLYING FORCE TO MOVE CROWNS AND ROOTS IN DIFFERENT DIRECTIONS.—THE ESTHETIC VALUE OF THE INCISORS.—PRESERVATION OF ALL THE UPPER INCISORS IMPORTANT.—PRESERVATION OF ALL THE LOWER INCISORS NOT ALWAYS NECESSARY.—UPPER LATERALS SHOULD BE PRESERVED, OR SUBSTITUTED IF LOST.—INCLINATION OF LOWER MOLARS NORMAL.—ANCHORAGE, PROPER AND IMPROPER.—ANCHORAGE FOR MECHANISMS.—SIMPLE AND COMPLICATED MECHANISMS.—SIMPLICITY A MERIT.—COMPOUND MECHANICS NOT NECESSARILY COMPLEX.—COMPOUND SIMPLICITY IN PROPERLY COÖRDINATED MECHANISMS IS HIGH MECHANICS.—RESULTS FROM MACHINERY, NOT COST, ARE THE PROOFS OF VALUE.—ESTHETIC MECHANICS.—REMARKS UPON THE DIFFERENT PLANS OF OPERATIONS.—A FACTOR IN SUCCESS.

IN all the branches of dentistry there is no class of operations that call for so much time to perform as those of correction of irregularities of the teeth, therefore none that call for more discretion in the selection of applicants. In a book like this it is possible to make suggestions upon this phase of the subject that might be of especial benefit to the younger operators, not only upon the matter of fees, but that which has much to do with outside causes of success and failure. To do this, however, in a work upon a scientific subject is not customary; nevertheless, a few remarks will be ventured here, and more in a special chapter in Part XX.

In selecting cases it is important that the patient should be very desirous to have the operation performed, as "lukewarmness" is always detrimental to success. It is also important that the mental disposition of patient's parents, or friends nearest the patient, should be of the right kind, for there are cases, in themselves very easy to perform, that are made difficult from contrariness of the patient or meddlesomeness of the patient's friends. I have known simple cases to be, through such perverseness, more difficult to treat than complicated cases supported by the good behavior of the patient and the friends. If the applicant has arrived at the age of considerable intelligence and personal pride, there is but little doubt of success without any irritating annoyances. It is well never to undertake elaborate operations unless all these moral aspects are present. Of course there are adverse circumstances that cannot be wholly avoided. A patient may be too young to see the importance of an operation, and may require parental authority to induce obedience.

Effect of Force.—Teeth will move in any direction by force continuously maintained or frequently repeated for a sufficient length of time. The force may be within the tissues of the jaws, as exemplified in cases where liberty, by extraction of an interfering tooth, is followed by natural adjustment of the obstructed tooth, but perhaps it is more satisfactorily shown in cases where the force is furnished by the finger, or is obtained from a machine.[1] The first aim, however, in any operation for the movement of a tooth is to cause slight looseness, by more or less decalcification of its socket tissues, a condition that results from pressure of the tooth upon these tissues. This softening of the socket breaks the fixedness or rigidity of the tooth, leaving it comparatively easy to be moved either by absorption of the tissues or by bending of the alveolar process, or by both.

The proper correction of teeth by machines lies in applying the force in the right direction and in a philosophical way. To elevate teeth in their sockets, the direction

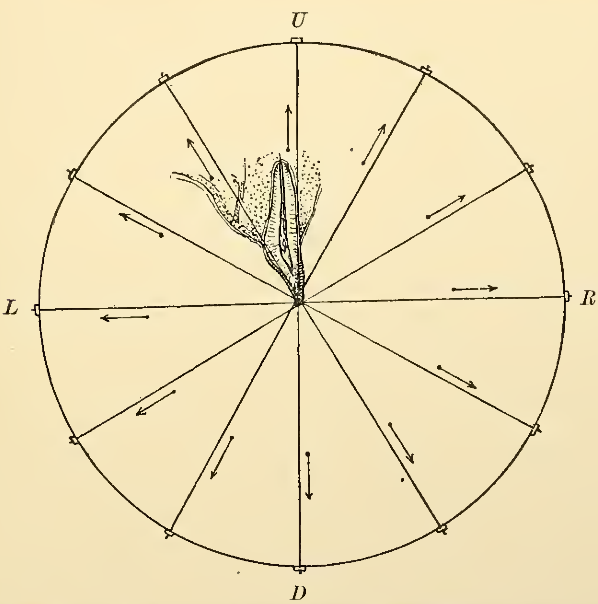

FIG. 696.—Showing the philosophy of the application of force upon teeth.

of force applied is similar to that for extracting them, the difference in results depending upon the amount of force

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[1] The first regulating operation performed by the author was upon one of his own upper central incisors, when he was a small boy. This outstanding tooth was moved into line by pressing his finger upon it several times a day for several weeks.

applied in a given time. For movements in other directions, philosophy is also the basis. Teeth can be moved in any direction by brute force simply, but to move them in the best way depends very much upon a high quality of intelligence behind the hand. To more clearly explain the fundamental mechanical principles of moving teeth in the various directions necessary to success, I will resort to diagrammatical aids.

Fig. 696, representing a sectional view of a central incisor, shows radial lines drawn in various directions from the end of the crown to a circular line around it; these radial lines represent different directions of force that may be applied to teeth. To show the philosophy of mechanical action upon teeth, let us suppose these radial lines to represent screws connecting the tooth with a hoop, having holes, through which the ends of the screws project, and are tightened upon by nuts.

If all these cords were equally tightened upon the tooth by the turning of the nuts upon the outside of the band, it will be seen that the different draughts of force would be compensating, and therefore would not affect the position of the tooth. So will it be equally apparent that if all the cords excepting one should be taken away, and this one were to be acted upon by its nut, the part of the tooth acted upon would be drawn toward the nut, and in the direction indicated by the arrow alongside of the radial line. If the draught should be downward toward D, the tooth would start from its home in the socket. If the tooth should be moved only a short distance, the operation would be called "elevation of the tooth"; but if the tooth should be drawn entirely out of its socket, it would be called "extraction." If, however, all the screws excepting the upper one, U, should be taken away, and this one should be drawn upon, the tooth would be moved farther into its socket, and the operation would be called "depression of the tooth." To continue the illustration: if all the screws were removed excepting the one in the direction of L, and this one should be acted upon by its nut, the force would cause the crown of the tooth to move posteriorly, and at the same time the end of the root (to be further explained later) would move anteriorly. On the other hand, if the opposite screw, pointing in the direction of R, were to be the only one acted upon, under the same surrounding conditions the crown would be moved anteriorly, while the apex of the root (to be further explained later) would remain comparatively stationary.[1] So it may be said of the influence of action of any one of the other screws. Under the same conditions it would move the tooth in the direction indicated by the arrow alongside the radial line representing the screw.

If these facts are clearly understood, it will be seen that to move a tooth, all depends upon applying a proper degree of force; and to successfully regulate a tooth, by any of the various plans, depends not only upon furnishing force, but upon applying the engine of force so that it will bear or draw upon the right place. If the object is simply to elevate the tooth, all that is necessary is to cause the force to act in the line of its long axis, and in the direction of the end of the crown; but if the object is to move the crown posteriorly or anteriorly, the force should be applied so as to act at right angles (or nearly so) to the long axis of the tooth.

Thus far we have gone along the lines of general princi-

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[1] The difference in the behavior of the end of the root here mentioned will be found explained more fully in Parts XVIII. and XIX., Moving of Roots *en Masse.*

ples; but there are several related factors that cause deviations from these general lines in operations upon the front teeth (especially the upper), that should be taken into consideration. These deviations are caused by the socket resistance acting upon these teeth (being moved) like fulcrums; that is, some of these teeth tilt upon places somewhere within the middle third of their long diameter.

Fig. 697, representing the same conditions of applied force as shown in Fig. 696, illustrates various phases of this fulcral influence, made manifest in the behavior of the ends of the roots. When force is applied longitudinally with the long axis, there is no lateral movement of any part of the root; but when applied in any other direction this fulcral influence is felt. The arrows on the ends of the roots indicate the directions in which they will tend, when the crowns are acted upon in the directions represented by the lines extending from their cutting ends. The results of these various influences are illustrated in the last picture in the figure.

The particular place where the socket-tissue will act as a fulcrum in a given case depends upon the angle of the line of force to the long axis of the tooth; the nearer it approaches at right angles to it, the more circumscribed will be the fulcral bearing. On the other hand, to the degree that the line of force approaches the long axis of the tooth, will the area of the fulcral bearing be increased, until the action of the root upon the socket-wall will become more like a chafe. The cases in which the fulcral bearing would be circumscribed are indicated by triangular marks, while those cases in which the fulcral bearings would be broad and undefinable are not marked. The angle of the arrows to the long axes of the teeth, however, make this matter plain.

The root that would have the greatest degree of lateral movement is the one having the engine of force applied at right angles to the end of the crown. If it is desirable to have the crown moved posteriorly, without materially disturbing the end of the root, the force should be applied

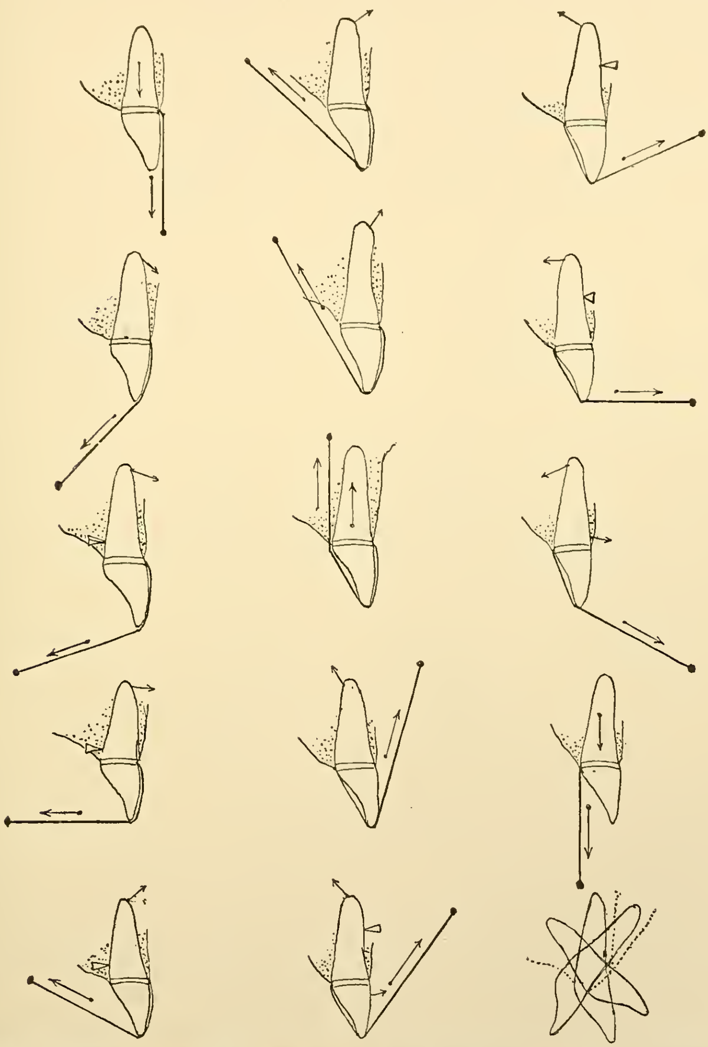

Fig. 697.—Illustrating the different effects upon the roots by the application of different lines of force upon the crowns of upper incisor teeth.

at a place nearest midway of the tooth, practicably at or near its neck.

Fig. 698 illustrates the theory of applying force to incisor teeth for moving the crowns and the roots, but most of the mechanisms shown are not intended to represent those used in actual practice; the two pictures next to the

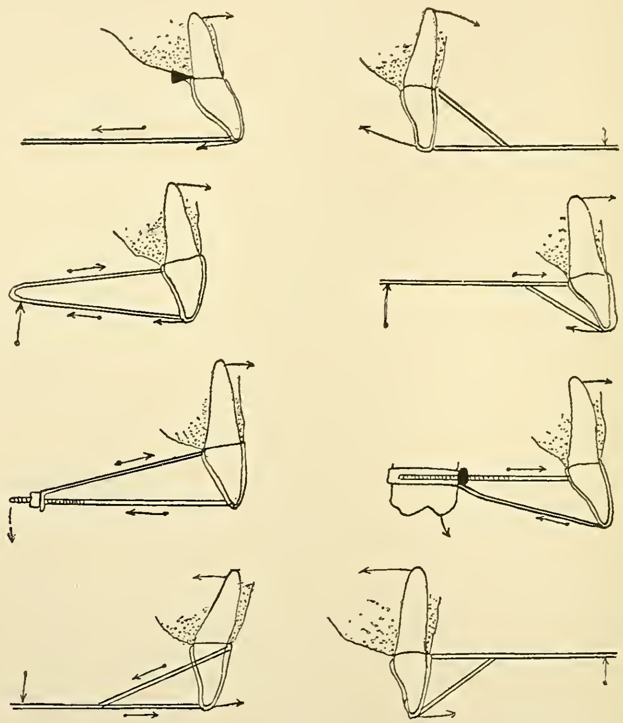

FIG. 698.—Illustrating the philosophy of applying force to cause lateral movement of the roots of upper incisors.

two lower ones serve to illustrate the principle of mechanisms for applying force to move roots. To move them forward, as is often desired when correcting protruding teeth, to round out a sunken upper part of an upper lip, all that is necessary is to apply posteriorly acting force to the end of the crowns. The alveolar process posterior to the root being more extensive in quantity than the alveolar tissue anterior to it, the absorption will not be as rapid (by pressure of the tooth), as the thin anterior wall over the root will bend forward. The first picture in the figure (698) illustrates, by a black triangular mark, the place of the fulcral bearing in a case of this kind; it also (by an arrow) indicates the direction that the end of the root will take. The last two pictures represent the tendency of the root to move, by the application of force, in the opposite direction; but as the alveolar tissue in the rear of it is extensive, its absorption is too difficult for the root to move (posteriorly) before the neck of the tooth will move anteriorly, as far as is desired, in a case of instanding teeth. The remaining pictures represent similar conditions.

To move both the crown and the root bodily forward (sometimes necessary in elongating the dental arch) requires the application of forces that will act in opposite directions; or, perhaps more clearly expressed, the mechanism must be so constructed that the crown can be held firmly and given gradual liberty to move forward, as the root is made to move forward. For further consideration of this interesting phase of the subject, see chapters in Parts XVIII. and XIX., upon Elongation of the Arch and Correction of Protruding Teeth.

In Part IV. is exhaustively treated the subject of the author's theory in regard to the different kinds of force given in moving teeth. To refresh the reader's mind, however, the following outline of these chapters is presented:

Brief of Author's Theory.—Teeth are moved through absorption of the socket-tissue, or by bending of the alveolar ridge, or both. This absorption, or this bending, may take place by the tissue-alterations being carried on within their physiological functions, or outside of these healthy functions and in the pathological. If the tissue-changes can be conducted within the physiological functions, the operation of moving a tooth will be painless; but if the rate of changes be pushed beyond this condition, into the pathological, there will be more or less pain.[1]

Any regulating mechanism that can be controlled so as to confine the tissue-changes within the healthy line is therefore superior to those that cannot. Mechanisms that operate by elastic rubber or by metallic springs, if the power is not so great as to force the changes to exceed healthy action, will be comparatively painless; but to control elastic materials so that they will not cause pain is generally difficult and often impossible.

This is not the case when mechanisms operated by screws can be used, because by the screw exactness can be secured and precisely the proper degree of force can be given. Especially is this true when the management of the mechanism is left to the patient, who knows better than the operator when the greatest degree of force can be given without causing pain. This desideratum is assured by the screw making it possible to take advantage of the law of labor and rest, which applies to this kind of tissue-action as well as to all other tissue-energies.[2]

Magnitude.—Operations for the correction of irregular teeth are divided into minor and major. The former term

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[1] Before the author published his first papers (1875–76) it was the universal opinion that "the movement of teeth can only be successfully conducted through pathological difficulties."

[2] As some authors on orthodontia appear to so misunderstand my views and theories that their writings tend to mislead concerning the facts that contribute so important a part to a thorough education in this branch of dentistry, it will pay every earnest student to carefully read Part IV. of this treatise, because when these indisputable facts are clearly understood, and practice is governed by them, the prejudices of the people against operations for the regulation of teeth will be overcome, and appreciation of high skill will rapidly extend.

refers to the miscellaneous class in which only a few teeth are irregular; the latter to protruding teeth, V-arches, saddle-arches, etc., requiring more extensive operations. It should not be inferred from this, however, that minor operations are always easy. Many of them are as perplexing as operations for the correction of a larger number of teeth.

In this Part (XV.) will be found many different plans of minor operations for the correction of the irregularities of the different classes of teeth—incisors, cuspids, bicuspids, and molars. Beginning with the incisors the others will be considered in the order given.[1]

Esthetic Extraction.—Importance of Preserving the Upper Lateral Incisors.—The incisors are all *feature teeth;* but while, esthetically speaking, it is not always important to retain all the lower, the preservation of all the upper incisors is of utmost importance. Dr. C. A. Harris, who wrote in 1839–50, says, rightly, in regard to the upper incisors: "These teeth are more conspicuous, and, when well arranged, contribute more than any others to the beauty and pleasing expression of the mouth; their preservation and regularity are, consequently, of the greatest importance. Hence the practice of removing (extracting) the laterals, when they are situated behind the centrals and the cuspidati, and when the dental arch is not completely filled without them, is one that cannot be too strongly deprecated. . . . They should never, therefore, be removed, unless their arrangement and that of the other teeth is such as to render their adjustment *impossible.*"[2]

These views of Dr. Harris are entertained by most

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[1] For a clear understanding of the plan of this and the following Parts of this work, see the opening chapter, "Prefatory Remarks."

[2] Harris's "Dental Surgery" (1850), p. 153.

practitioners, yet there are a few who do not seem to regard them as being absolutely necessary to first-class operations. Several cases have come to my knowledge in which the upper laterals have been extracted to make room for neighboring teeth; but I have known very few cases in which the upper centrals had been extracted, and the space closed by the remaining jumbled teeth being brought into line. One of the most remarkable of these was a case treated by Dr. S. H. Guilford, who gave as his reason for the act, "the extracted tooth was black as ink." The remaining teeth had been arranged in a curve, and there was no space left. The "one-eyeness" of expression of the front teeth was peculiar. It suggested to the mind that an artificial tooth in place of the missing one would have been an improvement.[1]

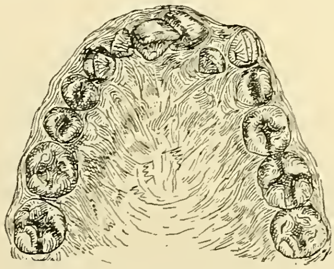

FIG. 699.—Jumbled Upper Incisors.

As the subject of the "relative esthetic value of teeth" has been elaborately considered in Part XIV., Chapters LXVI., LXVII., it is not necessary to further elaborate. Every dentist should strive to thoroughly understand the subject, in order to know what is regarded by artists as absolutely necessary to first-class operations.

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[1] Two cases of this kind, by Dr. Guilford, are illustrated by Figs. 229 and 231, pp. 352, 353, in the "American System of Dentistry" (1887).

Figs. 699 and 699A represent two cases of jumbled front upper adult teeth. Such as these, in which a greater or less number of the upper incisors occlude on the wrong

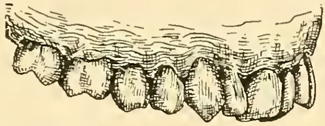

FIG. 699A.—Jumbled Upper Incisors.

side of the lower teeth, are common; generally, however, there is only one tooth that falls behind. If any are turned in their sockets, correction is comparatively easy. In reference to older teeth, Dr. C. A. Harris says: "They are regarded as the most difficult to remedy." At the present day the majority, however, are not so difficult to correct as they were in his time; but where the root is crooked or the front teeth overlap one another, requiring several to be moved to make sufficient space to form them in line, the correction is sometimes very difficult.[1]

In some simple cases where only one or two incisors antagonize squarely on the opposite teeth, they can be corrected in childhood by repeatedly pressing the fingers upon the irregular tooth or teeth, or, as suggested by Goddard (1844),[2] "biting on a stick or on the handle of a

[1] *Right and Left in Figures.*—In referring to the figures the reader should always bear in mind that while the right side (of figure) of the lower dental arch (when the incisors are uppermost, as in nearly all cases herein represented) always corresponds with the same (right) side of the patient, and *vice versa* concerning the left side, this does not apply in cases of the upper arch. When reference is made to figures of the upper arch (representing the incisors uppermost) the sides are presented thus: those of the right side of the patient are represented on the reader's left side of the figure, and *vice versa* when reference is made to teeth on the left of the patient. This difference will be easily understood by examining the two jawbones, held in the same position as represented by the fignres.

[2] "Goddard, On the Teeth" (1844), by P. B. Goddard, p. 121.

tooth-brush held nearly perpendicular between the upper and lower teeth." This act is based on the principle of the inclined plane. Of course a stick is not equal to a plane. For moving a greater number of teeth the use of rubber rings, or of peg-plates, is followed by more satisfactory results.[1] Wire springs, so formed and anchored that they will bear steadily in the right direction upon teeth, are also practicable. Many dentists, however, prefer elastic-rubber rings, stretched and woven around and between the teeth, so as to draw properly upon them. The rubber should not be so applied that it will cramp the teeth upon one another and cause them to interfere with the liberty of the tooth or teeth to be moved.

A rubber ring, attached to an anchor so formed that the ring will act from a fixed place, a short distance from the irregular tooth or teeth, will obviate this difficulty. One of the best of such anchors is a gold wire, or narrow strip of plate, fastened to the adjacent teeth, or fastened to the teeth on one side of the arch, the main part extending along past the instanding teeth, and held there by the other end being attached to the teeth of the opposite side.[2] Occasionally a mechanism having an arm (similar to that represented by Fig. 402 (A), Part VIII.) anchored to one side of the arch only will serve desirably. In some cases screw-jacks placed within the arch are advisable. For others, however, screw-jacks are not as easy to work with as elastic rubber. Several operations in which each of these mechanisms was used independently, as well as connectedly, will be found explained under their appropriate heads.

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[1] See Part VI., Chapter XIX., p. 216.

[2] This plan, which is old, was referred to in the "Dental Cosmos," January, 1876, and April, 1881.

Importance of Lower First Molars.—It has been taught that the inclining forward of a lower molar occurs only where a tooth anterior to it is lost. Undoubtedly teeth incline forward farther when not supported by an adjacent one than where there is no break in the dental line, but, as Dr. Eugene H. Smith suggests, the line of many lower dental arches curves downward in the middle part so far that the teeth posterior to the lowest point naturally and necessarily incline forward even when there are none missing; consequently inclination of lower molars is not always abnormal. This being a fact, it is all the greater reason why a side lower tooth should not be extracted where a wide space would be left, unless its absence is of greater benefit to the patient than its presence (a condition too often found in the form of decay and disease resulting from neglect). To extract the lower first molars, when sound, to make room for crowded bicuspids, without attempting to assist nature to close the consequent space, as advocated by some writers, is a questionable practice.

Anchorage, Proper and Improper.—When the first molar has been extracted it becomes necessary to use the second and third molars for anchorage, to move back the bicuspids; but they should not be drawn upon for moving more than one tooth at a time, and even then these anchor teeth should be frequently examined to prevent too great inclination forward. If they have moved too far, they should be given liberty, permitting them to return to their normal positions. It should not be inferred from this, however, that the starting forward only a short distance is dangerous to these teeth, as all anchor teeth are liable and even expected to be moved somewhat by the draught. The question to decide is, how long such started anchor teeth can be safely used to further the operation.

If the antagonism is not broken too much these teeth will generally settle back into their former and normal places, even if they are elevated slightly in their sockets. If elevated, however, it may require months. Because of this natural tendency to settle back and down into the sockets it is *not prudent* to be in too great haste to *grind teeth* to improve antagonism after having completed the operation of moving teeth. (See Crowding, Spaces, Part XX.)

In planning a mechanism for moving teeth, one of the main points to be taken into consideration is enduring firm anchorage. On pp. 465, 466 (Part IX.) are given a few rules regarding anchorage resistance. These rules, however, are not to be regarded as infallible, because (as suggested in the paragraph following the rules) the hardness and other conditions of the alveolus in different cases are variable. These rules, although based upon approximately close calculations, should in practice be regarded as only giving the minimum socket resistance for anchorage. In my own practice I always include for anchorage all the teeth that are practicable, not only to prevent their being moved, but also to prevent soreness of the sockets. The exceptions to this rule of practice are in cases where a sufficient number of teeth cannot be taken advantage of for anchorage, or where it is necessary to *move anchor teeth forward to aid in filling extra space.*

Simple and Complicated Regulating Mechanisms.—In Part VI., pp. 208–210, I have dwelt somewhat on this subject; but as there are some *dentists* who persist in efforts to *prejudice students against improvements* in regulating mechanisms, a few more remarks will be made. In mechanics simplicity is the great desideratum with all natural inventors. No useless elements are found in first-class machines of any kind; but it is not everybody who understands this subject sufficiently to comprehend that there can be simplicity in complicated machinery, and that some of the grandest and most valuable machines ever invented are so because of this complicated simplicity. The Hoe printing-press is a startling example of this. More than 16,000 pieces in one machine, printing, folding, cutting, pasting, and filing 96,000 newspapers per hour, is an example of complicated simplicity and a marvellous illustration of the fruits of the genius of man.[1] The true mechanical genius laughs to scorn those who attempt to ridicule the best mechanisms ever invented for correction of irregularities of the teeth, calling them unnecessarily complicated, simply because they themselves have not sufficient skill to even copy them. So long as the dental profession contented itself with crude, cumbersome mechanisms no progress was made in this branch, but when higher mechanical skill was applied it advanced and continued to advance as more and more thought was centred upon the subject, until now it has loomed up as one of the grandest of all the branches of dentistry. Indeed it has reached a standard that never could have been attained from the acceptance of the views of those persons who are always to be found pulling back until dragged forward by public sentiment. In this work there are hundreds of mechanisms illustrated and explained, many of which may

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[1] The full-size press now in use is composed of more than 16,000 pieces, and weighs 130,000 pounds or 65 tons. Its total length is 26 feet 3 inches; width, 18 feet; and height, 12 feet. It prints upon both sides of three continuous webs of paper supplied from three separate rolls, splits the webs longitudinally, brings the narrow webs into one or several groups, serves the webs collected transversely into sheet lengths, unites the sheets by pasting, folds them, and delivers perfect newspapers composed of many sheets, bound together, cut open at the head, and counted. It can print 96,000 four or six page papers, 72,000 eight-page papers, 48,000 ten or twelve page papers, 36,000 sixteen-page papers, or 24,000 fourteen, twenty, or twenty-four page papers per hour.

at first seem to the tyro to be more complicated than is necessary; but there is not one in the book, *given as a lesson to follow*, that is really complex to an expert. Those which at first appear so are only examples of complicated simplicity that operate as easily as the turning of a screw. There are in vogue old-fashioned regulating mechanisms, consisting of plates and springs, match-sticks and strings, that *are* complex. These are not only difficult to manage, taking unnecessary time and causing great pain to change the strings, but impossible to be kept clean. With a lot of such things matted with decomposed food, no patient can feel happy over an operation.

True mechanics recognize any mechanism as simple that can be operated easily and will accomplish the result desired. Anything that requires great care and considerable time to manage is regarded by them as an imperfect machine. In other words, a regulating mechanism, if difficult to manage and painful to endure, must be regarded as more complicated than one (though requiring manipulative, mechanical genius to contrive) that will, when properly finished and applied, be managed easily and quickly, without causing pain. The former is *low mechanics*, the latter *high mechanics*.

Esthetic Mechanisms.—Another phase of high mechanics, as applied to dentistry, is the esthetic. Failure may arise from lack of skill on the part of the operator or by perversity of the patient. But many failures can be traced solely to the disgust of patients through lack of esthetics in the mechanisms; because conspicuously black and filthy mechanisms do not encourage the patients. There have been many failures, by the use of such things, that would have ended in glorious success if delicately and beautifully made gold mechanisms had been used.

CHAPTER LXXII.

IRREGULAR DECIDUOUS TEETH.—SUPERNUMERARY TEETH.

IRREGULAR DECIDUOUS TEETH.—IRREGULAR ADULT TEETH.—SUPERNUMERARY TEETH; SOME REMARKABLE CASES.—UPPER SUPERNUMERARIES.—LOWER SUPERNUMERARIES.—TREATMENT OF SUPERNUMERARY TEETH.—TREATMENT OF IRREGULARITIES OF TEETH CAUSED BY SUPERNUMERARIES.

THE form and size of the dental arch varies in different people; so also does the irregularity of the teeth in the different forms of the arch vary. These variations are sometimes found in small children, but not so frequently as in adults.

Irregular Deciduous Teeth.—The few deciduous cases recorded have generally been found to be confined to a single tooth in a jaw. The author has, however, seen a few cases in which there were several. Of protruding upper teeth he has seen but one marked case,[1] and only one marked case of protruding lower teeth has come within his observation. The habit that some children have of sucking their thumb or finger, or of biting on extraneous things, would naturally be thought to have some influence in causing protruding upper deciduous teeth. This was so in the case referred to; when the second set

[1] In this case the (successors) second set also protruded.

erupted they also protruded. The lower case was the result of excessive growth of the body of the jawbone. Dr. E. S. Talbot, who has probably examined the teeth of as many children (in Institutions) as any other person, says: "Protrusion of the teeth of children before the sixth year is very uncommon. I have never observed a case of protrusion of the upper, except in cases of thumb-sucking, and only very few of those. I have seen only four cases of protruding lower teeth; these were the result of excessive growth of the jawbone."

Cases of jumbled or uneven deciduous teeth are also rare. M. Delabarre, who wrote in the early part of the present century,[1] mentions a case in which the upper teeth on one side of the medial line "occluded" inside of the lower, while those on the opposite side of it were in their proper positions.

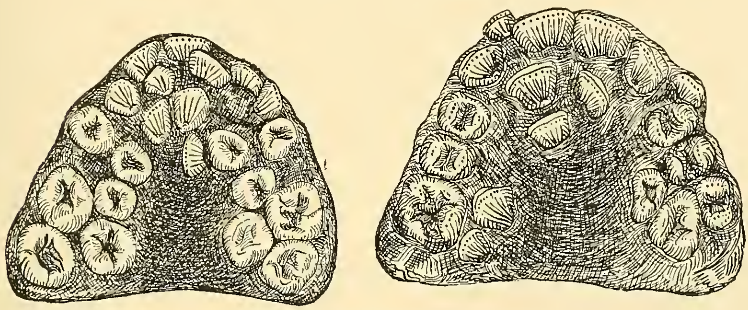
Though such irregularities of deciduous teeth are unsightly, they are seldom followed by irregularity in the second set; consequently it is not necessary to correct them. It is well that this is so, for it would be rather difficult to correct deciduous teeth before children have arrived at the age of sufficient intelligence to aid the operator by compliance with his instructions.

Irregular Adult Teeth.—Later, and before approaching eruption of the adult upper cuspids, the upper incisors of the second set are generally found to be regular; but just before or soon after the eruption of the cuspids, the incisors are frequently found to have become irregular. This is oftener true of these teeth than any others excepting the cuspids themselves. Sometimes these irregularities arise from inherited causes, but generally from mechanical, such as result from too early or too late loss of the

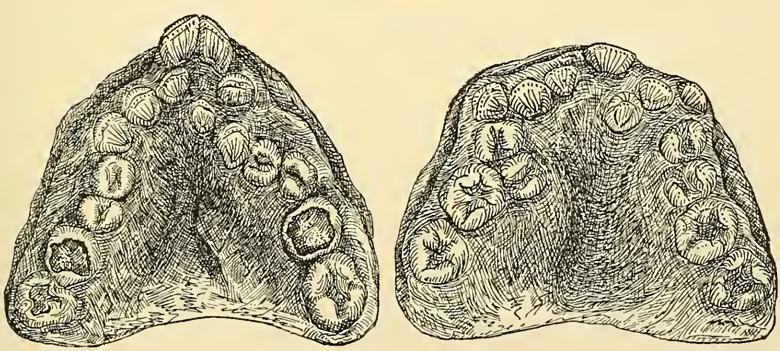
[1] Paris, 1815–26.

deciduous teeth. This is shown in cases where the space left by the (too early) loss of the upper (deciduous) cuspid is encroached upon by the first bicuspid, thus forcing the adult cuspid, which erupts later, to crowd the incisors. It is also shown in cases where the presence of the deciduous tooth forces the successor to one side. (For more elabo-

GALAXY SETS OF UPPER TEETH.



FIGS. 700, 701.—Supernumerary Teeth.



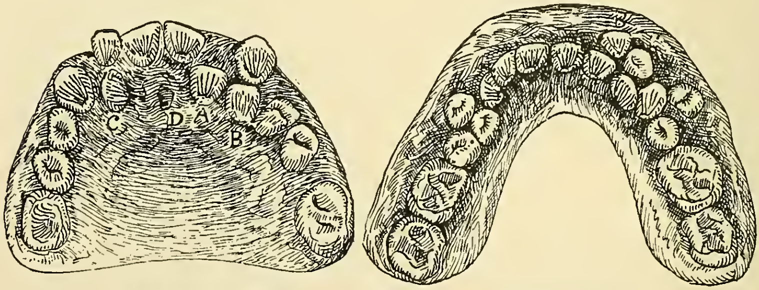
FIGS. 702, 703.—Supernumerary Teeth.

rate consideration of the subject of causes of irregularities of the teeth, see Etiology, Part III.)

Supernumerary Teeth: Some Remarkable Cases.—The number of these extra teeth varies in different cases. As a rule only one, two, or three are found, but sometimes there are several more; indeed there are cases in which these teeth are so numerous that the outfit does not appear to belong to a human being.

Upper.—Figs. 700–703, drawn from casts deposited in the museums of Baltimore College of Dental Surgery[1] and Pennsylvania College of Dental Surgery,[2] represent several of the most remarkable of this class. Their general appearance so closely resembles clusters of stars that they may be aptly called *galaxy sets.*

Fig. 704, from the "New York Dental Journal" (of July, 1859), represents the upper jaw of a similar case, one that the reporter gives as a "third dentition." A is a perfect



FIGS. 704, 704A.—Upper and Lower Supernumerary Teeth.

canine tooth, directly behind where there had formerly been a lateral incisor. B and C are two lateral incisors, D being the space where before there had been three teeth extracted. The patient (aged thirty-eight) said that in each member of his immediate family similar "freaks of nature" were in some form present; he also asserted that his father had a complete "second" and "third set" of teeth. The author thinks this assertion, however, should be regarded as having come from a person not qualified to judge correctly.

Lower.—Sometimes supernumerary teeth are present in the lower jaw.

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[1] Baltimore, Md. [2] Philadelphia, Pa.

Fig. 704A represents a case reported in the same journal. This case was that of a sister of the above-mentioned narrator. She was twenty-nine years of age. In this figure there were extra perfect bicuspids and a perfect extra lateral incisor, besides other supernumeraries.

General Treatment of Supernumerary Teeth.—These teeth often crowd the normal ones out of their proper positions. The treatment for such cases is to extract all that are not needed to complete the dental arch, and then regulate the remainder, if necessary, whether they be supernumerary or normal. The condition that would require the retention of a supernumerary is where it could be made to fill extra space in a complete set of normal teeth, or where it would serve as a substitute for a lost normal tooth, or for one that has become too extensively decayed for repair.

When such extra teeth erupt in the earlier part of life there is no uncertainty in the minds of experts as to their identity; but if this occurs late in life it cannot always be so easily determined.

Occasionally the presence of supernumeraries gives rise to newspaper notices of "third sets." That there are teeth (not full sets) of a third dentition there is but little doubt; but some that erupt in old age belong to the second set; therefore there may be a question as to which class the late teeth really belong. Those that erupt in old age, and which belong to the second set, are generally third molars; but there are cases of upper central incisors and cuspids that do not appear until they become visible by the lowering of the socket-tissues, as do stumps of trees appear when mill-ponds are drawn off.

The greatest age at which new teeth have appeared through the gums is not positively known. The author has seen several cases where one or two upper teeth have appeared at ages varying from sixty to seventy years. In Horace Walpole's translation of Count Anthony Hamilton's "Memoirs of Grammont" is mentioned one of the most notable instances on record. It is the case of Edward Progers, a younger son of Colonel Philip Progers, of the family of Garreddin, in Monmouthshire (Wales), who (according to the testimony of Le Neve) "died December 31, 1712, or January 1, 1713, aged ninety-six (96) years, *of the anguish of cutting teeth*, he having cut *four new teeth*, and had several ready to cut, which so inflamed his gums that he died thereof."

Treatment of Irregularities of other Teeth Caused by Supernumeraries.—Those that can be treated correctly with the least trouble are in cases where the irregularity has been caused by subsequent eruption of supernumeraries. Extraction of such useless teeth is generally sufficient. When an upper central is turned out of its proper position by intrusion of a supernumerary, it sometimes causes considerable annoyance to the patient; but the natural tendency of teeth that are thus turned is to return to their former places soon after the way has been made clear. Although such cases seldom require further treatment than the extraction of the intruding tooth, there are occasionally found some that require mechanical aid.

FIG. 705.—Upper centrals moved out of place by a supernumerary.

Fig. 705 represents a case of this class, that was corrected simply by extracting the tooth that had intruded itself between the two upper centrals.

Fig. 705A represents the same case a few months after the extraction.

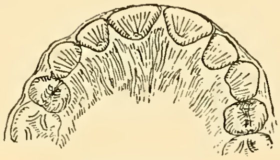

FIG. 705A.—The same case after extraction of the intruding supernumerary.

To apply a mechanism to such a case, after extraction of the supernumerary, and before giving nature an opportunity to remedy the defect, is generally to subject the patient to unnecessary annoyance and expense. If there is any danger to be apprehended from the "let-alone" plan after extraction of the intruder, it is that the tooth turned aside may go *too* far in its return. This arises from the open space left in the alveolus by the extraction. While mechanical auxiliaries are sometimes necessary in such cases, their use is more for preventing the teeth from moving too far and beyond their proper limits than for moving them to their proper places.

CHAPTER LXXIII.

INCLINED PLANES.—MOVING UPPER INCISORS BY THEM.—THE PHILOSOPHY MINUTELY EXPLAINED.

DIFFERENT KINDS OF PLANES.—OPERATIONS BY DOUBLE-ACTING INCLINED PLANES.—BY GOLD THIMBLE-PLANES.—BY SOLID PLANES.—ESTHETIC PLANES.—REGULATING AND RETAINING PLANES COMBINED.—BY SKELETON-PLANES.—BY TRIPLE PLANES ANCHORED BY CLASPS.—FRAME-PLANES ANCHORED BY CLAMP-BANDS.—LOCK-PLANES.—PHILOSOPHY OF CONSTRUCTION OF FRAME-PLANES.[1]

THERE are several kinds of inclined planes; some large, others small, and planes which have individuality, in which size is not a special feature. Some of these mechanisms are made with one or more surfaces, so bevelled that when they are placed firmly in position on the teeth of one jaw they will cause those in the other to move. The other planes are made of plate, so applied that the teeth, by antagonism with them, are also influenced to move in the direction that will correct the deformity, though the plane, strictly speaking, has no bevelled part.[1]

An inclined plane may be so constructed that it will move teeth in only one jaw or in both at the same time.

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1 Some of the operations represented and explained in these Parts are fractions of larger ones. These fractions, by representing special parts, enable classification that renders the book more valuable to practitioners than would be possible by grouping the parts into larger operations and presenting many of the details over and over, which would have been necessary in explaining the entire process of similar operations. For further remarks on this subject see Introduction to Parts on Operations by Mechanisms.

If the operation is to be in one jaw only the anchorage should include a larger number of teeth than those to be moved; but when it is desired to have teeth in both jaws moved (at the same time) the degree of resistance in the sockets in both jaws should be relative to the number of teeth acted upon. The philosophy of this action may be more clearly understood by referring to Fig. 706, which

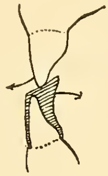

FIG. 706.—Sectional view, showing movements of a single upper and a single lower incisor, by a double-acting inclined plane placed on one lower tooth.

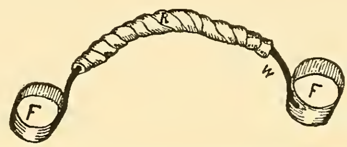

FIG. 707.—Forcing instanding upper incisors forward by an elastic-rubber plane (Parr).

represents a sectional view of two incisors being moved, oppositely, by a single-tooth plane; the upper incisor moving forward, and the lower backward. This dual action, however, can be depended upon only where there are but few teeth to be moved.

Inclined planes were formerly made of gold or silver plate, but they are now generally made of hard rubber. Dr. C. A. Harris, in his work, suggests the swaging of gold plate so as to cover several teeth, even as far back as to include the first molars. These planes cover not only the teeth, but also a part of the gums.[1] At the present time, however, the covering of gum-tissue is seldom, if ever, regarded as proper.

Fig. 707 represents a peculiar mechanism devised by Dr. H. A. Parr.[2] This mechanism, which acts upon the

[1] Harris, "Principles and Practice of Dental Surgery" (1850).
[2] Devised April, 1888.

principle of the inclined plane, was used for moving instanding upper incisors outward. The moving element of this mechanism consisted of a strip of elastic rubber, R, wound spirally around a stiff gold wire, W, on the ends of which were soldered gold ferules, F, F, for anchors. These ferules embraced the first upper bicuspids. The wire was so bent that in occlusion of the jaws the lower front teeth antagonized on the lower side of the roll of rubber, pressing it against the lingual surfaces of the instanding upper incisors (similar to the frame-plane[1]) with such force that they were moved anteriorly. The rubber, being soft, caused no unpleasant sensation, but, on the contrary (as the patient said), felt "like chewing-gum."[2]

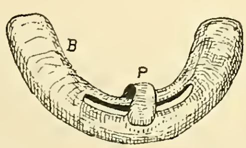

FIG. 708.—Gold Inclined Plane (Harris).

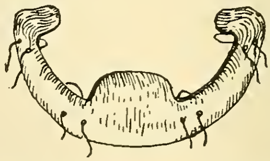

FIG. 709.—Inclined Plane (Goddard).

Fig. 708 represents one modification of a gold inclined plane described by Harris. This was used for moving forward an upper central incisor. The mechanism consists of an anchor-plate, B, and an inclined plane, P. A hole is made in the plate through which the lower incisors may project. The plane is a strip of plate, bent, and soldered to the anchor-plate, as represented.

Figs. 709 and 710, copied from Goddard's work (1844), represent two similar mechanisms for moving upper incisors.

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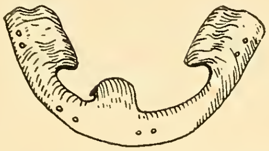
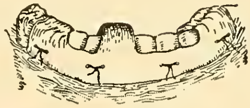
[1] See Fig. 112, p. 232, Part VI.

[2] See Part XX., Chapter XVI., On Caution in the Use of Inclined Planes.

Fig. 711 shows the application of one of these planes to the teeth.[1]





FIGS. 710, 711.—Two Inclined Planes (Goddard).

Thimble-planes.—Fig. 712 represents a gold-thimble inclined plane. This consists of three parts soldered together, viz., a ferule, C (No. 29 or 30), a stiff piece of plate, P, and a piece of wire, W.

FIG. 712.—Thimble-plane for one tooth.

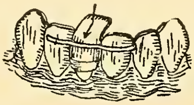


FIG. 713.—Application of the same.

Fig. 713 represents the application of this thimble-plane to the teeth, for moving forward an instanding left upper lateral. This mechanism is cemented upon the lower tooth, leaving the wire arms resting against the labial sides of the two teeth adjacent to it. The instanding upper tooth is moved forward by biting upon the plane P. The object of the wire arms is to prevent the tooth on which the thimble is cemented from moving inward while the upper central is being moved outward.[2]

Thick Planes.—Fig. 714 represents the case of a girl about eight years of age, in which both of the centrals had erupted in the posterior position, and, by constantly antagonizing against the posterior surfaces of the lower in-

[1] "Goddard, On the Teeth" (1844), Plate II., Figs. 5, 6.

[2] For remarks concerning the making of this mechanism, and to whom belongs the credit of originating it, see Part VI., Chapter XX., pp. 231, 232.

cisors, were being forced still farther back. The right central was also slightly turned in its socket.

Like many cases of this class in which the teeth are not crowded, this irregularity was easily corrected by a hard-rubber inclined plane, so made and fitted to the eight

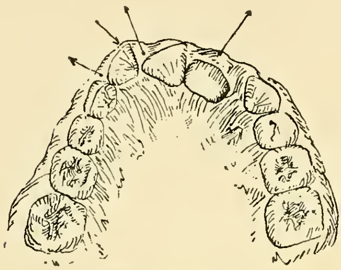


FIG. 714.—Case showing two instanding centrals before an operation.

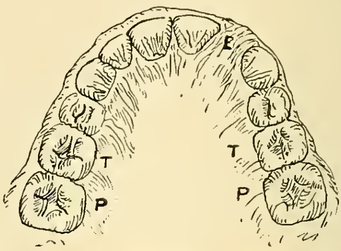


FIG. 715.—Appearance at close of the operation.

lower front teeth that when the upper centrals antagonized with it they were compelled to move forward in the direction indicated by arrows.

Fig. 716, a sectional view of the right half of the upper and lower jaws of a similar case, with a plane applied, represents the relation between the innermost tooth and the plane, as in this case.

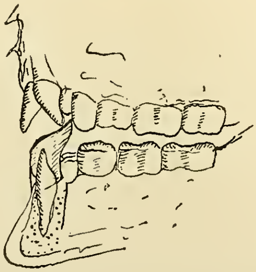


FIG. 716.—Sectional view of an inclined plane, as applied.

Fig. 715 represents the former case (Fig. 714) after the operation was completed. Only one week was required to correct the irregularity; but this is less time than is usually necessary. These teeth, like those of the majority of cases, by overhanging in front of the lower ones after being regulated, required no artificial means for retaining them in their new positions. (P, adult; T, deciduous molars.)

Regulating and Retaining Planes Combined.—Figs. 717 and 718 represent two peculiar inclined planes devised by the author for moving forward upper front teeth. Both of these mechanisms, which were constructed for esthetic

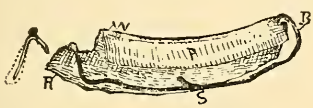


FIG. 717.—Gold spur-inclined plane with hard-rubber base (A).[1]

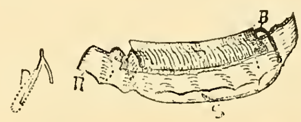


FIG. 718.—Modification of the same (A).

as well as practical use, served for retaining purposes as well as for correction of the irregularities. They are made in three parts: hard rubber, gold plate, and gold wire.

In the one represented by Fig. 717, P designates the inclined surface of a strip of gold plate, swaged to ride on the cutting-edges and in front of the (lower) incisors (see sectional view at left of the main figure); R, the hard-rubber base; W, a wire ridge; and B, the anchor-wire, having midway of its length a spur, S, to lodge between the incisors, to aid in keeping the plane in place. Each end of this anchor-wire B is vulcanized into the extremities of the hard-rubber part R.

When the mechanism is applied to the teeth the wire B extends forward from behind the teeth, over the approximal valley between the cuspids and first bicuspids, thence

[1] The mechanisms devised by the author that are represented in this work are indicated by the letter A at the ends of the inscriptions.

downward and along in front of the incisors near the edge of the gums. To prevent this wire from sliding upward on the teeth is the primary office of the spur, s, soldered to it. This spur, by means of the spring-wire B, projects between the central incisors and is held there. The object of the wire W is to heighten and sharpen the ridge so that it will project upward behind the ends of the upper incisors. This mechanism is esthetically valuable as a retainer in a case where the upper teeth are too short to overhang the lower ones.

The gold part of the plane represented by Fig. 718 consists of two pieces. The ridge is made sharp by the upper edge of one piece projecting above that of the other. This is indicated in sectional view at the left of the main figure. In other respects this mechanism is similar to the one last described.

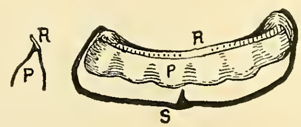


FIG. 719.—Gold Spur-inclined Plane (A).

Fig. 719 represents an all-gold inclined plane, constructed upon the same general plan as the last one described. This one, which was worn as a retainer by a young woman, was made as follows: The part, P, covering the teeth was of one piece of gold swaged to fit them; upon the front surface was soldered another and thicker piece of plate, R, which projected above it to rest behind the ends of the upper teeth.

These last three figures probably represent the best and least unsightly inclined planes yet devised. All are very useful for retaining in place corrected instanding upper front teeth that are too short, and until they are more fully erupted.

Of course such retainers are not necessary in cases where the grinding of the side teeth shorter would cause proper overhanging of the teeth.

Skeleton-planes.—Fig. 720 illustrates an operation by an old skeleton mechanism, constructed upon the principle of an inclined plane, as published by M. Catalan in 1826. In

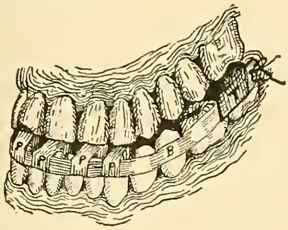


FIG. 720.—Plan of moving front upper teeth forward by a skeleton inclined plane (Catalan, 1826).

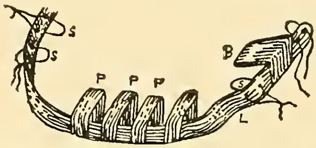


FIG. 721.—The main part of the mechanism.

this case all the upper incisors which were posterior to the lower teeth were moved by biting upon small pieces of plate bent as shown.

Fig. 721 represents independently the main part of the mechanism. This is not given here as one to be recommended, but to show a prototype of many that were later devised for similar cases. The construction and application were as follows: A thick strip of gold (long-band) to extend along the outer surfaces of the lower teeth, was of sufficient length to reach from the molars of the right side to the corresponding teeth of the left. The bow-pieces, P, P, P, serving as inclined planes, were soldered to this strip. These small pieces extended upward from the long one, thence posteriorly on and over the ends of the front lower teeth, and downward, covering their lingual surfaces. The extremities of the long strip were tied to the molar teeth by strings, S, S. To prevent the ends of this long strip from sliding down the teeth and injuring the gums, a broad piece of plate, B, was soldered at right angles to each extremity, and then bent so as to rest on the molars as shown.

This mechanism (like many of the crib-wire variety used by a few dentists at the present day) was faulty and inconvenient to wear, not only from its unsteadiness, but because it collected and retained large quantities of food debris, rendering the operation dangerous to the teeth and the general health.

Clasp-anchors.—Inclined planes, made on the principle of the last one described, have sometimes been anchored to the side teeth by broad clasps instead of strings.

Frame Inclined Planes.—I have constructed several peculiar inclined planes, which I have experimented with, but have not used all sufficiently to enable me to express full confidence in them. Plans of some of the modifications will here be given, in the hope that my readers will try to improve upon them. Contrary to the philosophy of the old plan of applying planes which rested upon teeth of the jaw opposite to those that are to be moved, these rest upon the teeth of the same jaw that contains those to be moved.[1]

These gold mechanisms, which are denominated frame-planes, are constructed upon a principle different from that devised by Catalan. They may be shaped so they can be attached to the side teeth of the upper jaw, or to those of the lower. When applied to the upper, the inclined plane is so placed against the (upper) teeth to be

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[1] *As there is an erroneous impression abroad that I have placed regulating mechanisms on the market for the profession, I take this opportunity to correct the error. I am not now, and never have been, financially interested in placing regulating mechanisms on the market in any way whatever; nor do I make a business of furnishing dentists privately with such mechanisms. In some instances I have, as a friendly act, assisted dentists.*

moved that when the lower front teeth strike it (the plane) they tend to move in the direction desired.

Either upper or lower teeth may be treated by these mechanisms, but the special object for which they were devised was, application to the upper jaw and moving teeth in the same arch.[1]

Figs. 722 and 723 illustrate the beginning of two operations for moving instanding upper incisors outward by similarly made (triple) planes. These planes differ from each other only in the form of the anchors. In one

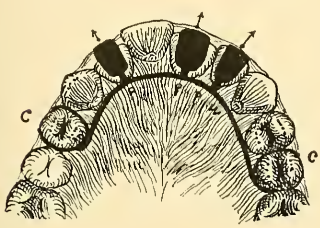

FIG. 722.—Triple plane, anchored by clasps (A).

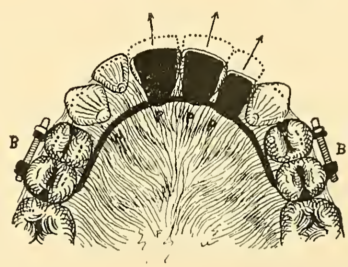

FIG. 723.—Triple plane, anchored by clamp-bands (A).

(Fig. 722) they consist of strong clasps, and in the other (Fig. 723) of clamp-bands. The upper instanding teeth are moved forward by the planes (shown in black) being pressed against them, by antagonism of the lower teeth against their under surfaces. The requirements of the case, of course, must govern the form and inclination of the plane.

Clasps are weak anchors, and may slip when teeth antagonize. Anchor-clasps are only practicable when the pressure of the lower teeth is between the clasps and the points of contact of the upper teeth with the plane, when bitten upon.

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[1] These mechanisms were first publicly explained in a lecture by the author, February 27, 1888. (See "Brooklyn Medical Journal," July of the same year.)

Fig. 724 represents a mechanism made similar to one represented by Fig. 112, Part VI., p. 232. It is a modification, differing in the addition of extra wires for supporting the side arms (to make the mechanism very rigid), and in the use of clamp-bands for anchors instead of clasps. The

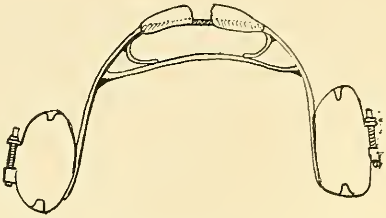

FIG. 724.—Bottom view of a double inclined plane for moving upper and lower teeth (A).[1]

object of making the inclined plane in two parts, as shown, is to enable easy adjustment where teeth must be moved in different directions. This division, however, weakens the mechanism. If necessary to make all more rigid, other pieces of stiff wire should connect the planes with the transpalatine wires, after being properly adjusted to the teeth to be moved.

When the mechanism is worn on the upper teeth the plane is inclined as represented by P, Fig. 732; but if it is to be attached to the lower jaw it should cap the upper third or half of the lower incisors, as shown by Fig. 733.

With this mechanism, as with all those here described, the stiff wire bow should lie along the lingual side of the dental arch, and as close to the gums as the circumstances will permit. To prevent the plane from being turned over or forced out of its proper place when bitten upon *it* also should extend nearly to the gums, so that the wire W can

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[1] From a lecture given February 27, 1888, published in "Brooklyn Medical Journal," July, 1888.

connect at as near right angles to it as possible (Fig. 732). The position of the wire, however, is not so important as its stiffness, excepting the rear end, which should be elastic.

Fig. 725 represents a modification, consisting of a piece of gold plate, P, soldered to the middle part of a stiff bow

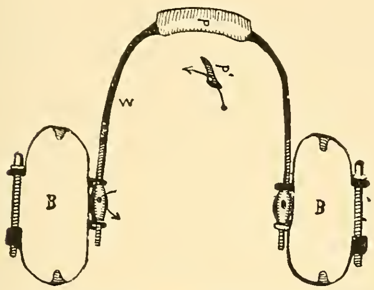


FIG. 725.—Frame inclined plane for the upper teeth (A).

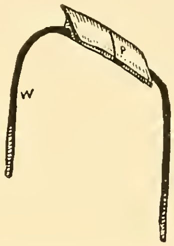


FIG. 726.—The plane part, detached from its anchor-bands.

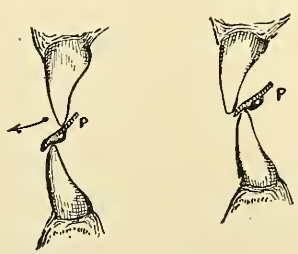
of gold wire, W. (See Fig. 726.) This bow is anchored to the side teeth by two clamp-bands, B.

Philosophy of Construction of Frame Inclined Planes.—As the practicability of these mechanisms depends upon a clear understanding of certain principles of mechanics, I shall go into details at considerable length concerning the effect of antagonism of the teeth upon the plane, and its supports. In order to make the plane firm on teeth the bow may be soldered to the clamp-bands, or it may be detachable. By the latter plan each extremity of the bow (which is screw-cut) is projected through two staples soldered on the lingual side of each of the anchor-bands. These arms are held there by nuts placed between the staples. By turning the nut one way the inclined-plane piece will move forward; and by turning it the other way, backward. A side section of this plane is shown in the middle of Fig. 725. This mechanism is not always sufficiently rigid.

These inventions have for their object the furnishing of delicate mechanisms that will be firm and strong, and not be so inconvenient to wear as the usual large rubber planes. By fastening them to the side teeth by screw-tightening bands, the mechanisms can be easily removed and as quickly readjusted.

The exact form of the plate used for the inclined plane depends upon the position of the irregular tooth, the direction in which it is to be moved, and its relation to those in the opposite jaw. The proper length and form of the wire arms for holding the plane in place depends upon the form of the dental arch, and the distance between the irregular tooth and the anchor of the mechanism.[1]

Figs. 727 and 728 illustrate the relative position of the plane and the incisor teeth before and after an operation.



FIGS. 727, 728.—Views showing the relation of the tooth and planes before and after an operation.

If the lower surface of the plane should be smooth the antagonism of the lower teeth against it would, while tending to move the upper incisors forward, also have a tendency to move the lower ones backward, unless the latter are held stationary. In this mechanism a check for

[1] Gold thimble-crowns cemented to some of the side teeth sometimes furnish sufficient anchorage for these mechanisms, but usually they are not equal to clamp-bands.

arresting the lower teeth in their progress is given by the wire soldered to the lower surface of the plane.

As before said, an essential element is proper stiffness of the wire arms; in fact, rigidity of the wire bow and plane is of the utmost importance. Unless it is *very* rigid the plane P, when bitten upon, will turn from its proper inclination and fail to do its work. The relation of the plane to the wire arms and their stiffness governs the behavior of the mechanism.

Fig. 729 illustrates the effect of force upon an improperly made mechanism. In this diagram, P represents, in section, a broad inclined plane, and the arrows the di-

FIGS. 729, 730, 731.—Showing the philosophy of action and reaction upon the plane.

rection in which the posterior part of it (plane) would move when bitten upon by the upper and lower incisors, if the arms were not sufficiently stiff. The forcing of this posterior part of the plane downward can be prevented by having the wire arms (especially the anterior parts) so stiff that they cannot bend. The necessary degree of rigidity of course depends upon how far the lower incisors are forward of the upper ones. The proper angle between the wire and plane is also important. Perhaps this point can be more clearly seen by contrasting Fig. 729 with Figs. 730, 731, which illustrate a "square on and under bite," that would not force the posterior border of the plane downward.

Fig. 732, illustrating an entire half of the mechanism, indicates by an arrow beneath the cuspid the direction in which the posterior part of the plane would tend to move by force of normally arranged lower teeth. In this figure

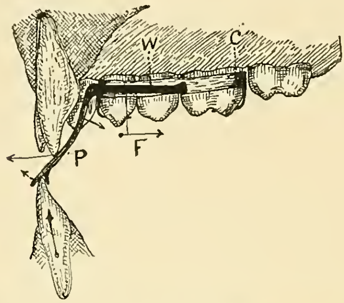


Fig. 732.—Showing the importance of having the connection of the plane and the wire nearly at right angles, or else very rigid.

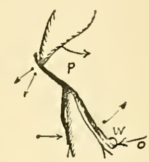


Fig. 733.—Showing the direction of influences of force applied on a lower inclined plane having considerable leverage.

the effect of the bearing of the plane against the stiff wire, W, (elastic at the anchor clamp-band C) is shown by an arrow under the bicuspids. Too much stress cannot be placed upon the fact that unless the plane and wire bear nearly at right angles, or the mechanism is rigid, the posterior part of the plane will move downward when bitten upon.

Fig. 733 shows (in section) by arrows, the direction in which the different parts of a plane would tend to move if worn on the lower teeth and bitten upon by protruding upper incisors. We shall have occasion to refer again to this point, after having explained the following three figures.

When it is necessary to move teeth in one jaw only, as in these cases, the opposite ones should be held stationary. To accomplish this end the inclined plane may have a groove made on its under side, by soldering a strip of plate to it. Another plan equally effective is to bend the plane, forming a trough for the under teeth to rest in.

Figs. 734, 735 represent sectional views of two similar grooves made by the former (soldering) process.

Fig. 736 is a like view of a groove made on the latter plan.

FIGS. 734, 735.—Sectional views showing one form of groove for holding stationary the lower incisors (A).

FIG. 736.—Sectional view showing a large lock made by bending the plane (A).

Fig. 737 is a sectional view of a plane having a groove on the upper side for holding the upper incisors stationary while the lower ones are sliding posteriorly on its lower side.

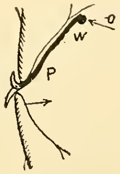


FIG. 737.—Sectional view of a groove on a plane for holding upper teeth stationary (A).

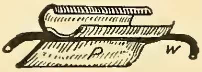


FIG. 738.—Lock-plane (A).

Fig. 738 shows another but inferior form of plane for holding upper incisors stationary.[1]

When it is necessary to move the upper and lower teeth unequal distances at the same time, or, in other words, to force the front teeth of one jaw a certain distance and then hold them there, while the opposite antagonizing teeth are allowed to continue their movement, a lock-shoulder should be made on one side of the inclined plane, at such a place as will permit the teeth to move

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[1] The application of this mechanism is shown in section by Fig. 112, Part VI., Chapter XX., p. 232.

the shorter distance and then arrest them at the proper place, while the opposite ones can move farther, until they are stopped by the other groove or lock.

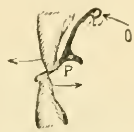

FIG. 739.—Plane with a lock for moving upper and lower teeth at the same time (A).

FIG. 740.—Plane with a lock for moving upper and lower teeth at the same time (A).

Fig. 739 illustrates a sectional view of a modification of this class of planes, having only one lock.

Fig. 740 illustrates a similar view of a plane having two locks.

Notwithstanding all that has been said is true, it should be remembered that the distances between the place of antagonism upon the plane and the anchorage must also be taken into consideration; for if the wire arms and the anchor-bands combined are too short, the leverage being short, the tendency to elevate the anchorage teeth would be much greater than if their length were greater. In other words, the anchorage should be as far from the plane as practicable. It should also be remembered that the extremities of the wire arms (their ends being soldered to the anchor-bands) should be filed near the ends, so that the plane will play slightly when bitten upon, in order to follow the changed positions of the teeth being moved, without causing the anchor-bands to move up and down.

CHAPTER LXXIV.

MOVING UPPER INCISORS BY STRINGS AND BY ELASTIC RUBBER ALONE.—MERITS OF ELASTIC RUBBER AS AN AGENT FOR CORRECTING IRREGULARITIES.

GENERAL REMARKS ON THE USE OF STRINGS.—DELABARRE'S PLAN OF USING THEM.—MAURY'S GUM-GUARD HOOKS IN COMBINATION WITH STRINGS.—ELASTIC-RUBBER RINGS.—EVIL EFFECTS OF PRESSURE UPON FULCRAL TEETH BY STRINGS OR BY ELASTIC RUBBER.

A VERY old plan for regulating front teeth explained in 1768 by T. Berdmore, was to place a gold wire or silken ligature around and among the teeth, in such a way that it would draw or bear upon the irregular tooth or teeth in directions that would tend to correct them. More than half a century afterward, Delabarre in 1826 and Maury in 1828, and still later Harris in 1839, mentioned in their books similar uses of (silk) ligatures. When, in 1846, E. A. Tucker introduced strips of elastic rubber for the purpose it was a decided step in advance, as this made it possible to more easily secure the force. At that time rubber rings were not in market. As these rubbers were cut from a sheet, and then tied to the teeth by strings, they would often pull out of the places made for them. Through the invention of rubber tubing this difficulty was overcome in a measure, but only in a measure, as the tubing at that time was not made strong at the seam. Years afterward tubing was so improved that it would not often break. The strongest and most useful rubber rings that I have found are called "election rings" (furnished by rubber companies for binding ballots). The different plans for using "election rings" will be explained in their appropriate places under treatment of cases.

Fig. 741, drawn from Delabarre's book on Dentition, shows how he applied a string in one case. His plan (which was old even then) was to fasten a silken string to a posterior tooth and ride over and under other side teeth so that it would draw outward the instanding right upper

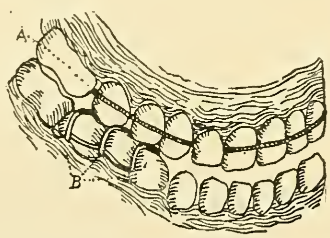

FIG. 741.—An old plan of moving a lateral outward by a string (Delabarre, 1826).

lateral. To prevent antagonism of the two dental arches a crib or basket, made of round wire, was placed upon and over some of the lower side teeth, to bite upon. This gag was made similar to the round-wire cribs now used by some dentists for retainers and for anchoring wire springs.[1]

Maury Gum-guards.—Fig. 742 represents separately the Maury guards. Being of double hook or ring form they

[1] These wire cribs or basket mechanisms have been redevised by different dentists several times during the last twenty-five or thirty years, each deviser believing himself to be the original inventor. The crib, however, while sometimes effective, is generally inferior to the clamp-band, because less firm. Cribs made upon the plan of the Schange crib (1848) are, however, useful on teeth having small necks.

permit one part to be caught over the end of a tooth, leaving the other part to hold strings or rubbers in place.

In these Maury guards, though crude in design, may be seen the principle of all gum-guards made at the present day, whether used independently (like those devised by

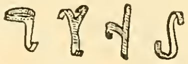

FIG. 742.—Gum-guard Hooks (Maury, 1828).

myself) or in combination with clamp-bands and long-bands. I was not aware, however, of Maury's mechanisms until many years after I devised and published mine. My cuspid-guard is exactly like the first guard shown in Fig. 742 (Maury's). (See Part VI., Chapter XXI., p. 243.)

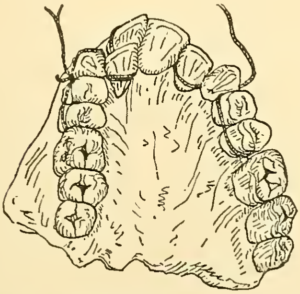

FIG. 743.—Moving several teeth by a string (Maury, 1828).

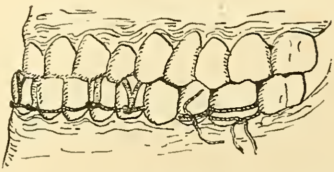

FIG. 744.—Moving teeth by strings (Maury).

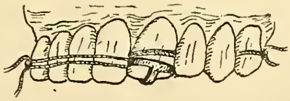

FIG. 745.—Moving teeth by strings (Maury).

FIG. 746.—Moving teeth by strings (Maury).

Figs. 743, 744, 745, and 746, from Maury's work,[1] written two years later than Delabarre's, illustrate how Maury used strings in combination with his gum-guard hooks.

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[1] "Traité Complet de l'Art du Dentiste," par F. Maury, Paris, 1828.

Evil Effects of Pressure upon Fulcral Teeth by Strings or Elastic Rubber.—Though the use of strings and rubber rings alone is sometimes practicable, the unfavorable shape of some teeth frequently prevents their use. There are also cases in which their influence might be improper upon teeth intended to serve as fulcrums, over or around which they bear or play. This would be so where the

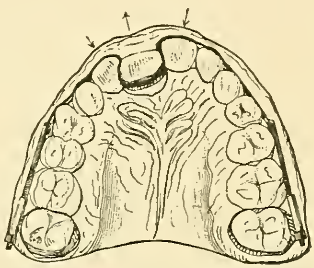

FIG. 747.—Improper application of rubber.

teeth borne upon would cause crowding. Fig. 747 represents an improperly applied string or rubber ring. Such difficulties, however, can generally be easily overcome by drawing the strings or the rubber rings over gold hooks advantageously located on stiff wires extending from anchors on other teeth. Besides the above-mentioned supports for holding strings and rubber rings in place, preventing their riding upon the teeth, there is the modern gum-guard ring, of which there are several varieties. (See Part VI., Chap. XXI., p. 43.)

Corrugated Metallic Ribbons.—As wearing of elastic-rubber rings, stretched around and between teeth, has its prototype in the older plan of wearing strings, as mentioned by Catalan and by Delabarre,[1] so, too, the wearing

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[1] A. D. 1826.

of thin strips of metal in this manner, as mentioned by Salter, Byrnes, and others, was probably suggested by the same plan. Regarding the value of corrugated strips opinions differ. That they have any advantages over rubber rings the author thinks is doubtful. Probably, however, the relative value of the two depends somewhat upon the conditions of the case in hand. Dr. Byrnes certainly deserves credit for drawing out their greatest value.

CHAPTER LXXV.

MOVING UPPER INCISORS BY ELASTIC-RUBBER RINGS IN COMBINATION WITH PLATES AS ANCHORS.

MECHANISMS CAUSING CONTINUAL FORCE MORE NUMEROUS THAN THOSE CAUSING INTERMITTENT FORCE.—GENERAL REMARKS UPON CONSTRUCTION OF PLATES, SHOWING HOW TO RENDER THEM FIRM AND USEFUL.—ELASTIC-RUBBER RINGS AND SPIRAL SPRINGS WITH PLATE-ANCHORS.—PLATES WITH HOOKS.—PLATES WITH ARMS.—CLAMP-BAND PLATES THE BEST OF ALL ANCHOR-PLATES.—DETACHABLE STAPLES, HOOKS, AND BUTTONS, FOR PLATES: HOW MADE.—OPERATIONS BY DIFFERENT DENTISTS.—THE RELATION BETWEEN THE MEDIAL LINE AND THE POSITION OF THE FRONT TEETH.

MECHANISMS in vogue for moving teeth by continued force are more numerous than those for moving teeth by intermittent force. This arises not only from the fact that the former are cheaper, but because such mechanisms can be more easily contrived to suit a greater number of cases. The active value of these mechanisms (for continued force) varies widely; some are very effective, and others not at all. Only those which are regarded as practicable will be explained. Of these the plate mechanisms used in combination with elastic-rubber rings will be considered first. In later chapters a large number of skeleton mechanisms, in which rubber rings constitute a part, and in which the plate has no part, will be represented and explained.

Elastic-rubber Rings with Plate-anchors.—In Part VI. (Chapter XIX.) the subject of construction of different kinds of plates was considered, and several plans for attaching elastic rubber to them were given. Many points not sufficiently dwelt upon there will now receive further attention.

The most unsatisfactory way of anchoring plates is by strings; but clasps, especially the Tomes clasp, the Schange crib-clasp, and the Lachaise crib (double clasps), are supe-

FIG. 748.—Tomes's principle of the clasp.

rior because (as anchors) they are firmer. One of the best means now known is by clamp-bands vulcanized to the plate, devised and published by the author several years ago. By these clamp-bands (one on each side) the plate is firmly bound in place. (Schange, Lachaise clasp, see Chap. LXXXI.)

No plate should press too strongly upon the soft tissue. With a simple or unaided plate, or even one having clasps, (if the side teeth incline inward at so great an angle that the plate would move against the gum sufficiently to injure it,) the injury may be prevented by gold ears so attached to the plate or to the clasps that they will rest in the sulci of the crowns of some of the side teeth. This precaution, however, is more necessary in cases requiring widening of the dental arch than in others.

If clamp-bands are used on the plate, ears are seldom necessary, because either the buccal or the lingual sides of the clamp-bands (by bearing on the inclining walls of teeth) prevent them from impinging hard upon the gums.

To connect protruding incisors with plates (the draught to be within the dental arch) elastic-rubber rings are often used. Siegfried and other dentists sometimes use spiral springs. The collection of food *débris* in such springs, however, is liable to become offensive.

Clamp-band Anchor-plates: how made.—Clamp-band plates (see Figs. 749, 754, 756) are constructed upon a cast of the teeth as follows: Having selected the proper teeth on each side for anchorage, the clamp-bands are first fitted to them,

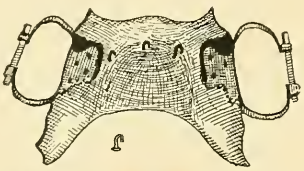

FIG. 749.—Clamp-band Plate (A).

after which a piece of gold plate (called the wing) about one-fourth of an inch in width is soldered to the lingual side of each. The two bands are then placed upon the cast, and held in position by sufficient additional plaster to cover the screws of the clamp-bands. (This, of course, is applied on the buccal side of the teeth.[1])

Staples and Hooks for Plates.—The means of attaching an elastic-rubber ring may be a staple, a hook, or a button. The hook is generally the best.

Ready-made wire staples and hooks are fixed to plates in various ways. Often they are fastened to the casts before the plate is vulcanized. This is done by making one leg of the staple or the hook of extra length, which is then forced into the cast, leaving the eye, the hook, or the button projecting above the cast sufficiently to permit the

[1] For full explanation of the philosophy of action of force upon plates, see Part IX., Chapter XLIV., p. 468.

rubber plate (when vulcanized) to embrace its neck, the ring or the hook appearing on the opposite side of the plate. (See Fig. 750.)

When the cast is placed in the flask, the rubber is packed over, under, and around the staple, and then it is vulcanized in the usual way.

When ready to insert the plate in the mouth the staples or buttons are bent to poise in any desired direction for holding the elastic-rubber rings.

Fig. 750.—Old form of staples and hooks.

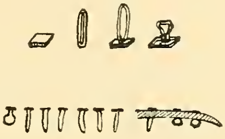

Fig. 751.—Different forms of modern staples for plates (Wilson).

Ready-made Staples and Buttons.—Fig. 751 represents several ready-made staples as devised by Dr. C. P. Wilson. This "Wilson-loop," which is superior to those represented in Fig. 750, is made as follows: Take a piece of soft gold, or platinum wire half an inch or less in length, and having doubled it upon itself, solder the two ends together; join them also to the center of a disc or a square piece of plate one-twelfth of an inch or more in diameter. These (which should be kept on hand in quantities), are fixed to the plate in two ways: by being vulcanized to the plate, or applied after the latter is vulcanized. If used on the detachable plan a hole is bored through the plate at the proper place, and countersunk on the palatine or alveolar side. The staple is then pushed through the hole, until its disc or square head rests in this countersunk recess; it is then opened by an excavator passed through the protruding part; this widens it into a ring, ready to have tied to it the elastic rubber. When required to be used as a button the wire part may be vulcanized into the plate, leaving the disc projecting above the plate.

Ready-made Tack-pins for Hooks.—Fig. 752 represents a handy kind of attachment that is convertible into hooks for plates within two minutes. This hook is made of a piece of soft gold or platinum wire about the size of a pin

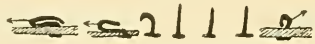

FIG. 752.—Platinum tacks for hooks (A).

and about half an inch in length, hammered flat on one end, or soldered (at one end) to the center of a disc of gold or platinum one-twelfth of an inch or more in diameter.

When the plate is vulcanized and polished a hole is bored through it, and countersunk on the under side, after which the leg is projected through the hole until the head rests in the recess. The leg is then bent so as to form a hook ready for connecting the elastic-rubber rings.

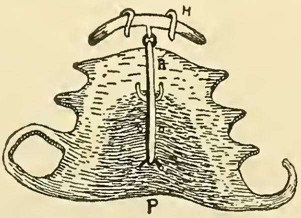

FIG. 753.—Mechanism for drawing back protruding upper centrals (Kingsley).

Plates.—Fig. 753 represents a mechanism by Dr. N. W. Kingsley for drawing posteriorly protruding upper centrals. It consists of a hard-rubber roof-plate, P, an elastic-rubber ring, R, and a Linderer strip, H, having two hooks. The metallic part is placed in front of the teeth (to draw upon them), and is connected with the posterior part of the plate by the rubber ring which is tied to it by a string through holes. The plate is anchored to the side teeth by hard-rubber clasp-like projections from the posterior corners of it. For further remarks upon the subject of the proper place to attach the draught, see Part VI., p. 214.[1]

Fig. 754 represents a mechanism for drawing an outstanding left central into line by the power of a rubber ring. The entire mechanism consists of five elements: a

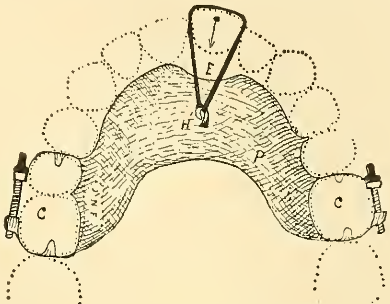

FIG. 754.—Clamp-band anchor-plate for an elastic-rubber ring (A).

hard-rubber plate, P, a hook, H, two anchor clamp-bands, C, C, and one elastic-rubber ring, E. The author's improvement is the application of clamp-bands to the plate to secure firm anchorage.[2]

After the plate has been placed in the mouth and the clamp-bands screwed firmly to the side teeth, the rubber ring is placed over the outstanding tooth, and then stretched and caught upon the hook in the middle of the plate as represented. This rubber draws upon the tooth in the direction indicated by the arrow. Should

1 This hook-strip H is like Linderer's strip with hooks. (See Fig. 14, "Handbuch der Zahnheilkunde, Zweiter Band," Joseph Linderer, Berlin, 1848.) The same is represented in Part XIX. of this work.

2 The plan of anchoring a roof-plate by clamp-bands was first published by the author in the "Dental Cosmos," January, 1888. See Fig. 89, Part VI., Chapter XIX., p. 219.

there be insufficient space between the teeth to admit the outstanding central, the rubber ring should be caught upon two hooks set widely apart on the plate. By this plan the same rubber forces the adjacent teeth farther apart at the same time that it draws upon the outstanding tooth.

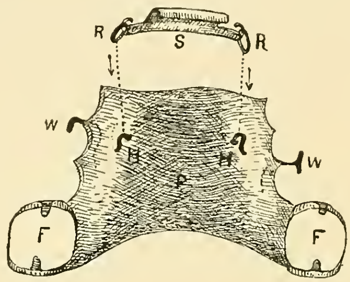

FIG. 755.—Mechanism for moving protruding upper centrals (modification of mechanisms devised in parts by Linderer, Tomes, Harris, Kingsley, and the author).

Fig. 755 represents a mechanism for drawing posteriorly protruding upper centrals by the power of elastic rubber. The mechanism consists of a narrow strip of flat gold, S, having attached to it (by solder) a broad, hook-shaped piece of plate, two elastic-rubber rings, R, and a hard-rubber plate, P, having hooks, H (similar to the knobs used many years ago by Dr. C. A. Harris). The plate is inserted in the arch, and held on the side teeth by ferules, F, F, and kept from injuring the gums by lugs, W, W. The hook-strip of gold is only a slight modification of J. Linderer's hook-strip. (See cut in Part XIX.) When ready to apply the mechanism the strip S is placed across the front of the incisors, and drawn upon by the rubber rings (stretched between the laterals and cuspids), and caught on the hooks in the plate. To prevent the strip S slipping upward and bearing on the gum is the object of the broad hook, which catches over the ends of the incisors.

Fig. 756 represents a mechanism for drawing, posteriorly, two prominent upper incisors. It consists of a gold T-piece, T, to bear upon the labial surfaces of the incisors, an elastic-rubber ring, R, and a hard-rubber roof-plate, P, having two clamp-bands, C, C. The clamp-bands, which are vulcanized to the plate, are to fasten it firmly

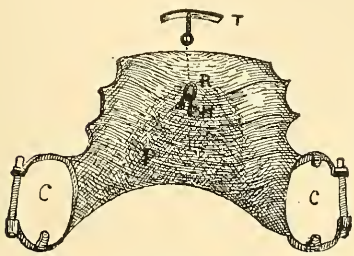

FIG. 756.—Mechanism for moving protruding centrals (modification of mechanisms by Harris, Kingsley, and the author).

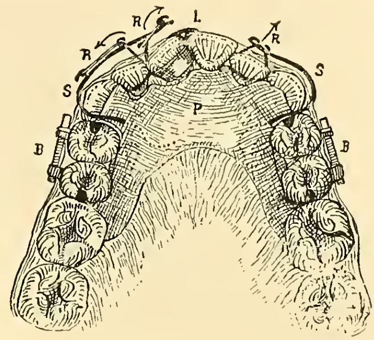

FIG. 757.—Moving incisors by elastic rubber in combination with a plate having arms (A).

to the side teeth. The elastic rubber is stretched and caught on a tack-hook, H, in the middle of the anterior part of the plate. With the exception of these anchors this mechanism (like the one represented by Fig. 755) is only a modification of one previously used by Dr. Kingsley.

For further remarks concerning elastic rubber in combination with plates, and also concerning the use of peg-plates, see Part VI., Chapter XIX., p. 211.

Fig. 757 illustrates an operation by a mechanism similar to that pictured in Part VIII., Fig. 402, p. 431. The operation was for turning the right upper central and lateral, and moving the left lateral outward to line.

The mechanism in detail consisted of three elastic-rubber rings, R, R, R, a hard-rubber roof-plate, P, two gold clamp anchor-bands, B, B (to fasten the plate to the bicuspids), and two stiff gold-wire arms, S, S, of the size of a large pin, one extremity of each of which was vulcanized into the plate. (See dotted lines.) On the longer wire arm were two hooks, and on the shorter, one, all three of which were of gold wire, about the size of a small pin.

On the right central was cemented a thin platinum ferule having a short platinum-wire arm. On a hook at the extreme end of this arm was caught one of the elastic-rubber rings, which, after having been stretched, was again caught upon the hook-end of the long arm. This draught was for turning the tooth in the direction indicated by the arrow. To aid in this operation a lifting force was added by another piece of wire, L, so soldered to the labial side of the ferule that it would rest upon the left central as shown. The right lateral was acted upon by a second rubber ring tied to the tooth in such a way as to draw upon its anterior approximal side, when drawn through the middle hook on the long arm, and caught upon the posterior hook.

To move the left lateral outward to line it was drawn upon by a third rubber ring caught between two hooks on the free extremity of the shorter wire arm. Such a mechanism is somewhat bulky, but when skilfully made and properly applied the success of the operation is certain. I now make one rubber do the work of the three.[1]

Box-plates.—Many dentists make anchor-plates on the "box plan." The box-plate is held in place on the side teeth by enclosing their crowns. As these plates are always liable to injure the teeth they should be used only by patients who will keep them scrupulously clean.

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[1] Though entirely original with me, this mechanism (excepting the addition of the clamp-bands for anchorage) I subsequently found in principle (distant) to be only a modification of one previously devised for the lower teeth, and represented in Oral Deformities, Fig. 35, p. 86, by Dr. Kingsley.

Fig. 758 illustrates a case in which the upper laterals had never erupted, and which, to all external appearances, were not present within the jaw. It also illustrates the first of four stages of an operation for moving the centrals to make room for insertion of two artificial laterals.

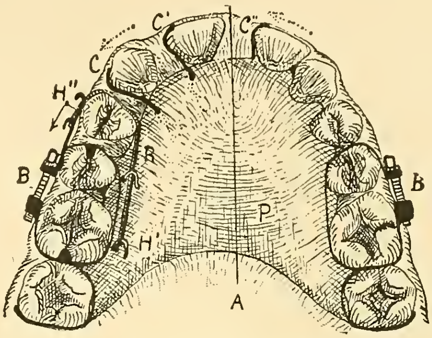

FIG. 758.—Placing four front upper teeth evenly as regards the medial line (A).

Because of the unused space in the dental arch most of the remaining front teeth had drifted from their normal positions, leaving several interdental spaces, one of which was between the centrals. Nearly all this space (which was one-fourth of an inch) was at the left of the medial line A. The left central stood in place of the left lateral; the right central a shorter distance to the right of the medial line. The right cuspid and first bicuspid stood separately. As the patient was a young woman this one-sidedness was strikingly conspicuous; therefore it was more important that the deformity should be corrected than if the case had been that of a man having a mustache.

It was as desirable to place the centrals evenly in regard to the medial line as it was to insert the artificial laterals. This part of the operation included, also, the moving of the right cuspid and first bicuspid to the (patient's) right;

indeed, to transfer, as it were, all the spaces into two for the accommodation of the lateral incisors. As the moving of these four teeth required firmer anchorage than the posterior teeth on the right side of the jaw could give, it was necessary to place in bondage all the teeth except those to be moved; even the aid of all these teeth, excepting one at a time, seemed necessary to move the one tooth left free.

The mechanism used consisted of a rubber ring, R, and a hard-rubber roof-plate, P, having two gold clamp-bands, B, and three gold fingers, C, arranged upon teeth as represented. The rubber ring was the engine of force, and the plate and clamp-bands the anchor for it.

The first stage of the operation was the moving of the first bicuspid back against the first molar by a rubber ring stretched over it (see checkered line) and caught upon the hooks H′, H″. This having been accomplished, the tooth was held in place by a clasp, C (on the adjacent cuspid), after having been bent posteriorly so as to rest against it. The second stage of the operation consisted in catching another rubber ring upon the same hooks, and stretching it forward over the cuspid, to draw it back against the first bicuspid, after which it was held there by bending another finger, C′, back against it.

These teeth now having been moved into their proper places, the third stage, the moving of the left central, was begun. This was done by interposing wedges of wood between it (the left central) and the cuspid; when this tooth had been moved to the medial line there was left sufficient space to admit of an artificial left lateral.

The fourth stage consisted of the insertion of the two artificial laterals on a delicate, half-round gold wire having two small clasps to hold it in place. The plan of this partial denture, which served as a permanent retaining mechanism, is given in Part XIII., Chapter LXI., pp. 650, 651.

Of course the mechanisms used in this operation (like those in some others explained in this work) occasionally required slight alterations, such as the scraping and filing of the plate and clasps, to meet the changes made by the movements of the teeth; but the general form of the mechanism remained the same throughout the operation.

The right central was moved to the medial line, by a wedge between it and the right cuspid, just before the laterals were inserted.

CHAPTER LXXVI.

MOVING UPPER INCISORS BY ELASTIC-RUBBER RINGS IN COMBINATION WITH BASKETS OR CRIBS; WITH FERULES HAVING KNOBS OR HOOKS; AND WITH CLAMP-BANDS SERVING AS ANCHORS.

DIFFERENT KINDS OF ANCHORS.—FERULES, CRIBS, AND CLAMP-BANDS.—SCATTERED ANCHOR TEETH.—OPERATION BY A RUBBER RING WITH A HARRIS BAND AND GUM-GUARD RING.—BY A RUBBER RING AND HOOK-BAND.—BY A FERULE, RUBBER RING, AND CLAMP-BAND.—BY THE SASH CLAMP-BAND.—BY AN EXTENSION-ROD MECHANISM.—BY A TRACK MECHANISM.

A DELICATE anchor, and one of the best known for attaching an elastic-rubber ring to move a tooth posteriorly, is the crib-clasp of Lachaise, or some form of clamp-band, or a ferule[1] placed around one or more of the teeth, serving as anchorage to the one to be moved.

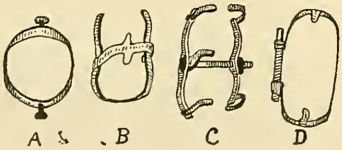

FIG. 759.—Four kinds of anchor-bands.

In Fig. 759, A represents the C. A. Harris band or knob ferule; B, the crib-clasp of Lachaise; C, a trans-

[1] Authorities differ in regard to the spelling of this word. Some use one *r*, and others two. In this work the plan of using a single *r* has been adopted.

verse screw clamp-band; D, a longitudinal screw clamp-band.

The Harris band (sometimes erroneously called the Magill band) consists of a ferule having two knobs soldered to it for attachment of draught-cords. It was used by Harris in 1839 to turn a tooth.[1]

The Lachaise anchor consists of narrow strips of plate bent to embrace two or more teeth. This crib somewhat resembles the Delabarre round-wire crib (1826), the forerunner of the one used much later by W. H. Atkinson, and many years later still by V. H. Jackson and others.

The transverse screw clamp-band is a screw-crib. It consists of two strips of plate connected by a screw.

The longitudinal screw clamp-band consists of a thin ribbon of gold having a nut on each end. These nuts are connected by a screw as shown.

Anchor-ferules.—Ferules are often made of plate, but those of rolled wire are tougher and less liable to break. The wire is rolled to the thickness of heavy writing-paper (about Nos. 32–34), and then it is cut to any desired width. The broadest ferules are nearly the length of the crown of the anchor tooth.

The C. A. Harris band or ferule is regarded by some dentists as superior to any other kind of band for an anchor. It is an excellent small anchor where only one tooth is to serve as anchorage, but for firmer anchorage, embracing several teeth, the clamp-band is more reliable and therefore superior to it. Not only is it easier to ap-

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[1] The Harris knob-ferule Dr. S. H. Guilford calls the "Magill band." It is due to the honor of Dr. Magill that he does not wish to be forced into the position of a usurper of another's invention, and does not claim to have been the first to make and use this kind of a mechanism. In a letter to the author he says: "I did not make such until 1871, and do not claim it." Dr. Harris published a description of this kind of ferule (having knobs) in 1839.

ply, but it is adjustable to any size and to any number of teeth, and is less difficult to remove than a cemented ferule. Moreover, the draught upon a clamp-band embracing more than one tooth will not turn the teeth within the band. This cannot be said of a single ferule with a draught upon one side only.

Unless the ferule is skilfully made and properly applied it furnishes a tight trough around the neck of the tooth, in which food will lodge, and if left too long at a time is more liable to lead to injury than the clamp-band. However, if the ferule fits the tooth properly there is no danger.

Are Clamp-bands Safe?—It may be thought that flat clamp-bands would be liable to accumulate food and injure the teeth; such an opinion, as experience has proven, would be erroneous. I have used these bands for a quarter of a century, and have never yet seen a tooth injured by them. It is true that a trough is sometimes present when a flat clamp-band is used, but it is so formed that the saliva will play back and forth between the band and tooth sufficiently to neutralize any *débris* and thus prevent injury. It is prudent, however, to remove any anchor-band once a week and thoroughly cleanse the teeth. In cases where a flat (ribbon) band would possibly be imprudent to wear, I use a clamp-band made of round platinum wire, which cannot collect *débris*.

Concerning the construction of ferules, see Part VIII., pp. 427–433, also Part XVI. (on Turning Teeth). For construction of clamp-bands, see Part VIII., pp. 410–423.

Fig. 760 illustrates, in the case of a child, an operation the object of which was to make room for an instanding upper right lateral, by moving posteriorly the first bicuspid and cuspid, after having extracted the second bicuspid.

The process consisted in moving the bicuspid and cuspid by a plan the principle of which was explained many years ago by Dr. C. A. Harris (1839–50). The different parts of the mechanism (which are represented separately in Fig. 761)

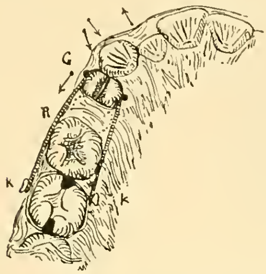

FIG. 760.—Moving an upper first bicuspid by a rubber ring and knobbed ferule, to make room for an irregular lateral.

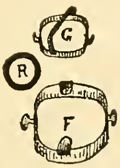

FIG. 761.—Different parts of the mechanism: Harris band, author's gum-guard, rubber ring.

consisted of one gold Harris band or knobbed ferule, F, a rubber ring, R, and one bicuspid gum-guard ring, G.

The rubber ring was first caught on the knob K, on the lingual side of the ferule F; then it was stretched forward over the bicuspid, thence back, and caught on the buccal knob K. Soon after the bicuspid had started back (by the draught of the rubber) the cuspid began to fall back of itself. This soon liberated the instanding lateral, which then slowly moved outward to line. The directions in which these different teeth moved are indicated by arrows.

The gum-guard ring prevented the rubber from sliding upward on the tooth and injuring the gum. To keep the anchor-ferule from similarly sliding upward on the molar tooth, ears (represented in black) were soldered to it, and then bent so that they rested on the grinding surface of the molar. The parts of the mechanism that are ascribed to Harris is the ferule F, and the draught-cord (not rubber). These were connected by knobs soldered to the ferule.[1]

Fig. 762 illustrates the case of a child for whom a left upper cuspid and a lateral were, at the same time, moved

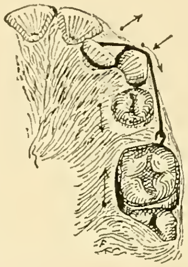

FIG. 762.—Moving an instanding lateral outward by a rubber ring in combination with a ferule (slight modification of the Harris plan).

into their proper places. The first step in the operation was the extraction of the left second bicuspid, to make room for the first bicuspid to be moved back. The next was the moving of the teeth. The ferule (Fig. 763)

FIG. 763.—The Anchor.

was cemented on the first molar, and then a rubber ring was caught on the hook and stretched over the outstanding cuspid, thence on to the instanding lateral. The rubber ring was removed daily by the patient, and substituted by a new one. To prevent turning of the molar the hook was soldered to its anterior side. By this plan the four teeth slowly moved into line. (See arrows.)

As a rule, it is a better plan to first move back the bicuspid, then the cuspid, and lastly the lateral. When teeth are erupted sufficiently to hold the rubber ring in

[1] The use of elastic rubber (not rings) was first suggested in 1846 by Dr. E. A. Tucker.

place, this is an easy plan of treatment. Even if the crowns are not fully erupted, and are short, the operation can be successfully performed by cementing ferules (with hooks) on the short teeth, to which the rubber ring can be attached. If in any case the rubber ring would slide upward and injure the gum, such a ferule should be used.

Anchor Clamp-bands.—Clamp-bands for anchorage purposes are more difficult to make than simple ferules; but, as said before, when it is necessary to embrace more than one tooth for anchorage they are superior to the ferules. For attaching the rubber ring, a hook is soldered at some convenient place on the band. The posterior end of the screw, however, can be made to serve for the same purpose. Even the ears will sometimes be sufficient.

FIGS. 764, 765.—Longitudinal screw clamp-bands for anchoring elastic-rubber rings (A).

Figs. 764 and 765 represent two modifications of such bands, together with the rubber rings. For particulars on the construction of clamp-bands, see Part VIII., pp. 410–423.

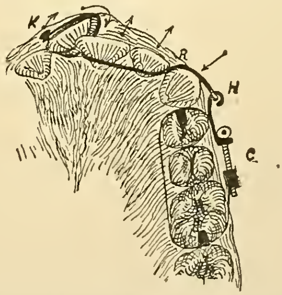

FIG. 766.—Moving upper incisors by elastic rubber anchored to a clamp-band (A).

Fig. 766 illustrates an operation for moving the upper incisors by a mechanism consisting of a gold Harris ferule, placed on the right central, in combination with a rubber ring, R, and a hook clamp-band, C, placed on the bicuspids and first molar. The rubber ring was caught on the knob K on the ferule, and, having drawn it between the centrals, it was stretched between the lateral and cuspid, thence over the latter, and fastened on the hook H on the clamp-band C. In this operation the rubber bore upon the incisors and cuspid in such a way as to cause them to move in the direction indicated by arrows.

In this case it was necessary at different times to vary the degree of tension of the rubber, by substituting for it one of another size. It was also essential, during the latter stages, to make slight changes from this plan of application of the rubber, in order to cause variation in the directions of movement of the teeth.

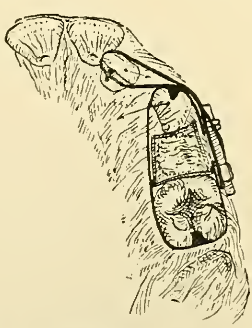

FIG. 767.—Drawing a lateral to line (A).

Scattered Anchor Teeth.—The Sash Clamp-band Plan.— Fig. 767 illustrates an operation for drawing an instanding left upper lateral to line by an elastic-rubber ring. The special object in presenting this case is to show a unique plan of using scattered teeth for anchorage. Here the anchor-band (sash clamp-band) is made to embrace the left cuspid and first molar, the first bicuspid having been extracted before I saw the case. To prevent the clamp-band from drawing these anchor teeth together, a rectangular frame made of round wire was soldered in it (posterior angles only), leaving the freedom of the band intact. The rubber ring was first caught over the posterior end of the clamp-band screw, thence it was stretched, and caught on the ferule on the lateral. This drew the tooth into place without causing the anchor teeth to encroach upon the space belonging to the unerupted second bicuspid.

Fig. 768 represents a slight modification of this sash clamp-band.

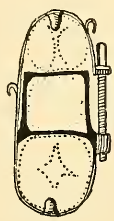

FIG. 768.—A Sash Clamp-band (A).

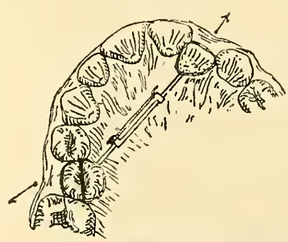

FIG. 769.—Moving outward a left upper lateral and right second bicuspid by an extension-rod operated by a rubber ring (A).

Fig. 769 illustrates an operation for moving outward two instanding upper teeth—a left lateral and a right second bicuspid—by a gold extension double rod operated by a rubber ring.

The mechanism is constructed as follows: The rod is made in halves by placing pieces of half-round gold wire alongside of each other. The wire is about the thickness of a large pin and double in width, the length of each piece being nearly equal to the distance between the instanding teeth. These wires, placed with their flat surfaces in contact, are held together by two small gold ferules, one being soldered to the end of each wire. The opposite extremities of the wires slide through each other's ferule. These (ferules) were so formed as to hold the wires in contact, yet sufficiently loose to permit them to slide easily upon each other. A hook (shown in black) was soldered to each of the bands.

To ascertain the proper length of the rod, the distance diagonally across the dental arch, between the two instanding teeth, was taken. A narrow ferule was soldered to the free end of one wire, and a bicuspid gum-guard ring to the free end of the other. With the exception of the rubber ring this completed the mechanism. To apply it, the ferule and the gum-guard ring were placed on the instanding teeth as shown; after which a small rubber ring (see checkered line) was caught on one of the hooks on the extension (double) rod, and then stretched through the other hook, and back to the one first mentioned, where it was then lodged. This rubber ring lengthened the rod, thus forcing the teeth farther apart, and in the direction indicated by the arrows.

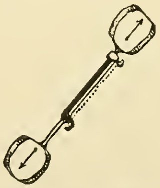

FIG. 770.—A modification of the same mechanism. The dotted line represents the rubber ring (A).

Fig. 770 represents a slight modification of this mechanism. One of the wires and its ferule is represented in black, and the other in white. This extension-rod is made of round instead of half-round wires, and is held together by one extremity of each being bent around the opposite one. These mechanisms are delicate and effective.

Track Mechanism.—Fig. 771 represents a delicate gold mechanism for pushing an instanding *left* upper central outward to line.

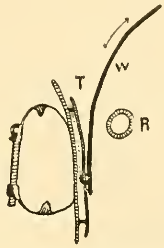

FIG. 771.—Track mechanism for moving forward an upper central by power of a rubber ring (A).

To the lingual side of an anchor clamp-band is soldered a strip of plate, and projecting inward from this strip are two very short wire posts. To the ends of these posts is soldered a piece of flat wire, T, for a track. Upon this track slides a small rectangular ferule, fitting it snugly, but not tightly. To this ferule is soldered one extremity of a piece of stiff round wire, W. The power is exerted by a rubber ring, R.

When ready the clamp-band is first screwed upon the right upper bicuspids, and then, having inserted the end of the wire W in a hole in a ferule cemented on the instanding tooth (not shown), the wire is held steadily, while the rubber ring R is caught over its posterior end, and stretched forward over the anterior end of the track T, thence posteriorly, and caught again on the end of the wire W. It is then left to do its work of drawing the wire W forward against the instanding tooth.

The object of the flatness of the track T is to prevent the wire W from turning by the tongue. This wire is curved to conform with the outline of the palatine surface of the mouth.

CHAPTER LXXVII.

SHORT, NARROW STRIPS OF PLATE.

OLD PLANS OF MOVING UPPER INCISORS BY SHORT-BANDS.—THEIR RELATION TO MODERN PLANS.

PLANS OF CORRECTING TEETH BY TYING THEM TO SHORT, NARROW, FLAT STRIPS OF ELASTIC, AND NON-ELASTIC PLATE.—PROTOTYPES THAT LED TO THE MODERN SHORT-BAND, LONG-BAND, AND THEIR ANCHORS.—PLANS OF FAUCHARD (1728–1746), BOURDET (1786), DESIRABODE (1823), AND TUCKER (1846).—THE AUTHOR'S APPLICATION OF OLD PRINCIPLES.—HISTORICAL NOTES.

OF all mechanical auxiliaries for correcting irregularities of the incisor teeth, there are probably none in the past or present more used than the narrow strips of flat metallic plate tied to the teeth by strings. In some cases these strips of plate are applied inside of the dental arch; in others, outside, and in others still, on both sides. The latter plan, however, is nearly obsolete, the inside strip being now seldom, if ever, used in this way. Since the author introduced the use of round wire as an improvement on the flat strip, the latter has been less used.

By comparing the scanty remarks on the subject of correction of irregularities in the works of the earlier writers on dentistry with the contents of this work, not only the evolutionary development of the long-band will be seen, but also the great advancement that has been made in this class of mechanisms.[1] The close relationship of these strips combined with roof-plates and alveolar ridge-plates, called bow-plates, will also be seen.

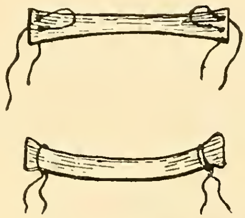

FIG. 772.—Short strips of metal (Fauchard, 1746).

M. Fauchard (1728–1746).—As mentioned elsewhere in this work, Fauchard appears to have been, if not the first, at least one of the earliest writers who described mechanisms for correcting irregular teeth. His mechanisms, however, were few in number, and of the flat "strip" (metallic) variety. Berdmore, an English writer, two years later (1748) mentioned the plan of Fauchard, but does not speak highly of it nor of the art of correction of irregularities of the teeth by any plan. Fauchard does not claim that the strip of plate was originated by him. M. Desirabode, a later writer (1823), in speaking of these

[1] It may be thought that because of the secrecy in which old-time dentists held their knowledge, they invented more regulating mechanisms than history records. Notwithstanding the fact that they generally kept to themselves all that they could, and while it was possible to keep secret their treatment for diseases of the gums and teeth, or even the process of filling cavities, it was not so easy to conceal their artificial teeth or their mechanisms for correction of irregular teeth, because they must have been as conspicuous to everybody then as such things are to-day. Nor is it reasonable to suppose that the "crown head dentists," who must have had special advantages and opportunities at that time (and who also were authors), could have been ignorant of all or nearly all regulating mechanisms then in use. The author believes that they recorded in their works all they knew upon the subject. Indeed, the animosity shown by some of these early authors against the efforts and mechanisms of other dentists is akin to proof that nothing was left hidden or unrecorded.

strips, says that he thinks such strips had probably been in use from "ancient times."[1]

Fig. 772 represents the strips mentioned by Fauchard.

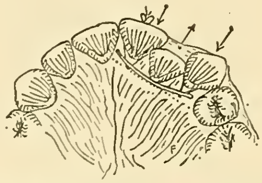

FIG. 773.—Fauchard's operation for moving an instanding lateral incisor outward by an elastic strip of metal. Drawn from description (1746).

M. Bourdet (1786).—Bourdet, who wrote in the French language, comments prejudicially upon Fauchard's views, and dwells largely on what he regards as his own improvements in mechanisms; but he fails to show novelty in them.[2]

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[1] Fauchard says: "If the teeth are much out of line, and cannot be corrected by means of threads, it is necessary to use a band of gold or silver." (Fauchard used the term "band" for strip.) He further says, but not clearly: "The width of this band should be less than the height of the teeth to which it is applied. The band must be neither too stiff nor too flexible. Two holes are made beside each other at both extremities. In the two holes at each end are put the two ends of a thread, which, passing partially through, forms a loop in the middle of each thread. If the tooth is inclined outward the plate is exteriorly applied; if it is bent inward the plate is applied inside the teeth." (See Fig. 773.) "The nearest of the upright teeth to those that are bent are then encircled with the ends of the threads which are passed from the exterior to the interior of the arch, or from the interior to the exterior, according as the band is applied inside or outside. . . . Finally, having crossed them several times, the threads are tied and their ends cut off.

"When one end of the band is fastened the other is treated in the same manner. By the pressure and support given by the band the inclined tooth will be made upright in a short time.

"Instead of holes, two notches or indentations (*échancrures*) may be placed at the extremities of the band, as sometimes these afford a firmer hold to it. If these are used the threads must first be tied in the middle, the band then applied to the teeth, and the threads fastened around the tooth on which the notches or indentations rest." ("Le Chirurgien Dentiste, ou Traité des Dents." 2d ed., Paris, 1746. The first edition was published in 1728.)

[2] Bourdet says: "M. Fauchard has already detailed the operations of which I propose to speak. But as all such methods are tested by experience, the experience which I have acquired has suggested to me some new views on the

In principle, there is no difference between his and Fauchard's plans. (See Figs. 773–776 and 774–775.)

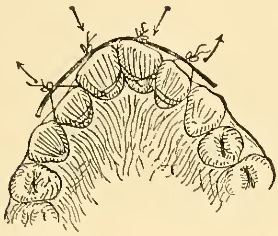

FIG. 774.—Plan of moving instanding laterals to line (Fauchard, 1746).

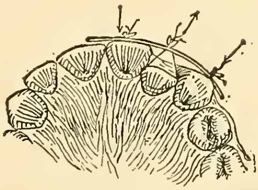

FIG. 775.—Plan of moving an instanding incisor by a metallic strip. Drawn from description (Bourdet, 1757).

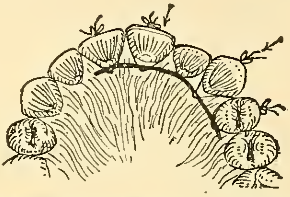

FIG. 776.—Plan of evening front upper teeth. Drawn from description (Bourdet).

What has been regarded by some dentists as a modern plan for moving incisors, viz., the use of strips of flat metal tied to the teeth with strings, is substantially the same as the Fauchard and the Bourdet plans. Like Fauchard and other old-time writers,* Bourdet often

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mechanisms of the art. In describing them I therefore use the artist's privilege of improving on any received invention.

"The means generally employed to arrange the teeth in line, and in an upright position, after having separated them, and having filed away such portions of them as overlapped other teeth, are threads, strips of plate, the pliers or pincers, and the *pélican* (forceps).

"Let us begin with threads and strips. . . . When the age of the patient and the condition of the teeth are such as to require the aid of strips of plate, for example, in the case of three irregular teeth, of which the middle one is inclined in a direction opposite to that of the other two, a narrow strip of plate should be made, about the length of the three teeth. This strip should be pierced with six little holes, two at each end and two in the middle. When the strip is in place these holes are exactly opposite the teeth. Three threads are now passed through these six holes, each one forming a loop. By drawing these threads (loops) tightly the strip is fastened on the teeth. The threads are then tied successively, beginning with the extremities of the strip. This speaks of strips of plate as "bands," and of ferules as "bandelettes." In this translation the French word for band has therefore been rendered strip.[1] In speaking of such strips (of different lengths) in our own time they are denominated short-band and long-band.

One hundred years after Fauchard recommended strings with metallic strips, Dr. E. A. Tucker (1846) made the first improvement upon the plan, by substituting for strings pieces of elastic rubber. Many years later still, Dr. Bonwill hit upon practically the same plan as that of Fauchard and Bourdet. He says: "The appliance that with me has

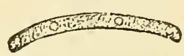

FIG. 777.—Bourdet's Strip.

superseded all others is a curved bar of platinized gold, with holes for silk ligatures." (See Figs. 777, 780–782.)

strip should be removed and replaced at least twice a week, until the teeth have assumed the proper position." (See Fig. 775.)

[1] "If the middle tooth comes into place and the other two teeth yet remain inclined" (outstanding), "a longer strip of plate must be made, which will rest on the teeth nearest to those that are inclined. This is put on the inside of the two teeth that are correctly placed, and on the one that has been corrected. It ought to have eight holes, that is, two at each extremity, opposite the two anchor teeth, and two others on each side, opposite the teeth which it is desired to correct. Four threads are drawn through these eight holes, and each thread makes a loop which passes around the teeth. Beginning at one end of the strip the loop is wound around the tooth which is to serve as an anchor tooth; that is to say, the end of the thread which is in the first hole at the extremity of the strip is passed between the two anchor teeth; and the other end of the same thread, which passes through the second hole, between the bent tooth and the adjacent upright tooth. The end of the thread in the third hole should be passed between these two teeth, and that in the fourth hole between the tooth that remains deformed and the newly corrected tooth. The thread of the fifth hole is tied on the other side between this corrected tooth and the other irregular tooth; that of the sixth hole between the latter and the naturally upright tooth. The seventh thread passes between the two regular teeth and the crooked one; and the thread of the eighth hole between the two regular teeth." (Bourdet.)

NOTE.—For some of this historical information the author is indebted to various works loaned to him by C. D. Cook, M.D.

Fig. 778 represents the strips or "bands" mentioned by Bourdet (photo-electrotype reproductions from Bourdet's work).[1]

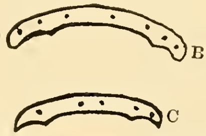

FIG. 778.—Bourdet's modification (1786) of Fauchard's short strips of plate (1746).

The pointed parts of the strips here represented were intended to be bent at right angles with the strips, to enable them to fit between the teeth, thus aiding in the stability of the strip.

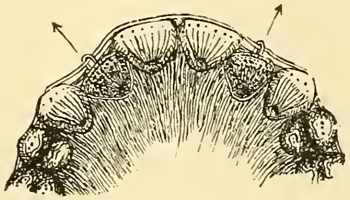

FIG. 779.—Drawing two upper laterals outward to line by a wire anchored by two ferules (A).[2]

Fig. 779 illustrates the author's plan of using the Fauchard principle in an operation for moving to line two instanding upper laterals. The mechanism consists, not of a flat strip and strings, but a straight piece of small elastic gold wire (cut from a delicate spectacle-bow) and two thin platinum ferules, each having a hook on its labial surface to hold the wire.

The plan is, first, to cement the ferules on the instanding laterals; then, having placed the wire along the labial

[1] He (Bourdet) describes the mechanisms separately thus: "In Fig. 778, B is a strip of plate for turning a tooth; through two holes passes the thread to surround and turn the tooth." The use of strip marked C is not given. It is probably similar to that of B.

[2] "Dental Cosmos," March, 1886 (A.).

surfaces of the front teeth, it is sprung and caught under the hooks on the ferules as represented.

In the early steps of this operation, however, it was not practicable to spring the wire down sufficiently far to catch it under the hooks. It was therefore sprung part way, and temporarily held there by strings tied in the hooks. When the instanding teeth had moved sufficiently far outward to permit the wire being caught into the hooks, the strings were dispensed with.

This process is not strictly scientific, because the pressure on the centrals, serving as a support to the wire (the centrals being already in their proper places), tended to press them inward. They did not move sufficiently far, however, to interfere with the successful completion of this operation.

In cases of loose centrals, or where the spaces must be widened considerably to make room for the accommodation of instanding teeth, such a mechanism would be impracticable.

Should a single central stand far out of line, and its mate on line, the one outstanding tooth may, with advantage, be made to serve as a fulcrum. Thus if one end of a wire lever, having a ferule on it, be so attached that, though lying across the outstanding central, and being sprung down and caught upon a cuspid or bicuspid beyond, it would not press upon the central that does not need moving, the operation might be regarded as scientific. Such a mechanism is represented by Fig. 303, Part VI., p. 342. I would not advise the beginner to use such mechanisms until experience has enabled him to judge correctly the relative effects of such bearings.

When centrals stand in the anterior position, and the laterals in the posterior, there would be a mutual advantage by using the centrals as a fulcrum. This is especially true if a double lever, as here represented, should be used.

It will, of course, be seen that forces bearing in such opposite directions have a tendency to mass the teeth together. Experience shows, however, that when firm teeth are only slightly out of line such cramping is not always sufficient to prevent the laterals from being drawn into line. Should, however, the fulcral teeth move, and they are not too long held out of place, they will soon return to their normal positions when liberated.

CHAPTER LXXVIII.

MODERN SHORT-STRIPS.—EXTENSION-STRIPS.

MODERN PLANS OF MOVING UPPER INCISORS BY STRINGS AND RUBBER RINGS IN COMBINATION WITH METALLIC SHORT-BANDS ANCHORED BY CLASPS, FERULES, AND CLAMP-BANDS.

BOURDET'S, HARRIS'S, EAMES'S, AND THE AUTHOR'S PLANS.—MECHANISM IN WHICH THE FORCE OF RUBBER RINGS CAN BE GRADUATED.—ANCHOR-BANDS WITH ONE AND WITH TWO ARMS.—CLAMP-BANDS WITH STATIONARY ARMS AND GRADUATING-HOOKS.—CLAMP-BANDS WITH DETACHABLE ARMS.—EVIL EFFECT OF LEVERAGE BY ARMS ON ANCHOR-BANDS.—EXTENSION-BARS OPERATED BY RUBBER RINGS.—AUTOMATIC MECHANISMS.—THE HARRIS EXTENSION MECHANISM, OPERATED BY A RUBBER RING.—BONWILL'S MODIFICATIONS.

ONE of the lightest and most delicate of anchors for holding elastic-rubber rings are gold arms fixed upon one or more teeth (serving as anchorage) by clasps, ferules, or clamp-bands. In a preceding chapter (LXXVI.) the use of ferules and clamp-bands having one or two knobs or hooks was dwelt upon. In this chapter will be explained the use of longer arms in combination with clasps or bands for the same purpose. The simplest of anchors for these mechanisms is the clasp or the ferule, but the clamp-band, although more difficult to make, is generally superior.

In 1746 Fauchard published the simple strips represented by Fig. 780; in 1757 Bourdet made known similar strips. (See Fig. 781.[1]) In 1888 Bonwill gave out as his favorite, another made similar to these. (Fig. 782.) All these

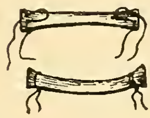

FIG. 780.—Fauchard's Strips (1746).

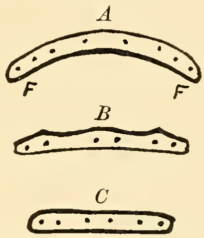

FIG. 781.—Bourdet's Strips (1757).

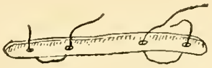

FIG. 782.—"Bonwill's Strip" (1888).

are simply narrow strips of plate having holes through them for strings. They are readily made, and serve well as cheap mechanisms. For further information concerning the Fauchard and the Bourdet strips, see the preceding chapter.

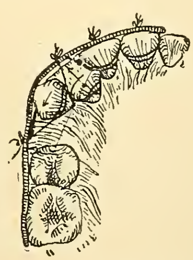

FIG. 783.—Moving an instanding lateral to line by the Bourdet plan of 1757.

Fig. 783 illustrates a plan for moving to line an instanding right upper lateral by the Bourdet modification of the Fauchard strip, tied with anchor-strings to the teeth. Of

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1 "In Fig. 781, B is a strip of plate pierced with six holes for putting in position two teeth inclined outward; F, F are places in the strip which rest inside the teeth that serve as anchors.

"A is a strip of plate pierced with eight holes, which is applied inside to bring into line a tooth that stands 'outward.'"

The figure C is not explained. Fig. 782 represents a similar strip that is advocated by Dr. Bonwill (1888).

all mechanisms ever invented for the regulation of teeth, none have so long continued in favor as this. Indeed, it is in common use now by some dentists. From this prototype evolved all modern short-bands and long-bands used on the outer side of the dental arch. The improvements that have been made for attaching the strip to the teeth (such things as the clasp, ferule, and especially the clamp-band) are so great that as a means to an end these mechanisms have almost obliterated the prototype.[1]

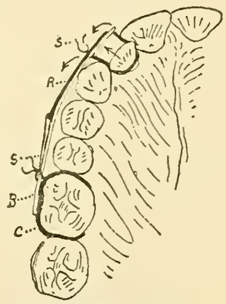

FIG. 784.—Plan of drawing an instanding lateral to line by a rubber ring attached to a narrow strip of plate anchored by a clasp (Bonwill).

Fig. 784 illustrates a plan, as devised by Dr. W. G. A. Bonwill,[2] of applying the Bourdet strip in combination with a rubber ring for drawing to line an instanding lateral. This strip is anchored by a clasp, C.

Figs. 785 and 786 represent two modifications of this mechanism. Each of these, consisting of a strip of thick

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[1] In 1878 I published (in the "Dental Cosmos") a mechanism devised by myself. This consisted of a narrow strip of plate anchored by a clamp-band. This was used for moving outward an instanding tooth, by means of a draw-screw attached to the tooth by a ferule, the screw projecting through the free extremity of the strip. This mechanism is represented by Fig. 1022, Chapter CIV. (on Cuspids), p. 1068, in this Part. Ten years later (1888) Dr. Bonwill published a mechanism consisting of a similar strip of plate, anchored by clasps, and operated by a rubber ring. (See Fig. 784.)

[2] Copied from a black-board representation made by Dr. Bonwill, February 28, 1888, before the New York City Dental Society (First, State District).

gold plate somewhat less than an eighth of an inch in width, has soldered to it a strong clasp as shown.

FIGS. 785, 786.—Two modifications of the mechanism (Bonwill).

Through the anchor extremity of the strip is bored a hole for the string (Fig. 784), for tying to it the rubber ring R. When the mechanism is ready to apply, the clasp C is sprung on the anchor tooth (here represented as the first molar), leaving the arm to extend forward, over, and beyond the instanding tooth. It rests on the cuspid. The rubber ring is then tied with a string to the posterior extremity of the arm at B, after which it is stretched forward over a notch in the anterior end of the strip (or through a hole near the same end), thence around the instanding lateral, and again tied (by another string) to the strip at S.

This mechanism is simple, and I think that, if frequently inspected by the dentist after it is applied, it would be practicable in the mouth of an intelligent patient who would not dislodge it.

Fig. 787 illustrates the operation of a mechanism by Dr. W. H. Eames. This auxiliary consisted of a metallic arm and a thimble-crown soldered midway to it (for anchor). The arm was of gold and platinum half-round wire (No. 20), three-sixteenths of an inch in width. This wire (soldered near the cervical border of the thimble-crown) was of sufficient length to extend from the right first molar to the middle of the left lateral. Two pins, P, P (taken from a crushed porcelain tooth), were soldered to the outer side of this wire, at points off against the right lateral. The thimble-crown was cemented on the right first bicuspid. To draw the lateral to line, the rubber ring was placed around it and caught over the pins.

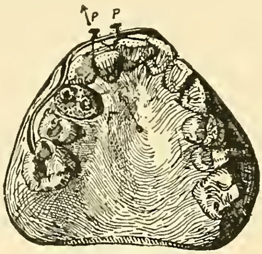

FIG. 787.—Correction of upper incisors by a rubber ring and an arm having a ferule for anchor (Eames).[1]

When the lateral had been moved to line, the operator found that it still needed to be turned in its socket. Without removing the metallic part of the mechanism, the turning was accomplished as follows: Upon the crown of the lateral was cemented a thin platinum ferule, having a headed pin of small size soldered to the lingual side (not shown in the figure). From one of the pins on the arm was stretched between the cuspid and the lateral a rubber ring, which was then caught over the pin of the ferule, and stretched back to the same pin on the arm. The force exerted by this rubber turned the tooth.

To retain the tooth in proper position the ferule on the lateral was removed, and then, after soldering a piece of gold wire across its labial surface to rest on the adjacent teeth, it was recemented in place.

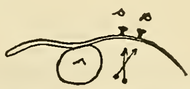

FIG. 788.—Modification of the mechanism (Eames).

Fig. 788 represents a modification of this mechanism, which was also devised by Dr. Eames about the same time.

[1] Published by Dr. Eames in the "Archives of Dentistry," February, 1888.

This differs from the other only in having a ferule, F, for anchor, instead of a thimble-crown.

The degree of force, of the elastic rubber, used in such cases can be varied in two ways: by different sizes of rubber rings, and by stretching the rubber to different distances; the latter is the better plan. (See Fig. 290, Part VI.)

Mechanism Capable of Graduating the Degree of Force from Elastic Rubber.—Another mechanism (considered by the author to be superior) consists of round wire fixed to a clamp-band. On the latter are attached, by solder or by screws, one or two arms made of such wire, upon which have been previously soldered in a row several small wire rings. These rings are so arranged that when the rubber is applied the draught upon the tooth or teeth to be moved can be given in any direction desired, and with a tension of the *requisite* degree of force. The mechanism is so constructed that the patient, as well as the operator, can adjust the rubber rings so that the tension upon the teeth will act as powerfully as possible, without causing much if any pain. *This is a desideratum* that cannot be accomplished with any degree of certainty by weaving rubber between the teeth, nor by metallic springs, because the power from these is difficult to control with accuracy.

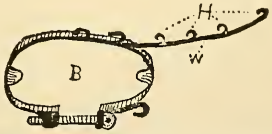

FIG. 789.—Mechanism with one arm and one row of adjusting-hooks for rubber rings (A).

Clamp-bands with Fixed Graduating-arms:—Fig. 789 represents one of the modifications of an arm clamp-band for attaching a rubber ring to move inward an outstanding left upper incisor. The metallic part consists of a clamp-band, B, and a stiff gold wire, W, having a row of small gold rings, H, soldered to it. These rings are afterward cut open to form hooks.

To apply this mechanism the clamp-band is first screwed tightly upon two of the left upper side teeth, after which the rubber ring is caught upon one of the hooks on the arm, then stretched and caught over the tooth to be moved, and back and caught on the same, or on another, hook of the arm, or perhaps on the hook near the screw.

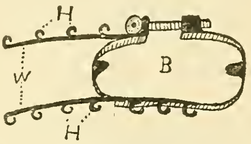

FIG. 790.—Mechanism with two arms and two rows of adjusting-hooks for rubber rings (A).

Fig. 790 represents a modification of the mechanism last described, and differs from it only by the addition of another arm. One of these arms lies on the inside of the dental arch, the other on the outside. The object of two arms is to enable draughts upon the teeth to be made in opposite directions. It is not often needed, but when called for it is very effective.

Fig. 791 illustrates an operation for a girl about ten years of age. In this case the right adult lateral had erupted in the left posterior position (behind the right central). This tooth had apparently been crowded out of its proper place by the presence of a deciduous cuspid which was left unextracted (by the former dentist) through fear that in removing it the first bicuspid might erupt anterior to its proper place, and thus interfere with the eruption of the adult cuspid. (To guard against danger of this kind, I extract in such cases both the deciduous cuspid and first molar at the same time.) The appearance of these teeth is shown alongside of the main figure. After the extraction the operation was suspended for a few weeks, to permit the irregular lateral to naturally fall into line if it would. It moved only a part of the proper distance, however, and then stopped.

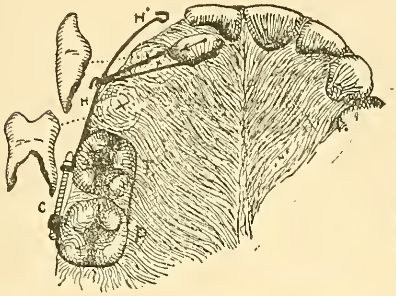

FIG. 791.—First stage in a process of moving a lateral incisor by elastic rubber and an arm clamp-band (A).[1]

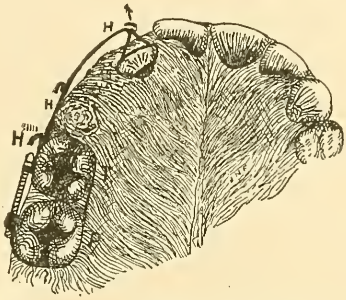

FIG. 792.—Second stage of the operation.

To force this instanding tooth into its proper place, a mechanism made as represented in the figure (791) was used. It consisted of a gold anchor clamp-band, C, having a stiff wire arm with two hooks, H, H′, to catch and hold one or more rubber rings after being placed over the instanding tooth. The primary movement was to draw the lateral sidewise from behind the central. This was accomplished by fastening the clamp-band around the deciduous molar T and first adult molar P, and then placing the rubber ring over the instanding lateral, and thence over the hook H.

When the tooth had been moved sufficiently far back, the rubber ring was changed from the hook H to the hook H′ as represented in Fig. 792. This change in the direction of the force drew the tooth directly outward and into its proper place.

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[1] Extract from a lecture by the author, February 27, 1888. Published in "Brooklyn Medical Journal," July, 1888.

It sometimes so happens that a slight irregularity is difficult to correct even by a superior mechanism. In this case the patient was an over-indulged girl, who would persist in picking the mechanism off, chewing it to pieces, and then pretending that it broke for reasons she knew not; consequently before I fully succeeded in correcting the case several mechanisms were used. This, of course, caused the operation to be unnecessarily tedious.

Evil Effects of Leverage in Armed Bands.—If force is exerted on an arm of this length the arm tends to act as a *lever* on the anchor teeth. The degree of force that was necessary in this operation, however, was so slight that the arm had little or no such effect upon the anchorage. If the leverage by the wire arm would be likely to move the anchor teeth, the arm should be made of sufficient length to rest upon other teeth beyond. In a case similar to the one above it might rest on one or both of the centrals.

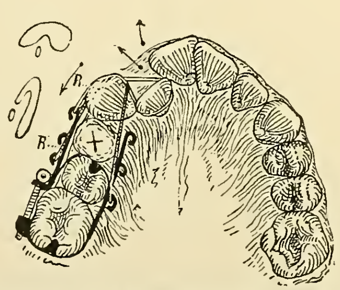

FIG. 793.—Making room and moving a lateral to line by power of rubber rings so adjusted as to keep the tissue action within physiological functions (A).

Fig. 793 illustrates an operation for moving an instanding lateral to line by two rubber rings, aided by a gold clamp-band with two arms, on each of which were several hooks. The object sought in the operation was to gain sufficient space in the arch to accommodate all the incisors, at the expense of a side tooth.

This figure represents both of the rubber rings as if applied at one time, but in the operation the rubber for the incisor was not applied until after the cuspid had been moved back nearly to the second bicuspid.

The first step was the extraction of the first bicuspid. The next was placing the clamp-band around the second bicuspid and first molar, and then a rubber ring, R (represented checkered), was caught upon a hook, F, on the lingual side of the anchor-band, and stretched forward over the cuspid, and caught upon the posterior hook on the buccal side of the anchor-band, to draw back the cuspid.

To move the instanding incisor outward, another rubber ring, R (represented in white), was caught around this tooth (lateral), thence stretched over the labial side of the cuspid, and caught upon the anterior buccal hook. The forms of these two rubber rings when stretched are approximately represented in miniature by O, O, alongside the main figure.

Although this kind of mechanism only approximates accuracy in adjustment of force, and is not equal to a screw-acting mechanism, yet it is sufficiently sure to enable the operation to be conducted without much pain. The patient (at home) applied the desired force by catching the rubber upon the right hooks.

Clamp-bands with Detachable Arms.—Fig. 794 illustrates an operation for moving a cuspid back and a lateral outward, after having extracted the first bicuspid to make room for them. This mechanism was of gold, and made in independent parts afterward screwed together. It consists of an adjustable wire arm, W, a clamp-band, B, and a rubber ring. In other respects it is similar to those (just described) having undetachable arms.

Fig. 795 represents independently the different parts, including a modified form, N, of the detachable arm P, which is the one represented by W in Fig. 794.

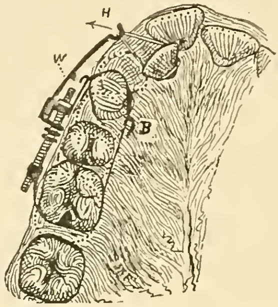

FIG. 794.—Drawing an instanding lateral to line by a rubber ring in combination with a clamp-band with a detachable arm (A).

In Fig. 794 two teeth are represented as being acted upon at the same time, but in practice the cuspid was first drawn nearly to the second bicuspid by the clamp-band, after which the rubber ring was applied to the lateral incisor. This drew it outward to line. The right outstanding central was subsequently drawn to its proper place by another rubber ring (not shown) placed over the tooth and stretched to the hook B on the lingual side of the clamp-band.

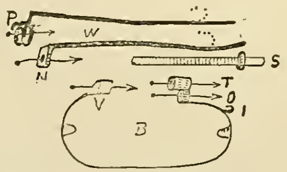

FIG. 795.—The different parts (A).

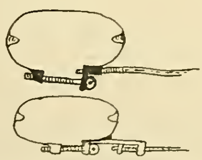

FIG. 796.—Other forms of anchor-band (A).

The arm W (Fig. 794) is made of stiff wire, one extremity of which is coiled. The other extremity, being nearly straight, projects through the smooth nut T (Fig. 795), after which it is bent in the form of a hook. (See dotted line.) The coil extremity P is held in place on the clamp-band by its bolt, S, projecting through it (the coil). The other form of arm, N (Fig. 795), is similar, but instead of a coil there is a smooth-bore nut soldered to the end of the wire as represented. In putting the parts together, the bolt S is projected through the clamp-band nut O, thence through the coil P (or the nut N, as the case may be), then screwed into the threaded nut V on the posterior part of the clamp-band. The hook may be bent to the form represented in Fig. 794, or as shown by dotted lines in Fig. 795.

Fig. 796 represents two other plans of attaching the wire arm to a clamp-band. These are by screwing the wire into a nut soldered to a clamp-band or to a piece of flat wire extending from the clamp-band. These forms of (anchor) clamp-band are equally valuable for attaching short-bands, long-bands, or drag-screws.

The main object sought in having the wire arm adjustable is *easy alteration.* The only advantage of this mechanism over the one last described is that when such mechanisms are kept on hand in parts they can be quickly improvised to meet various requirements. It is still more convenient if several wire arms of different lengths are always kept ready.

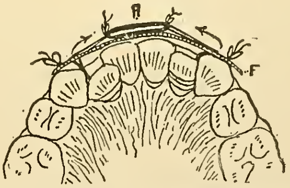

FIG. 797.—Plan of moving instanding upper lateral incisors outward (Bonwill).

Short-band Operations.—Fig. 797 illustrates a plan for drawing instanding laterals to line, as sometimes practised at the present day, and strongly advocated by Dr.

W. G. A. Bonwill.[1] The plan, however, though practical, cannot be regarded as wholly new, as the strip is similar to Fauchard's, and the rubber rings have been used similarly since the invention of rubber tubing soon after Dr. Tucker suggested the use of rubber (1846).

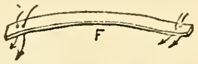

FIG. 798.—The Fauchard Strip.

The mechanism consisted of a strip of gold plate, F, a rubber ring, R, and four strings. This strip of plate was pierced with holes in each extremity for two strings by which it was anchored to the teeth. Like the old "Bourdet strip," this one also had other holes for strings, to connect it with the instanding teeth. To act upon these strings a rubber ring, R, is so interposed between them as to draw upon the instanding teeth. The extremities of the strip are first tied to the cuspids with strings. Then the instanding laterals are tightly bound with other strings, the ends of which are passed through the intermediate holes in the strip, and tied to the rubber which is stretched taut between them. The rubber now draws upon both strings and consequently upon both teeth. The effect of this draught upon the laterals is to cause a wedge-like action against the cuspids, tending to move them sufficiently to make the necessary space for themselves (the laterals).

In the figure the distance between the right central and cuspid is not represented correctly. In this instance the spaces for the laterals needed but little widening.

NOTE.—In some cases a better plan of moving the instanding laterals by this mechanism is to use no draught-

[1] Lecture before the First District, New York Dental Society, 1888, by W. G. A. Bonwill.

strings, but stretch the rubber ring directly from tooth to tooth through the holes in the strip of plate.

Moving Teeth by Extension-bars Operated by a Rubber Ring.—Fig. 799 illustrates an operation for drawing instanding upper laterals outward to line, and at the same

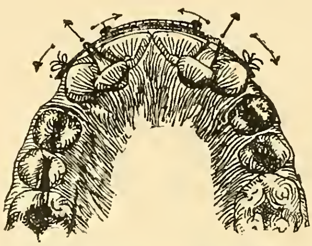

FIG. 799.—Moving cuspids back and instanding laterals outward to line by an automatic mechanism (A. J. Harris, 1868).

time moving away the cuspids. In this case (a girl seventeen years of age) the centrals were in their proper places, but the cuspids, owing to the deciduous teeth having been extracted too early, had encroached upon the territory of the adult laterals, leaving a slight space behind each of them (the cuspids). The operation was performed by the aid of a self-acting extension mechanism devised by Dr. Andrew J. Harris in 1868.

Figs. 800 and 801 give two views of this as it appears at full extension. The plan of operation was to make room for the jumbled teeth by elongating and widening the anterior part of the dental arch.

This mechanism (the first one devised of its class) consisted of two flat strips of plate, B, B′, each of which had a long longitudinal slot. These strips were held together by two pins, P, P′. One of these pins, P′, had two heads or knobs, the neck of the labial one (knob) being soldered to section B. The other had one head, the other end being soldered to the innermost strip B′. The two sections B, B′, sliding upon each other, were guided by the pins in the slots, and were held together by the heads. The sliding was caused by an elastic ring, R (see dotted line), caught upon the two heads. (Fig. 800.)

When the mechanism was applied, the extremities were firmly tied to the cuspids by anchor-strings, S, S, passing through the strips and over notches on their ends. The

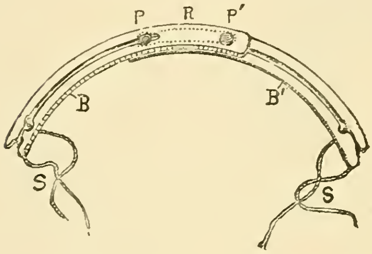

FIG. 800.—Front view of the mechanism, drawn from the original by the author.

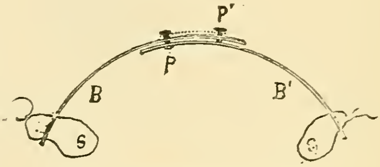

FIG. 801.—Edge view of the same, reversed (Harris, 1868).

strips were then pressed against the centrals, and the in-standing laterals firmly tied to them with other strings.

The mechanism was made to draw upon the laterals and force away the cuspids by the rubber ring R, stretched and caught, as above mentioned, on the knobs P, P′. The dental arch was also widened to make room for the laterals by the same action. The rubber ring, by drawing the pins toward each other, caused the mechanism to lengthen, and consequently lifted upon or drew forward all the teeth under the middle third of the metallic part of it.

Considering that this mechanism moves the anchor teeth (cuspids) posteriorly and outward, the laterals and centrals forward (by its middle part moving outward and dragging the anterior part of the dental arch forward), it may in some respects be regarded as a remarkable invention. The only defect in it is weakness of the anchors (strings). Platinum-wire clamp-bands or ferules for anchors would have been a great improvement.

About twenty years after Dr. Harris had invented his mechanism (Fig. 800), Dr. Bonwill "brought out," as his own invention, a similar one.[1]

Fig. 802 illustrates the plan of application of this modification of Harris's mechanism, as devised by Dr. Bonwill.

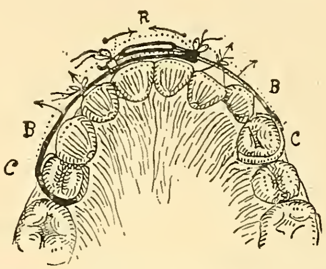

FIG. 802.—Application of a modification of the Harris extension mechanism, as made by Bonwill.

This modification consists of two plain strips of gold plate, B, B, on one end of each of which is soldered a clasp, C, for anchoring the strip to side teeth. These strips are held together by a small rectangular ferule soldered to the anterior end of each strip. Each ferule fits snugly around the opposite strip, but not so closely as to prevent them from easily sliding upon each other. Having applied the clasps to the side teeth, and pressed the middle part of the mechanism close to the incisors, they are tied to the laterals by strings as shown.

The mechanism acts upon the teeth by automatically lengthening itself by the ferules, that hold the two strips of metal together, being pulled toward each other by a rubber ring, R, stretched and tied to them by strings. By this

[1] Exhibited before the First District, New York Dental Society, February 28, 1888.

elongation, the middle part of the mechanism moves forward, causing the laterals also to advance.

Note.—Criticism has been made that in this act the clasps, if tight, would have a wrenching tendency upon the anchor teeth within them. Whatever the effect might be, clasps must be regarded as superior to strings for anchors. For such a bar as this, or that devised by Harris, I would use platinum clamp-bands or ferules, each being connected with the ends of the extension-bar by a short piece of thin elastic gold ribbon, or by a hinge. If clamp-bands were to be used, they should embrace more than one tooth.

CHAPTER LXXIX.

METALLIC SPRINGS.

MOVING FRONT UPPER TEETH BY SPRINGS IN COMBINATION WITH PLATES.

SPIRAL WIRE SPRINGS IN COMBINATION WITH A BOX-PLATE.—BOW-SPRINGS.—OPERATION BY TWO NEARLY STRAIGHT WIRE SPRINGS ANCHORED TO A BOX-PLATE.—SIMILAR MECHANISM; A PLAIN PLATE HAVING DETACHABLE SPRINGS.—SCALLOP-WIRE BOW-PLATE.—OPERATION BY V-SHAPE PUSHING-SPRINGS ANCHORED TO A PLAIN PLATE.—BY ZIG-ZAG PUSHING-SPRINGS ANCHORED TO A ROOF-PLATE.—BY COIL-SPRINGS WITH PLAIN PLATES.—THE W-WIRE SPRING.—CONCENTRIC SPRINGS CONTROLLED BY RATCHETS.

PLATES have been in use as anchors to springs for a long time. There are numerous varieties of these mechanisms devised by different dentists; some of the plates box the teeth, others do not. Several of the most practicable forms will be briefly described and their actions explained. Salter mentions in his work (1875) the use of a plain strip of metal resting on the labial side of the arch, and anchored to the side teeth by a plate, something like a Tomes bow-plate, the force being obtained by corrugating the strip from time to time by bending it into the approximal valleys between the teeth with an instrument. This author, however, appears to prefer (in some cases) the use of spiral springs in combination with plates.

Fig. 803 represents a mechanism of this kind, as given by Salter.[1] It consists of a box-plate for anchor and two spiral wire springs (coiled in a fashion similar to those devised by Fauchard in 1728–46 for connecting upper and lower artificial sets of teeth to keep them in place). The spiral springs, as represented in Fig. 803, are anchored to

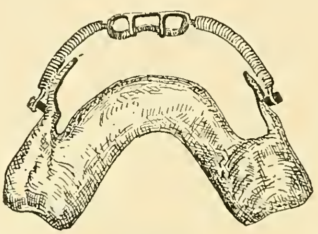

FIG. 803.—Mechanism for moving posteriorly upper incisors (from Salter's work).

the plate, and connected, in front, with a sash-like thing, formed so that it bears upon the protruding centrals. This mechanism will undoubtedly accomplish the desired end, but probably the common bow-plate, consisting of a strip of gold plate anchored to a roof-plate (as published many years ago by Tomes), is superior.

Mechanisms in which corrugated strips of plate constitute a part are much used by Dr. B. S. Byrnes. There are several modifications that he claims have been effective in his hands. Some of these mechanisms show the extreme to which corrugation may be carried. The strips are narrow and very thin (20 k. to 22 k. gold). For stubborn cases, however, Byrnes uses thicker strips.[2] All these modifications are skeleton, and draw upon the teeth.

Fig. 804 represents a simple mechanism for moving outward instanding upper lateral incisors. It is a modifica-

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[1] "Dental Pathology and Surgery" (1875), p. 50.
[2] "Dental Cosmos," May, 1886.

tion of one published many years ago by Mr. Tomes for moving a central;[1] it differs mainly in that it is a box-plate (hard rubber) instead of a plain plate (metallic). The modification resembles, also, one variety of a class of similar mechanisms used about forty years ago by Linderer, and later by Quinby and by Coffin. This one, which is

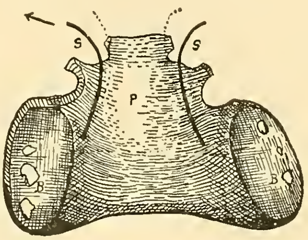

FIG. 804.—Box-plate with curved wire springs.

effective but clumsy, consists of two pieces of spring steel wire, S, S, and a hard-rubber plate, P. One extremity of each wire spring is anchored by being vulcanized into the plate, which covers the hard part of the roof of the mouth and tightly embraces the crowns of several of the side teeth. Before putting it in the mouth the springs are bent so as to bear upon the instanding teeth in the direction desired.

This kind of plate should be removed at least once a day and thoroughly cleansed, to prevent the *débris* (that always accumulates about such a plate) from injuring the teeth it covers. The first symptom of damage to them is an abnormal "whiteness" of the teeth embraced, and their having a soft and chalky "touch."

Fig. 805 represents a mechanism for moving the four upper incisors by the power of wire springs. The irregularity in the case consisted in the centrals being protruded

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[1] See Harris's "Dental Surgery."

beyond their proper places, and the laterals, although on the esthetic line of arch, being too near the mesial line and standing partly behind the centrals. The steps in the

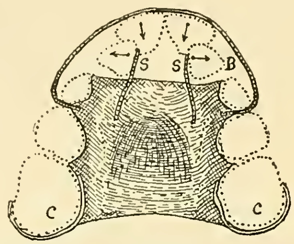

FIG. 805.—Mechanism for moving upper laterals outward and centrals inward.—Modification of two of Tomes's mechanisms combined.

operation were first to move these incisors laterally from behind the centrals, and then to move the centrals posteriorly between the laterals.

The mechanism used consisted of a hard-rubber roof-plate, with two Tomes springs, S, S, projecting forward so as to bear to the right and left upon the laterals, and a Tomes bow-spring, B, to bear inwardly upon the anterior surfaces of the centrals. The plate also had two molar-clasps, C, C.

This combination, although original with me, probably was preceded by some of Coffin's modifications.

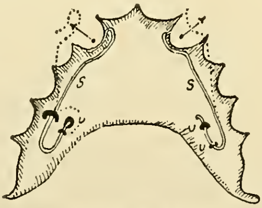

FIG. 806.—Plain plate with detachable wire springs for moving laterals (A).

Fig. 806 represents one of several modifications of mechanisms constructed upon what I call the Tomes principle. The essential difference between this modification and the last mechanism represented is that the wire springs s, s are detachable. I would not have it inferred from this, however, that I was the first to use a detachable spring in combination with a plate, as Professor J. Taft previously invented a similar mechanism some time between 1845 and 1848.[1]

Both of these plates are made of hard rubber, but this one covers only the roof of the mouth and does *not* cover the crowns of any of the teeth. If the side teeth are so inclined that the plate will not rest firmly, clasps or clamp-bands should be added to the plate to embrace some of them.

In preparing the springs for anchoring them into plates, one extremity of each is bent at right angles so as to project through a hole in the posterior part of the plate. It is additionally fixed to the plate by a platinum-wire staple (shown in black), the arms of which project through other holes in the plate, and then are either twisted, bent down, or headed on its palatine side. The free end of the spring is then formed so that it will bear against the tooth or teeth to be moved. The direction of the force of these springs is indicated by arrows, and their forms while in a state of rest are indicated by dotted lines.

To prevent the spring from slipping off the teeth borne upon, the extremity is hammered flat and curved to conform to the necks of the teeth. This curving, though not always necessary, is generally important. Should a spring

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[1] In a letter to the author Professor J. Taft says in regard to wire springs in combination with plates: "As early as 1845 to 1848 I began to give attention to the correction of Irregularities of the Teeth, and made a number of Devices for this purpose, one form of which was a metal plate adapted to the mouth, with a socket or small cylinder attached to it, into which was inserted a wire spring, for the purpose of bearing upon the irregular tooth, to press it into a correct position."

slip off after this precaution has been taken, it may be necessary to confine the anterior half (of the spring) to the plate by another staple (not shown in the diagram), made sufficiently broad to permit the spring to play.

Zigzag Springs with Plates.—In Part VII., p. 383, Fig. 350, A and C represent sections of two regulating and retaining plates having zigzag springs. As similar mechanisms have their uses, a few more will now be described and their action explained. The greater value of plate mechanisms having zigzag springs is for retaining teeth in place after being corrected.

Such springs without plates are explained in Chapter XXIV.

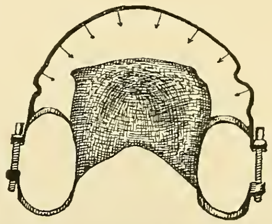

FIG. 807.—Scallop-wire, regulating and retaining, bow-plate (A).

Fig. 807 represents a mechanism used after having nearly corrected a set of protruding upper teeth. The object of giving the zigzag form to parts of the bow was easy adjustment of pressure to meet exactly the requirements of the case.

Fig. 808 illustrates the closing of the first stage of an operation for a girl about seventeen years of age. It was for moving outward two instanding upper laterals and slightly turning the centrals.

This mechanism consisted of two springs, S, S, and a hard-rubber roof-plate, P, having two clasps. The middle part of the two springs (made in one piece from gold spectacle-bows about the size of a pin) was first vulcanized into the body of the plate, after which the extremities were bent U-shape, as shown, to bear upon the teeth in the direction indicated by arrows.

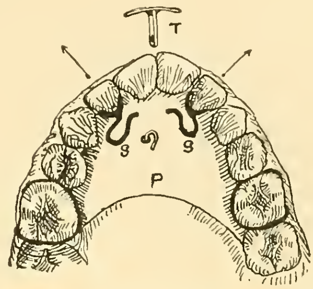

FIG. 808.—Moving laterals outward by U-shape springs anchored to a plate (A).

The centrals, which stood turned slightly outward, were subsequently drawn into line by an elastic-rubber ring in connection with a T-piece, T; the rubber was stretched posteriorly and caught on a hook on the middle part of the plate after the T-piece had been fitted so as to pull upon the centrals.

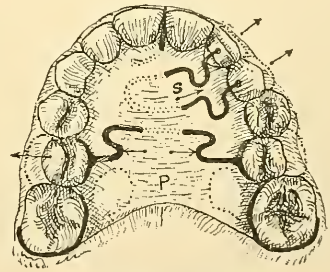

FIG. 809.—Moving to line a lateral, cuspid, and two bicuspids by zigzag pushing-springs anchored to a roof-plate (A).

Fig. 809 illustrates the beginning of an operation for correcting an instanding left upper lateral, cuspid, and two second bicuspids, by a modification of an old and well-known mechanism. This mechanism consisted of a hard-rubber roof-plate and four wire springs, two of which were of zigzag form and two of the letter S form, all being anchored into the body of the plate as shown. The two springs S were made of one piece of gold wire bent U-shape, the bow part being buried in the plate, leaving the extremities out to use against the teeth. One spring rested in a small pit made in the lingual side of the cuspid, and the other in a pit made in a ferule cemented upon the lateral. The other springs for the bicuspids (which also were of one piece of gold wire, with its middle part buried in the plate) were held in place against the instanding teeth by clasps soldered to their ends as shown.

The firmness of the plate P was aided by clasps, embracing the first bicuspids and the first molars. A platinum wire, projecting from the plate, thence between the centrals, also aided in steadying the plate.

After the mechanism had been forced into place, and remained a sufficient time to move the teeth and loosen the springs, it was removed, the springs drawn out a little, and again placed in the mouth. This alteration in the form of the springs was repeated twice a week.

Retainers.—When the case was corrected the teeth were temporarily held in place by a hard-rubber roof-plate having a platinum wire projecting between the centrals (similar to the wire on this plate), two clasps to bear against the bicuspids that were moved, and two pin-points to rest (in the pits) and bear lightly on the lateral and cuspid. The cuspid pit was eventually filled with gold.

Cavities Filled.—Before the regulating process was begun, several cavities found in the eight front teeth were temporarily filled with gutta-percha to prevent further decay. After the irregularities of the teeth were corrected, these fillings were replaced by gold wart-shape plugs. These plugs overlapped and underlapped one another in such a way that the teeth were mutually sustained in their new relations, thus rendering the further use of the retaining-plate unnecessary.[1]

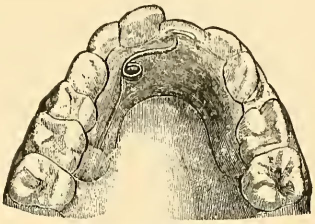

FIG. 810.—Moving a central forward by a coil wire spring anchored to a plate (Talbot).[2]

Fig. 810 illustrates a reported operation by Dr. E. S. Talbot for moving forward an instanding left upper central by a coil (piano) wire spring anchored to a hard-rubber roof-plate which was tightly fitted to the lingual surface of the teeth. The plate was sufficiently thick in its anterior part to nearly hide the lingual surface of the instanding tooth. This was for firmly holding in place the extremity of the spring, which projected through a hole in it, to bear upon the tooth. The hole was so located that the spring bore upon the tooth at a point midway between its cutting-edge and the gum. In the posterior part of the plate there was another hole, in which was anchored the other extremity of the wire, after being bent at right angles.

The degree of usefulness of such a mechanism depends upon the degree of firmness of the plate. When it is not firm the wire is very liable to slip along the inclined sur-

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[1] Concerning the philosophy of the action of such plugs, and the explanation of the process of their insertion, see Part VII., Chapter XXXVII., p. 393. When I wrote this chapter I supposed that I was the first to use retaining-pins in teeth. I used pins in cavities in teeth in the case of Isaac Purdy, New York, in July, 1879. (Author's "Dental Records," vol. iii., p. 187.) Recently I have heard that Dr. H. A. Baker used them in the same year or the year following. Proceedings of the American Academy of Dental Science, 1893.

[2] "Dental Cosmos."

face of the instanding tooth. By lodging the end of the spring in a hole made through a ferule cemented on the tooth, this slipping can be avoided even when the plate is not very firm. While it is sometimes allowable to make a pit in a cuspid, and sometimes in a bicuspid or molar, it is not proper to do so in incisors, because these teeth are too thin.

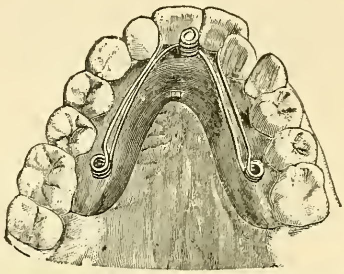


FIG. 811.—Moving laterals outward by a W-wire spring anchored to a plate (Talbot).[1]

Fig. 811 illustrates an operation for moving the upper lateral incisors outward by a complicated spring, by Dr. Talbot. The mechanism consists of a W-shape wire spring and a V-shape hard-rubber roof-plate. The form of this spring, which is shown separately in Fig. 812, is similar to

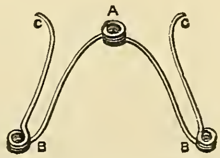


FIG. 812.—The W-spring.

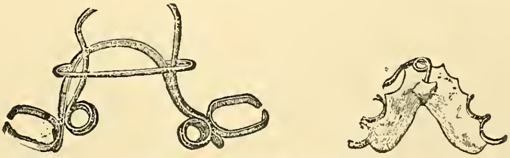
that of springs used in some varieties of timekeepers. It has three coils, one of which is situated at A and the others at B, B. The anterior coil is held in place by a post on the forepart of the plate. Extending anteriorly

1 "Dental Cosmos."

from each coil, B, the wire projects anteriorly, the end C bearing upon one of the instanding laterals as represented. The advantage claimed by Dr. Talbot for the triple coil is "lasting force." The author has not tried this mechanism.

It is said that in constructing this mechanism it is easier to make it by finishing the plate before adding the post than it is to vulcanize the post into the plate. I suggest that the addition of clamp-bands, such as are illustrated in Part VI., Fig. 89, on p. 219, might be an advantage to the mechanism.[1]

Concentric Springs Controlled by Ratchets.—Teeth may be moved by springs controlled by small ratchet-wheels. Such engines of force are best associated with plates. These mechanisms are effective, but difficult to make. In another chapter, under the head of the relative value of different kinds of Metallic Springs, ratchet mechanisms will be more fully explained. (See Part XX.)



FIGS. A, B.—Mechanisms with coil-springs (Bonwill).

[1] To whom the priority of devising the coil on a regulating-spring belongs is not fully decided. In 1888 Dr. Bonwill, in a lecture before the First District Dental Society of New York, claimed that he had described a coiled spring to the members of the Delaware Dental Society twenty-five years previously, and before Dr. Talbot made a claim. Dr. Bonwill said, in this lecture, that his description had not (1888) been published in any journal. He also mentioned that in his own practice he had abandoned the coil in springs. Figs. A and B represent two of these mechanisms, which he has since published.

CHAPTER LXXX.

MOVING UPPER INCISORS BY METALLIC SPRINGS WITHOUT PLATES.—DIFFERENT KINDS OF SPRINGS.

RELATIVE VALUE OF PLAIN AND COIL SPRINGS.—DIFFERENT EXPERIENCES REGARDING PAIN.—OPERATIONS FOR MOVING TEETH FORWARD BY SPRING-WIRE ANCHORED TO FERULES. —MOVING INSTANDING LATERALS OUTWARD BY THREE PIECES OF SPRING-WIRE.—MOVING THREE INCISORS.—OPERATION BY AN INDEPENDENT PIECE OF SPRING STEEL WIRE. —BY PLAIN SPRING-WIRE AND TWO FERULES.—BY A PLAIN BAIL-SPRING MECHANISM.—BY A COIL BAIL-SPRING ANCHORED BY FERULES.—BY A NEARLY STRAIGHT COIL WIRE SPRING ANCHORED BY FERULES.

AS before mentioned, the earliest efforts made for moving teeth with metallic things were probably based upon force derived from the elasticity of the metal, the part or parts that served as the engine of force being so shaped and applied as to have a springlike action upon the teeth. One hundred and fifty years ago, and even within the last sixty years, such springs were very crude, consisting merely of narrow, flat strips of gold or silver. These were placed along the anterior part of the dental arch, and were then sprung inward or outward, here and there, by the fingers, and tied to the instanding or outstanding teeth by strings. Now this plan is nearly obsolete among experts. Although spring machines in modern times are numerous and applicable to nearly every part of the mouth, only a few of them are philosophically constructed, and the majority are therefore incapable of causing the proper force for scientific work.

In the treatment of the subject, however, it will be necessary to refer to some of the less valuable mechanisms in order to appreciate the improvements that are made in others, as well as to give credit to the inventors of prototypes underlying some of the best mechanisms of the present day.

Material for Springs.—Like all the old kinds of springs, some of the modern ones are made of flat strips of plate; the best, however, are made of round and half-round gold, steel, or German-silver wire, the round wire being superior to the others whenever it can be applied, because it can be easily bent in any form. As to which of these different kinds of metals is best, depends somewhat upon the circumstances of the case in hand. Formerly I placed steel as one of the best, but now I regard gold and German silver as superior, and of these two I generally prefer gold, because it does not blacken.

Both of these are more easily altered in their form than steel whenever it is necessary to change the bearing on the tooth. To change the form of a steel-wire spring is difficult; indeed, it is sometimes impossible to bend it, after it forms a part of a plate mechanism, so that it will bear in the desired direction on the tooth. This is especially true when there is lack of room to bend the spring sufficiently to overcome the tendency to return to its old form and place. Gold and German silver are more easily bent, and although not as elastic as steel, they are sufficiently so for practical purposes. Gold, because of its brightness and cleanly appearance, is more encouraging to patients than German silver unless it is gilded.

The proper form of springs for skeleton anchors depends upon the requirements of the case in hand. Some of them are made straight, others curved, and there are those which have a coil. Of the latter variety there are two forms, the spiral and the concentric.[1]

Regarding the relative value of the different forms opinions vary. Probably this difference arises from lack of scientific thought. In a majority of cases (especially of the adult) that have come to my notice, the patients have complained more of pain from coiled springs than from plain ones. By this remark I do not intend to give the impression that the coil-spring should be abandoned in correction of irregularities of the teeth, but to draw attention to the fact that it is, at least, prudent to exercise care in so adjusting the coil that too great a degree of force shall not be exerted upon the teeth after they have once begun to move; and especially to suggest that this precaution should be heeded in turning teeth on their long axes, and in elevating them in their sockets: in other words, to bear in mind that the degree of power in metallic springs, like that in rubber, should have as close a relation to the limits of the normal functional changes in the socket-tissues as possible.

Plain vs. Coil Spring.—A metallic spring *without* a coil loses its power sooner than one with a coil, because the plain spring sooner reaches its equilibrium (or state of rest). The rapid weakening of the power in plain springs has been regarded by some dentists as a defect, and to overcome this imagined defect the coil-spring was introduced as an improvement. The tension of any spring, of course, weakens by degrees until it is entirely lost; but by the more rapid waning of the power of the plain

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[1] See A, B, Fig. 163, Part VI., p. 259, and C, Fig. 423, Part VIII., p. 441.

spring the operation sooner becomes less painful than when the coil-spring is used. The same rapid lessening in the degree of power also occurs when elastic rubber is used; but this rapid change in the power of rubber is not because of any particular shape of the rubber, but because of the deterioration in the quality of the substance, resulting from its becoming soaked with saliva.

In devising mechanisms the question of power should not always be held as the only point for consideration. It is one that is absolutely necessary, but to control it is equally important. It is easy to devise a mechanism that will exert power, but it is not always easy to make a spring instrument so that the power can be graduated and kept from doing harm.

Assuming that these premises are sound, it will be seen that this "storing of power" in a coil, which has of late been upheld by some dentists as a quality of great value, has some drawbacks. Unless the power is so weak as to move the teeth more slowly than is necessary by screw-power, such long-continued force, upon the tissues, as is usually practised by springs is liable to violate the law of labor and rest. This reasoning, however, is more applicable to adult cases than to those of growing children, whose bones are so soft that the teeth move easily and rapidly.

Different Experiences in Pain.—When force is first applied to an adult tooth it moves it with considerable rapidity for about one day; after that the tooth, approximating contact (not quite) with the side of its socket, meets firmer resistance, and moves more slowly. This slower rate does not continue, but after two or three days, a process of decalcification of the bone having set in, the tooth moves more rapidly, although not so rapidly as at first. Because of this difference in the rate of movement of the tooth on different days, the degree of force that would not be materially felt on the first two days might cause considerable pain on other days.

To more clearly explain, take two cases, each patient being twenty-five years of age, and both having instanding cuspids that are not in contact with the adjacent teeth. To one case let a plain spring be applied, and to the other a coiled spring. Though the springs are different in form we will assume that the powers are equal, and that both exert the maximum degree of force (commonly applied to the teeth) at the beginning of operations. While a comparatively high degree of force would be permissible, say, on the second day, because of the teeth being firm, it would not always be prudent on the first day, nor after retrogressive changes in the tissues have begun to take place, because this high degree of force would irritate the tissues, unless the force is sufficiently great to paralyze them. But to paralyze the tissues would not be scientific treatment, because, in paralysis, the activity of the vital energies of the parts (so necessary to proper and healthy changes in them) would be impaired. When retrogressive changes in the tissues have once begun they (the tissues) are more easily irritated, consequently more easily made painful; therefore, if the maximum pressure is not kept up there will be less interference of the vital actions governing the decalcifying process, and consequently less pain. This is why that when the firmness of the tooth under the influence of the spring is weakened, and the tooth has moved a short distance, the tension of a plain spring, by becoming considerably reduced, causes less pain than is experienced from the coil-spring, the force of which does not so rapidly weaken.

Although this difference between the influences of the plain spring and coil-spring may be true of cases in which the teeth stand alone, there are other cases in which the coil-spring may perhaps be applied, not only without danger, but with an advantage superior to that obtained from the plain spring. For illustration: where the alveolus is hard and the teeth are slightly jumbled, as in a case of an instanding upper second bicuspid, requiring only slight increase of room between the first bicuspid and first molar[1] to accommodate it, considerable persistent force is often necessary to push the tooth and wedge it between the adjacent teeth. Under such circumstances, the adjacent teeth, receiving a large share of the force applied to the instanding bicuspid, the movement of this (instanding) tooth would be so slow that little or no pain would be felt even if the force be excessive. To reiterate, the coil-spring, because of the persistency of its power, would, under such circumstances, be equal, and perhaps superior, to the plain spring. There remains, however, the fact that the tension from a coil-spring is more difficult to gauge and control than from a plain one, unless governed by a ratchet.[2] Control over wire springs can be had by the use of ratchet-wheels; but such auxiliaries are somewhat difficult to make, and when made are clumsy; yet they are practicable. (See Concentric Coil-springs Controlled by Ratchet-wheels, Part XX.)

Moving Teeth by Wire Springs Anchored by Ferules.—Since quick-setting cement (phosphate of zinc) came into use by dentists, strips of plate and wire springs soldered

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[1] This applies only to cases before the eruption of the second molar.

[2] On p. 189, Part IV., are explained the author's views concerning the difference between the influence of the spring and that of the screw upon socket-tissues during the process of moving teeth.

to ferules have been much more practicable than they were formerly.

Ferule-anchors.—We will first consider mechanisms in which the ferule constitutes an important part.

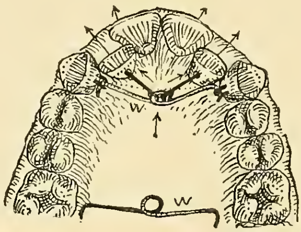

FIG. 813.—Moving instanding laterals outward by spring-wire (A).

Fig. 813 illustrates the beginning of an operation for moving two instanding upper laterals to line by three pieces of gold wire (linked together as shown) and four thin platinum ferules. Two of these ferules had staples, and two had holes bored through them for lodgment of two of the wires, the other being the spring. The action of this mechanism was quadruple: to force the two cuspids posteriorly, and (at the same time) the two laterals anteriorly.

The ferules were cemented upon the laterals and cuspids to be moved. These ferules constituted (as before implied) the anchors for the different extremities of the wires. Midway between the extremities of the spring-wire W (shown as checkered) was the engine of force, a single coil. Into this coil was linked one extremity of each of the other two wires (shown in black), bent in the form of a ring.

To apply the mechanism the ends of the spring W (which were bent at right angles) were caught in the staples of the ferules on the cuspids, after which the ends of the other wires were forced into the holes in the lingual sides of the ferules on the laterals. These staples, not clearly shown, may be inferior to tubes.

This mechanism is effective, but as the tongue is liable to be chafed by the wires, it is not so desirable as some other mechanisms explained in this work.

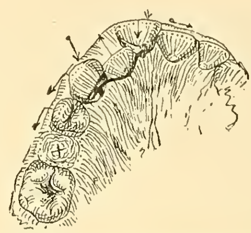

FIG. 814.—Three incisors moved by an independent piece of spring steel wire (A).

By Fig. 814 is illustrated an operation for moving into line an outstanding right cuspid and central and one instanding lateral, and at the same time making more room for the lateral by forcing the cuspid posteriorly, after having first extracted the second bicuspid, and started the first, posteriorly by a clamp-band.

The mechanism, which consisted of two ferules and a piece of delicate spring-wire, was an improved modification of Fauchard's strip of plate, its use being similar to

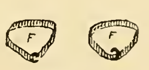

FIG. 815.—The mechanism represented in separate parts.

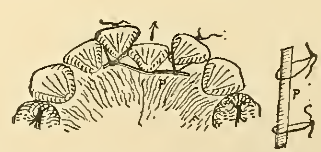

FIG. 816.—Berdmore's use of Fauchard's strip. Drawn from description (1768).

Berdmore's use of the Fauchard strip. (See Fig. 816.) Fig. 815 represents this piece of gold spectacle-bow wire and two ferules. The wire spring was caught upon small

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hooks soldered to the lingual sides of the ferules F, F. One of these ferules was cemented to the central and the other to the cuspid. Arrows indicate the direction of the different movements of the teeth.[1]

This mechanism, in cases where the lack of space is slight, is as effective as it is simple. Sometimes it is necessary to have a third ferule placed on the lateral to steady the wire spring. If possible to get along without this third ferule, it is a better plan, because any ferule, ever so thin, has thickness, and therefore a wider space is required between the central and cuspid to accommodate the instanding tooth.[2]

Fig. 817 illustrates an operation for moving outward an upper right central, and inward the left central and right

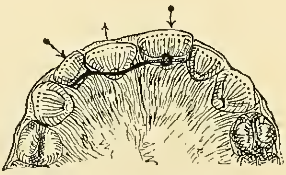

Fig. 817.—Moving incisors by spring-wire, one end of which is soldered to one ferule, the other end being free and resting in a hook on another ferule (A).

lateral. This simple mechanism, which is represented in detail by Fig. 818, consists of two thin platinum ferules, F, F, one-eighth of an inch in width, and a piece of gold spring-wire, W, one end of which is soldered to one ferule;

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[1] Thomas Berdmore, in 1768, thus describes what he thought to be his mechanism, but which was really Fauchard's: "A thin, elastic gold plate of the breadth of a watch-spring is placed on that side of the tooth which recedes most from the proper line, and then the ends of it are fastened to the teeth on either side, so that the bend of the spring may tend to press the irregular tooth to its place." This writer does not tell how the ends of the spring were fastened, but I surmise that it must have been by strings.

[2] Gold spectacle-bow wire, of the kind used for this purpose, should be of small size and very flexible. It can be obtained from opticians.

the other ferule has a hook soldered to its lingual side to hold the free end of the spring.

To apply this, the ferules are first cemented to the outstanding teeth with phosphate of zinc, while in a sticky

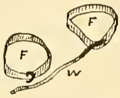
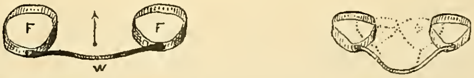


FIG. 818.—The mechanism in parts (A).

consistency; after this the free extremity of the straight wire is sprung forward and caught in the hook on the ferule on the left central.

Fig. 819 represents another improved modification of the spring and ferule mechanism, acting upon the principle of the Fauchard and the Berdmore strips. This differs from the one last described (Fig. 818) in that both ferules, F, F, are soldered to the spring-wire W, instead of one. The mechanism has one advantage that the others have not: while the power in the other wires moves the teeth at right angles to itself only, this one (Fig. 820) acts longitudinally as well as at right angles, *i. e.*, it forces the feruled teeth farther apart at the same time it moves the middle one outward. It is a triplex-acting spring.



FIGS. 819, 820.—Spring mechanisms for moving an instanding tooth to line (A).

To apply the mechanism to the teeth, the wire W is sprung so as to bring the ferules nearer to each other (as shown by the dotted lines in Fig. 820), yet not sufficiently to permanently bend or destroy the elasticity of the spring.

The elasticity of this wire when the ferules are forced upon the anchorage teeth, adjacent, is sufficient to cause them to move farther apart, and make more room for the instanding tooth to move up between them by the pressure of the middle part of the same wire upon it. This is not only a very simple, but for some cases a very practicable mechanism; but it may be difficult to so manage it that pain will not follow, and there is some liability of its moving the anchor teeth out of line.

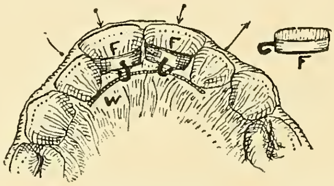


FIG. 821.—Moving outstanding centrals and instanding laterals to line by a piece of steel wire (A).

Fig. 821 illustrates the beginning of an operation for forcing outstanding upper centrals posteriorly and instanding laterals anteriorly.

The mechanism consisted of two ferules, F, F, on the centrals, and a piece of straight steel spring-wire, W, of sufficient length to reach across the laterals; it draws upon the centrals and pushes upon the laterals. A hook is soldered on the lingual side of each ferule to hold the spring in place.[1] The only drawback to this plan is that the mechanism causes the teeth to crowd upon each other. When, however, there is sufficient room somewhere in the anterior part of the arch, this objection does not hold.

Fig. 822 illustrates an operation for moving instanding upper laterals into line by a mechanism consisting of a combination of that represented by Figs. 818–820, and one

[1] This plan must be regarded, in some respects, as only a modification of the Fauchard plan.

by Dr. Talbot, represented by Fig. 824. This differs from Talbot's mainly in that the spring has no coil. The fig-

FIG. 822.—Moving instanding laterals outward by a slight modification of one of Talbot's mechanisms (A).

ure so plainly illustrates the operation that it needs no further explanation. The drawback is clumsiness of the spring.

Fig. 823 illustrates an operation for moving instanding upper laterals outward by a bail-spring machine. Although I thought that I originated this, I afterward ascer-

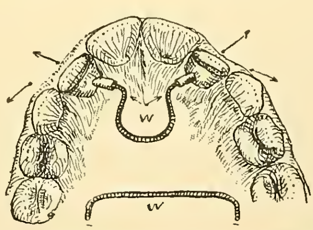


FIG. 823.—Moving laterals outward by a modification of one of Talbot's mechanisms (A).

tained that it was only a slight modification of one previously devised by Dr. Talbot. (See Fig. 824.) This one (Fig. 823) consisted of two ferules, each having a piece of rectangular (hole) tubing soldered to it, to receive the ends of the spring w, bent so that they could be sprung into them, similar to the way in which the ends of a bucket bail enter its ears.

When the mechanism was ready to apply to the teeth, the ferules were cemented on the laterals, after which the spring was cramped so that the hook-shape extremities caught into the sockets. These extremities were filed to correspond with the shape of the socket holes.[1] This wire, in its tendency to return to its original form, acted upon several teeth simultaneously, and in the directions indicated by arrows.

The ends of the spring and the sockets (tubes) should be so placed that the spring can lie close to the roof of the mouth, in order that it may not be disturbed by the tongue; the angular form of the extremities fitting correspondingly shaped sockets will tend to prevent falling of the spring. The advantage expected from a detachable spring was that the force could be easily increased against the teeth when necessary.

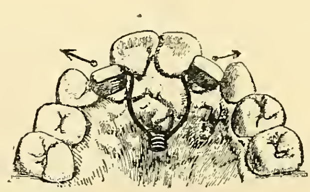


Fig. 824.—Moving two instanding upper laterals outward by a V-shape wire spring having a coil (Talbot).[2]

Fig. 824 illustrates a plan of an operation by Dr. E. S. Talbot for moving outward the upper laterals. The mechanism consists of two thin platinum ferules and a detachable steel-wire spring having a spiral coil. (The coil

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[1] To whom the credit belongs for first using sockets on ferules and clamp-bands, for lodging the ends of spring-wires and screw-jacks, has not yet been ascertained. The author, in 1874, made use of pits in ferules and clamp-bands, and in 1879 constructed sockets for the same purpose. Some of these sockets were soldered directly to the ferules, others were connected by links. Several of them are represented in the dental journals. Some are given in Part VI., p. 241, Fig. 127. I think, however, that the credit of originating the bail-spring having a coil in it, as represented in Fig. 824, should be given to Dr. Talbot.

[2] From the "Dental Cosmos," May, 1886, p. 213.

is made by tightly winding the middle part of the wire around a cylinder firmly held in a vise.) The ends of the spring, which are bent in the form shown in Fig. 825, rest

FIG. 825.—The Talbot spring.

in holes bored in the ferules. In this mechanism the spring plays in these holes like the bail in the ears of a bucket.[1]

When the mechanism was ready to apply, the ferules were cemented on the laterals so that the holes in them faced each other, after which the wire was cramped so that its ends entered the holes. The bow was then swung close to the palatine tissues, and left there. When the spring had nearly spent its elasticity it was removed from the ferules, the extremities pulled farther apart, and then it was returned.

The direction of force from a V-spring like this, or those previously represented, depends somewhat upon the shape and size of the curve, and on the point at which it bears on the teeth. This will be explained later.

Fig. 826 illustrates another and similar operation by Dr. Talbot. This one was also for moving an instanding lateral to line by a spiral-coiled wire spring, the ends of which rested in holes in two ferules. Having shaped the steel wire as shown in Fig. 827, one end was sprung into

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[1] Of course the principle of spring action in this and all similar ones is similar to that in the Fauchard-Berdmore strip. Since Talbot devised a detachable coil-spring in combination with ferules, several other dentists have made claims for originality in various modifications of them, some of which claims are too broad.

a little socket soldered to a thin platinum ferule cemented on the instanding lateral, and the other end into a similar socket on a ferule on a molar on the opposite side.

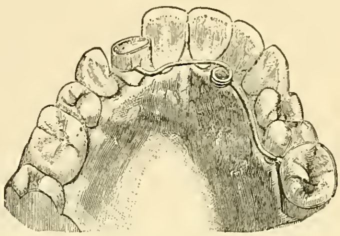


FIG. 826.—Moving a right lateral outward by an independent wire spring anchored by a molar-ferule (Talbot).[1]

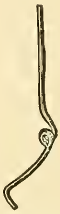


FIG. 827.—The spring.

To render this spring sufficiently firm, the socket on the molar-ferule must be made longer than is represented in the figure; it should be about one-eighth of an inch in length. To prevent the spring from turning, the socket should be oval or rectangular. This mechanism is the same in principle of construction as that represented by Fig. 824.

[1] From the "Dental Cosmos."

CHAPTER LXXXI.

MOVING UPPER INCISORS BY SPRING-WIRE ANCHORED TO CRIBS AND TO CLAMP-BANDS.

THE DELABARRE CRIB, SCHANGE CRIB, LACHAISE CRIB, EVANS CRIB, "ATKINSON CRIB," AND THE CLAMP-BAND.—THEIR RELATIVE VALUE.—OPERATIONS FOR MOVING OFFSTANDING TEETH BY SPRING-WIRE ATTACHED TO CLAMP-BAND ANCHORS.—MOVING A LATERAL AND TWO CUSPIDS AT THE SAME TIME BY TWO SPRINGS.—MOVING TWO LATERALS OUTWARD TO LINE BY COMPENSATING-SPRINGS ANCHORED TO ONE CLAMP-BAND.—MOVING A LATERAL AND A BICUSPID BY A STRAIGHT AND A HOOK SPRING.—MAKING ROOM FOR TWO INSTANDING UPPER LATERALS BY HOOK-SPRINGS.—SIDE-GRIP ANCHORS.—THE BOX-PLATE GRIP.

HAVING in the two preceding chapters explained several operations for the correction of incisors by wire springs in combination with plates and with ferules as anchors, there now remain for consideration operations for moving teeth by spring-wire in combination with other kinds of anchors called the "crib," the clamp-band, and the ferule. The crib, which is old, is simply a basket-like clasp made to embrace one or more crowns of teeth. Some cribs are made of narrow strips of plate, and others of round wire. All these cribs have a spring-like action and hold themselves upon the teeth. The clamp-band is not a spring-clamp, but simply an anchor-band tightened upon the anchorage teeth by a screw.

As mentioned in a previous chapter, Delabarre, in 1826, published the plan of a wire crib used on side teeth for the purpose of keeping the antagonizing teeth apart while other teeth were being regulated by strings. This crib probably suggested to later operators the use of cribs for anchoring metallic springs. Among the first to take advantage of the crib for anchorage were Evans, Schange, and, later, Lachaise. (Linderer, 1848.) Dr. J. L. Williams used the crib about 1854, later Dr. W. H. Atkinson and Dr. Merrall used it about 1871. Recently Dr. Jackson has adopted and made some use of the round-wire crib. The highest point of excellence in the principle of cribs was reached by Schange and Lachaise, but this principle is practically the same as in the Delabarre round-wire crib. All later wire cribs are the same or but slight modifications of these three. Several of the best of my own mechanisms are anchored by cribs made upon the Schange principle, but I generally prefer the clamp-band. In 1878 was published a transverse screw crib devised by myself (see Part VI., Fig. 287A), but I seldom use it now.

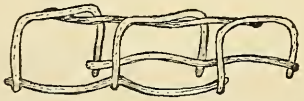


FIG. 828.—The Delabarre crib (1826).

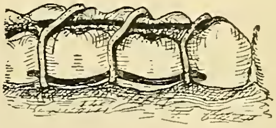


FIG. 829.—The Delabarre crib as applied.

Fig. 828 represents the Delabarre crib. This was made of six pieces of wire bent and soldered together as shown. (Fig. 828.) When ready to apply it was forced over the side teeth as shown in Fig. 829, the lower wires hugging tightly their necks.

Fig. 830 represents the crib used by Schange, and Fig. 831 that by Lachaise. These are made of narrow strips of plate bent and filed so as to fit closely the sides and sulci

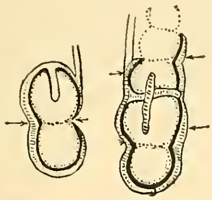


FIG. 830.—The crib of Schange (published in 1848).

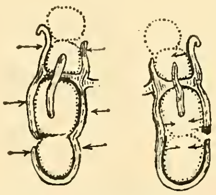


FIG. 831.—The crib of Lachaise, a modification of the Schange crib (published in 1848).

of the anchor teeth. To these anchors were attached strips, strings, and rubber, connecting them with teeth to be moved.

Figs. 832 and 833 represent cribs, as used by Atkinson, for moving irregular front teeth to line. As will be

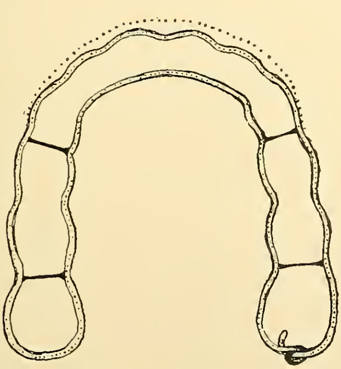


FIG. 832.—The full crib (1877–79).

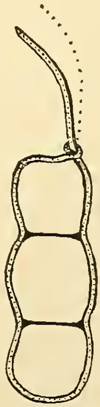


FIG. 833.—The single crib and spring.

seen, the one represented by Fig. 833 is similar to a part of the one represented by Fig. 832.[1] In some cases, where the teeth have small necks, such crib-anchors are prac-

[1] Dr. Atkinson personally informed the author that he thought that he had used cribs since 1870. He would not say that he originated them. The form of this crib resembles somewhat that designed by the Phœnician dentist, 400 B. C. (See Part II., p. 35, Fig. 9.)

ticable, as the grip is sufficient to even hold wire springs (Fig. 833), if skilfully made. If bunglingly made, however (as most of them that I have seen are), they cannot in any way be regarded as equal to many other mechanisms. The advantage of crib-anchors is their cheapness and the ease with which they can be applied and removed for altering the form of the springs.

FIGS. 834, 835.—The author's modification with springs.

The author's crib, represented by Fig. 834, is only a slight modification of the Delabarre and Schange crib. The improvement does not lie in connecting the middle of the two side pieces of round wire by a curved piece of spring-wire to cause grip, but in connecting the anterior or the posterior ends of the two side pieces of wire by a piece of very thin ribbon of rolled wire. The ribbon when in use rests between the side teeth, to prevent the crib from being drawn, or pushed out of place, when the force acts forward or backward. Simply uniting the ends of the binding parts on the sides of the teeth is not new, as it is shown in Schange's crib—where the two side pieces and the end piece are made of one strip of plate; the difference lies in the use of very thin elastic ribbon instead of thick rigid plate. The spring part is made of hard gold.

The principle of this side grip is the same as that in Schange's, and later in some of the older of modern anchors; for instance, box-plates covering and gripping the crowns of teeth. The Schange crib was probably suggested by swaging plates for inclined planes (for covering front teeth), and making them skeleton-like to permit some parts of the enclosed teeth to appear through holes. Fig. 835 represents the author's plan of attaching hook-springs to this crib for drawing back bicuspids.

Side-grip Anchors.—The box-plate is not a new invention. C. A. Harris, in his work, mentions the covering of all the lower teeth, as far back as the molars, by plates; this was done to anchor it firmly to the teeth. About this time was also introduced the hard-rubber box-plate, which constituted a still firmer anchor. As with the Delabarre crib, the grip of the box-plate is on the necks of the teeth, and especially those parts of the necks of each two teeth near their approximal sides. Observe that this grip (unlike that of the longitudinal screw clamp-band) does not force the teeth tightly together, but leaves them standing in their normal relations to one another, whether they be in contact or a little way apart.

The cribs suggested by Richardson, as well as by Schange and Lachaise, have their merit in this side grip. It is also the same kind of grip that was sought and obtained by the author in his transverse screw clamp-bands before referred to. The fish-tail and spear-headed clasps for holding plates in place, as used by Tomes, and later by Kingsley and others, act upon the same principle; *i. e.*, the metallic fingers, with spear-shape projections from the plates, which extended between or over the crowns of side teeth, bore upon the buccal sides of the teeth. Although round steel wire for cribs had gone nearly out of use, it has of late been somewhat revived by several dentists, among whom is Jackson. I do not believe, however, that steel wire will supersede "German silver" and gold, because these are easier to manipulate, and can be as easily soldered. The advantage claimed for the former is cheapness. Gold cribs, besides being equally effective, are more artistic, and will not blacken by use; nor are they too costly for the purpose.

Relative Value of Cribs and Bands.—In a large majority of cases the value of a *side-grip* anchor, whether it be a crib or a *transverse screw* clamp-band, is not equal to a longitudinal screw clamp-band; and valuable as is the ferule, it also is not equal to it for powerful draughts.[1] Longitudinal clamp-bands are not only firmer anchors for wire springs, but when wire rings or hooks are added they are more useful, because their firmness can be relied upon. Especially is this true as against ferules, because they can stand a strain that would loosen ferules by crumbling the cement; again, they never turn the anchor teeth; still, ferules and side-grip anchors have their uses, and should never become obsolete. (See Evening-cribs.)

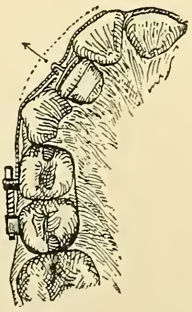


FIG. 836.—Moving a lateral outward by spring-wire anchored to a clamp-band (A).

Fig. 836 illustrates an operation for moving an instanding right upper lateral into line by a wire spring attached to a clamp-band serving as the anchor. A second mechanism (which was invented several years earlier than the crib and spring represented by Fig. 833) consisted of a

[1] The ferule has been dwelt upon somewhat in Part VI., pp. 241, 339, but it will be further treated later in this Part.

straight piece of gold spring-wire, one end being threaded and screwed to the anchor-band. Both nuts on this clamp-band were double. (See Fig. 837.) In the anterior nut both the holes were smooth, while in the posterior one

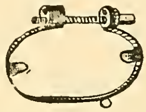
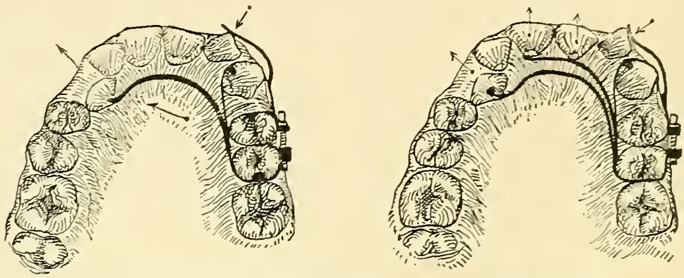


FIG. 837.—Double-nut clamp-band (A).

both were screw-cut. One of these holes in each nut was for the clamp-band bolt; the other for the spring, which, when applied, was projected through the outermost (smooth) hole in the anterior nut, and then screwed tightly into the outermost hole in the posterior nut. The free extremity of the wire extended forward from the clamp-band and rested on the cuspid and central, forming a line over the instanding lateral. This wire was sprung inward toward the instanding tooth, and caught upon a hook soldered to the labial surface of a platinum ferule cemented on it. The dotted lines show the position and form of the wire as it appeared before being caught under the hook. This spring is made of wire not larger in size than the smallest pin.

Fig. 838 illustrates two attempts to move a left lateral, two cuspids, and the centrals, by wire springs soldered to a clamp-band. This mechanism (which was made and used by a dentist who misunderstood my instructions about constructing it) did not work properly. It is presented more as a lesson on the error of not applying compensating-forces between teeth to be moved and the anchor teeth than as an example to follow. In this operation the left cuspid was moved back by the repeated tightening of the clamp-band before the other cuspid and the lateral were acted upon by the springs. Neither of the springs was soldered to the clamp-band until the left cuspid had been drawn back sufficiently far to make ample space for the lateral. This being accomplished, the springs



FIGS. 838, 839.—Moving an upper lateral and the cuspids and centrals by gold-wire springs anchored to a clamp-band (A).

were added, and so bent that they bore upon and moved both the outstanding left lateral and the instanding right cuspid in the directions indicated by arrows in Fig. 838.

Compensating-bearings.—It is obvious that any marked alteration in the size of the clamp-band (made by keeping it tight on the cuspid) might disturb the proper bearing of the spring on the lateral. Besides, the back force of both springs in one direction would also tend to move the anterior teeth in the clamp-band outward. To avoid this it was necessary to oppositely brace the anchorage. This was done with partial success by adding wire to the lingual side of the anchor-band, so as to extend anteriorly and posteriorly and rest against the centrals and the molar. The anterior part of this wire only is shown in Fig. 839.

Fig. 840 illustrates a third step in an operation for moving two upper laterals outward to line by compensating-springs anchored to one clamp-band. The first step in the operation was to extract the second bicuspids, which stood inside their proper positions. The next step was to move back the first bicuspids; this was accomplished by two gold clamp-bands anchored to the first molars as represented.

After this step had been completed a platinum ferule was cemented to each of the instanding laterals, to hold

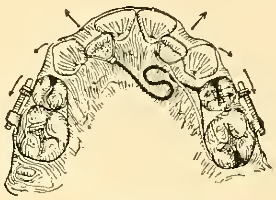


FIG. 840.—Moving instanding laterals to line with compensating-springs (A).

the ends of the two compensating-springs in place upon them. The other ends of the wires were soldered to the lingual side of the left clamp-band as shown. One of these springs (represented in white) was soldered to the posterior part of the anchor-band, and the other one (represented in black) was soldered to its anterior part.

When the springs (which were of hard-gold wire) were ready they were so bent that they would bear upon these teeth in nearly opposite directions as indicated by arrows.[1]

By this plan the influence of one of the springs upon the anchor teeth was opposed by that of the other, and this compensation of forces prevented the anchor teeth (the bicuspid and molar) from moving out of line.

To prevent the springs from slipping off the ferules on the laterals, the end of the longer (black) spring rested in a socket soldered to the lingual side of the right ferule,

[1] In this case the cuspids moved back naturally, but in a large majority of cases this self-movement of the cuspids is not sufficiently rapid; therefore I generally move the cuspids back before attempting to move other teeth.

while the shorter spring simply rested sidewise against the left tooth, just above the ferule.

To reduce the inconvenience of the longer spring to the minimum, it was curved upward to correspond with the shape of the palatine arch.[1]

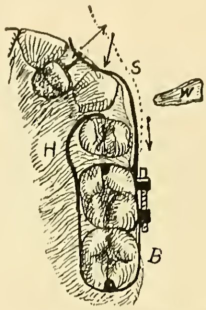


FIG. 841.—Making room for an instanding upper lateral, and moving it to line by wire springs anchored to a clamp-band (A).

Fig. 841 illustrates a case of irregularity of the teeth of an ill-willed child. It consisted of an instanding left upper lateral and an outstanding adjacent cuspid. To make room for these teeth it was necessary to first extract the second bicuspid and then move the first bicuspid upon its territory.

The mechanism used consisted of a straight piece of spring gold wire, S, and another of hook form, H, both of which were anchored to a clamp-band, B. This was used to prevent the child from picking and dislodging it from the teeth without causing pain. The size of the wire of which the long spring was made was less than that of the smallest pin (very delicate), while that constituting the hook-spring was stiffer and of the size of a large pin.

[1] This mechanism is like the one described in Part VI., p. 268. Concerning the construction and application of clamp-bands, see Part VI., pp. 236, 237.

Both were made from broken spectacle-bows. The hook-spring for moving back the first bicuspid was fixed to the anterior end of the lingual side of the clamp-band by (soft) solder, while the other spring was (soft-)soldered to the buccal side. The figure represents the mechanism as having been entirely constructed at one time. The outside spring s was not added until after the hook-spring had been used. The hook was made to catch on the anterior side of the first bicuspid, to draw it toward the molar. About meddling with this spring by the patient I will speak later.

To make room for inserting this spring (in the early part of the operation) a space was caused by a wooden wedge, w, forced between the cuspid and bicuspid. This seemed necessary, though it was at the risk of crowding the cuspid still farther upon the territory of the lateral. When this tooth (bicuspid) had been moved sufficiently to make ample space for the instanding lateral, the other spring, s, was applied and brought into use. This delicate wire (the natural position of which is represented by a dotted line) was sprung down between the cuspid and central, and caught in a hook-staple on a gold ferule, that was cemented upon the instanding lateral. The elasticity of this wire caused the lateral to move into its proper place.

Fig. 842 illustrates the second step in an operation for moving two instanding upper laterals to line. The first step consisted simply in extracting the right second bicuspid and the left first bicuspid; the second, in drawing the left cuspid and right first bicuspid posteriorly, by spring-wire hooks anchored to clamp-bands, which embraced the side teeth posterior to them, as shown. The third step was the application of the third spring to the right cuspid, and the fourth step, the addition of a long-band (not shown).

On the left anchor-band there was only one spring-hook, while on the right band there were two. The left hook and one of the right ones (lingual) were attached to the clamp-bands by square lugs. This was to aid in preventing these hooks from turning, through interference by the tongue. The main aid was from hammering flat the posterior extremities of the hook-wires to about one-eighth of an inch in width, to rest against the flat clamp-bands. The third hook was attached by being screwed into a nut on the buccal side of the clamp-band. All these hooks were attached to the teeth to be moved by staples soldered to ferules cemented on them. The right cuspid-hook was applied after the bicuspid had been moved. The bicuspid-hook was left as a retainer while the cuspid-hook was doing its work on the cuspid. The long-band (not shown) was subsequently added to the clamp-bands to serve as anchor to rubber rings for moving the laterals outward. The right anchor teeth were moved forward somewhat, but not sufficiently far to interfere with success.

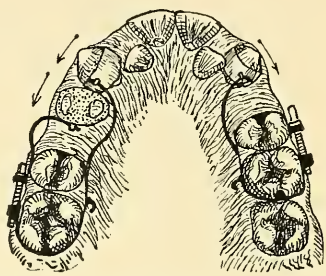


FIG. 842.—Making room by hook-springs for correcting instanding laterals (A).

Object of Hook-springs.—The chief value of these spring-hooks is found in treating cases of disobedient and unintelligent patients who continually pick at regulating mechanisms. This case was that of a girl about twelve years of age, who was not intellectually bright. I first tried other kinds of mechanisms, but did not succeed with the operation (because of this peculiarity of the patient) until these self-acting springs were substituted. Though she attempted to remove them, the pain she caused herself soon led her to cease meddling, through fear of repetition of pain. With these the operation was completed quite successfully.

CHAPTER LXXXII.

MOVING UPPER INCISORS BY PLAIN AND BY SCALLOP WIRE WITHOUT PLATES FOR ANCHORS.

MECHANISMS OPERATED BY THE POWER OF CORRUGATED STRIPS OF PLATE.—OTHERS OPERATED BY SCALLOP WIRE ANCHORED BY FERULES, CRIBS, AND CLAMP-BANDS.

FOR the correction of one or two front teeth that protrude there are several mechanisms, but the ones generally preferred mainly rest upon the labial surfaces. Bell, in 1830, mentioned the use of a strip of plate anchored to the side teeth. The strip was bent in and out to conform somewhat to the outline of the surface of the dental arch.

Fig. 843 represents the appearance of a strip, before being corrugated, by Dr. Byrnes. This mechanism, which is a modification of one by Desirabode (1823),[1] is made as follows: Two gold ferules, of a size that would closely embrace two or more side teeth (say a second bicuspid and first molar on each side of the arch), are connected by a strip of plate to rest along the outside of the front teeth. When applied to the teeth this strip is corrugated (as suggested by Salter) by being pressed upon by an instrument at places off against the valley spaces between the teeth

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[1] See Part VI., p. 337.

over which it rests. This bending forms a series of small drawing-springs. When the tension of the strip is spent it is taken off the teeth, rebent, and then replaced. Sometimes the strip should be annealed, cut shorter, resoldered,

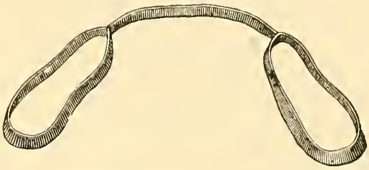

FIG. 843.—Long-band having two closed anchor-bands (Byrnes).

and then be reapplied. Occasionally the pressure may be advantageously increased by a block of wood or rubber inserted (as suggested by Tomes) between the strip and the teeth, at places where the force is desired.

Scallop-wire Mechanisms.—In Part VI., pp. 265–270 and 383, are represented several mechanisms acting by zigzag springs with crutch-anchors, and also in combination with band and plate anchors. We will now consider other mechanisms having zigzag springs. Next in value to the screw-acting mechanisms I place a class which I denominate *scallop-wire mechanisms*, devised by myself. By these mechanisms the force can be governed to push or to pull, the *greater value*, however, lying in their *pushing* qualities. The character of the force may be derived from *elastic* wire, but the *best* results come from firm action derived from rigid wire. The pushing force of the zigzag wire is made greater by increasing the size of the scallops, and the pulling force by decreasing their size. The wire has but few zigzag curves or scallops, generally only one or two, the remainder of the wire being plain. For anchors I sometimes use cribs (Schange), but generally I prefer clamp-bands for moving only one or two teeth, but for a greater number I prefer hard-rubber plates anchored by clamp-bands. Upon the same principle very excellent retaining-plates can be made. (See Retaining Mechanisms, Part XX.)

FIG. 844.—Mechanism for pushing force (A).

Fig. 844 represents a small skeleton mechanism for moving an instanding upper central incisor forward. It consists of a clamp-band for anchor, and a stiff piece of wire. After having bent zigzag one extremity of this wire, the end is soldered to the anterior part of the lingual side of the band as shown. This wire is then slightly curved toward the instanding tooth, and the end fitted into a hole or a socket in a ferule, w, cemented on it. The relation of this point of bearing to the central to be moved depends upon the direction the tooth must take. If it is directly outward the bearing should be on the middle part of the lingual side of it; but if the tooth is to be turned also, then the bearing should be to one side of the middle part. To increase or to maintain the proper pressure the zigzag part of the wire is slightly straightened.

In Part XVI. may be found represented a similar mechanism for turning a cuspid. This mechanism differs from the other in that it draws upon the tooth to be moved, instead of pushing it.

Fig. 845 represents a mechanism of this class for moving forward instanding upper centrals. The difference between this and the last ones described is mainly in the anchors. Instead of ferules or clamp-bands we have a modification of the Schange crib (1848).[1] My improvement in the crib is confined to the uniting of the anterior ends of

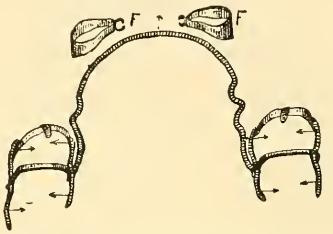

FIG. 845.—Mechanism for moving forward the centrals (A).

the biting-arms by a thin ribbon of rolled-gold wire to bear against the anterior sides of the first molars. This prevents the crib from being forced posteriorly when the bow is applied to the centrals. This bow, like the wire last described, is held on the centrals by ferules.

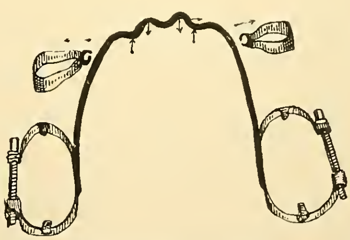

FIG. 846.—Mechanism for widening the cuspid parts of the arch (A).

Fig. 846 represents a mechanism for widening the cuspid region. The force upon these teeth is caused by straightening the corrugated part of the wire. The bow is held to the cuspids by ferules.

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[1] The Schange crib was published in German language by Linderer in 1848.

Fig. 847 illustrates an operation for enlarging the anterior part of the upper arch. The wire bow was held on the centrals and cuspids by ferules. The force against

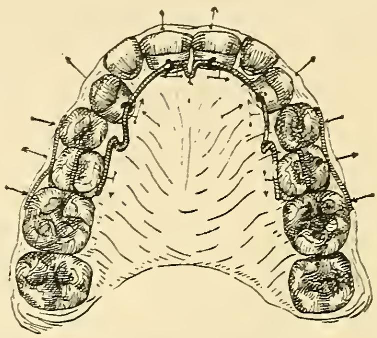


FIG. 847.—Enlarging the upper arch (A).

the six front teeth (see arrows outside the arch) was given by the posterior corrugations of the wire. The movement of the side teeth was caused by the buccal anchor-wires, and that of the cuspids by the anterior corrugation. To increase the force upon any of the teeth the corresponding parts were rebent. (For several other corrugated-wire mechanisms, refer to the Index.)

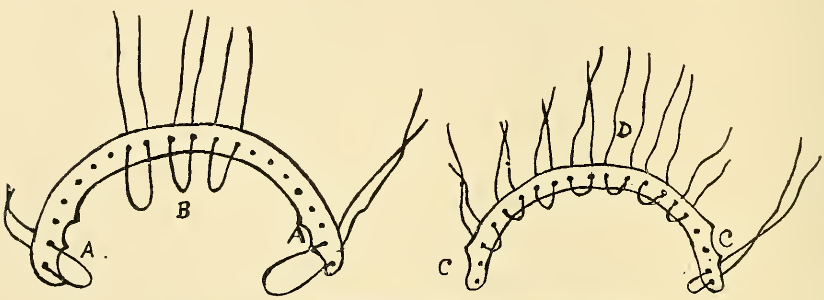
CHAPTER LXXXIII.

PLANS OF MOVING UPPER INCISORS BY METALLIC LONG-BANDS, AS MADE AND APPLIED BY THE EARLY DENTISTS, AND AS MADE AND USED BY MODERN DENTISTS.

THE PLANS OF MECHANISMS BY BOURDET, DESIRABODE, BELL, HARRIS, GODDARD, FOX, AND THE AUTHOR.—DIFFERENT PLANS OF ATTACHING STRINGS TO LONG-BANDS FOR DRAWING UPON TEETH.—THIMBLE-CROWNS AND CORRUGATED STRIPS.—MOVING INCISORS BY THE OLD-STYLE LONG-BAND IN COMBINATION WITH RUBBER RINGS.—MOVING INCISORS BY THE NEW KINDS OF LONG-BANDS IN COMBINATION WITH RUBBER RINGS.

AS elsewhere said, the long-band of to-day may be regarded as a modification of the Bourdet long-strip of plate, which, again, is only a modification of the Fauchard short-strip, of sufficient length to embrace three or four front teeth only. The long-band generally extends sufficiently far back on the buccal sides to include from ten teeth to nearly the entire length of the dental arch. The long, narrow strip of Bourdet was "pierced throughout its length with holes for strings." Strings, then, were not only used to cause traction upon the front teeth to be moved, but were also used as anchors to hold the extremities of the strip to the side teeth. By the best modern operators strings are not used as anchors, but, instead, some form of metallic anchors, such as clasps, ferules (Desirabode), knob-bands (Harris), thimble-crowns (Desirabode), cribs (Schange), clamp-bands (Farrar), takes their place.

Bourdet and Fox.—Bourdet, in describing the long-strips of flat plate, seems to have regarded them as his invention; but they only differ from Fauchard's in that they are longer.



FIGS. 848, 849.—Side views of Bourdet's metallic strips (1786).

Figs. 848 and 849 (photo-electrotyped from diagrams in Bourdet's book) represent two of his strips. Regarding Bourdet's use of these strips, see accompanying footnote.[1]

Fig. 850, drawn by the author, represents what was evi-

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[1] Bourdet (1786) says: "When the canines and incisors of the lower jaw protrude against the lip . . . the deformity may be corrected by the use of strips of plate. To put the upper teeth in their proper anterior position, and to draw back the lower ones, two semicircular strips must be made, which surround the teeth from the second molar on one side to the same tooth on the other side. Each strip should be pierced with twenty small holes, which, when the device is applied, ought to be exactly opposite the teeth which are to be placed in order, so that the thread caught in the two holes which serve for each tooth may draw it toward the strip. The strip of plate for the upper jaw will, of course, be larger than that for the lower, and it will be placed outside, toward the lip; while that for the lower jaw will be placed inside the dental arch, toward the tongue. As to the lower strip, each thread will form a loop on the strip's posterior face, and the ends which pass between all the teeth will fall outside and be tied each on its own tooth."

Following this, Bourdet gives a minute detailed description of the tying of dently intended to be the form of the Bourdet strip when applied. To quote Bourdet's language, Fig. 848 represents the "strip of plate for correcting teeth of the upper jaw when those of the lower project so as to cover them. A, A, curves [horns] in the strip to fit around the [anchor] teeth that serve as points of support. B, loops made by the

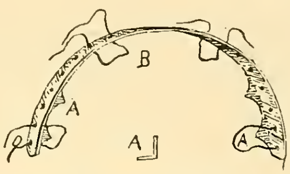

FIG. 850.—Edge view of the Bourdet long-band (1786).

threads which pass between the teeth and hold them to the strip. Fig. 849, anchor-strip of plate to fit on the inside of the lower jaw. C, C, curves in the strip which rest on the teeth that are in line. D, loops of thread on the concave surface of the strip."

About seventeen years later (1803) Mr. Fox described a mechanism consisting of a "strip" having gags attached to it. This mechanism differs mainly from Bourdet's in the addition of blocks of ivory or bone. This modification is now obsolete, yet, as it is the forerunner of the Desirabode thimble-crown anchor and gag combined, brief

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each thread, which is so trifling that it is unnecessary to quote it here. He then continues as follows:

"Nearly the same process is followed with the strip of plate on the lower jaw. The threads are passed in and out in the same manner, and then tied and knotted on the teeth. These strings should be removed and retightened twice a week, until the teeth have resumed their proper position—that is to say, until the teeth of the upper jaw are drawn forward, so that no part of them is hidden behind those of the lower jaw. When this operation is properly performed . . . the improvement is so great that the patient is hardly recognizable.

"Strips of plate ought to be of gold—never of silver, which turns black in the mouth."

mention of it is made. As shown in Fig. 851, these blocks, B, B, were riveted to short strips of gold plate soldered at right angles to the strip L. These blocks were used to hold the jaws apart while instanding front upper teeth were being drawn over the lower by strings connecting them with the strip.[1]

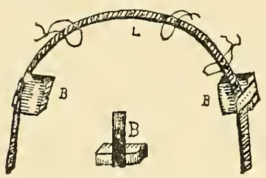

FIG. 851.—The long-strip in combination with gag-blocks, as used by Fox (1803).

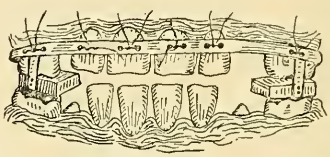

FIG. 852.—Illustrating the mechanism while drawing upper incisors forward by strings tied to the strip of plate (Fox, 1814).

Fig. 852, copied from the work of Fox, illustrates the application of this mechanism. In explanation of its use Fox says: "To remove the form of irregularity above mentioned, two objects must be accomplished: one, to apply a force which shall act constantly on the irregular tooth and bring it forward; the other, to remove that obstruction which the under teeth (by coming before the upper) always occasion."[2]

[1] "Natural History of Human Teeth," 1814.

[2] Mr. Fox further says: "The first of these objects may be attained by the application of an instrument adapted to the arch, which, being attached to some strong teeth on each side, will furnish a fixed point in front to which a ligature (previously fastened on the irregular tooth) may be applied, and thus, by occasionally renewing it, a constant pressure is preserved and the tooth may be drawn forward.

"The second object, that of removing the resistance of the under teeth, must be attained by placing some intervening substance between the teeth of the upper and lower jaws, so as to prevent them from completely closing and being an obstruction to the coming forward of the irregular tooth.

"This instrument [long-band] may be made of gold or silver. It should be so strong as not easily to bend. If about one-sixteenth of an inch in breadth, and of proportionate thickness, it will be sufficiently firm. This bar of gold must be bent to the form of the arch, and should be large enough to reach to

Long-bands and Anchors by Desirabode, Bell, Goddard, Tomes, Harris, and the Author.—Goddard (1844) mentions the anchoring of strips of plate to the teeth by gold clasps, but Desirabode (1823), twenty-one years earlier, anchored his long-bands by ferules. Desirabode,[1] however, devoted only a few lines to the regulation of teeth. Tomes, in his early work, gives a description of a long-band anchored to a box roof-plate. This class of bow-plates will be found explained in Part XIX. Of the long-strip (long-band), Desirabode writes as follows: "Whatever modern authors may say, . . . claiming it as their own invention, and supposing that they have solved a problem never before thought of, it is nevertheless true that it was known to the ancients [?]; . . . if our predecessors have not derived as much benefit from it as ourselves, it was because they did not avail themselves of firm points of support [anchorage]—a first condition in all apparatus of replacement."

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the temporary molars, which are the teeth to which it is to be tied. Holes are to be drilled in it at those places where ligatures are required, which will be at places opposed to the teeth designed to be the fixed points, and also at points opposite to the place where the irregular tooth or teeth are situated. Then to the bar a small, square piece of ivory is to be connected by means of a little piece of gold, which may be fastened to the ivory and the bar by two rivets. This piece of ivory passes under the grinding surfaces of the upper teeth, is kept there fixed, and prevents the teeth from closing, and consequently takes off all obstruction in front.

"The bar [long-band] is to be attached by a strong silk ligature to the teeth at the sides, so that, if possible, it may remain tight as long as it is required. A ligature is then to be tied around the irregular tooth, and the ends, being brought through the holes in the bar, are to be tied in a firm knot. In two or three days this ligature must be removed and a new one applied. The tooth will soon be perceived to move. A fresh ligature must be used every three or four days, in order to keep up a constant pressure sufficiently powerful to bring the tooth into a line with the others.

"The same mode of treatment is to be observed whether there be one, two, or three teeth growing in a similar manner."

1 "Surgeon-dentist to Charles X. of France." This author's book is of considerable value to the dental historian.

Figs. 853 and 854 represent Desirabode's mechanisms. Their construction is given in the following translation: "Let us suppose an incisor thrown forward, and having space enough to permit it to be reduced into line. We take the mould of the defective dental arch. Then, upon the posterior and anterior faces of the teeth, we adapt a bandelette of gold somewhat narrower than the height of

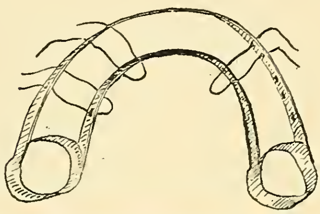

FIG. 853.—Double long-band with ferule-anchors (Desirabode, 1823).

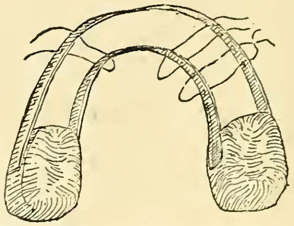

FIG. 854.—Double long-band with thimble-crown anchors (Desirabode, 1823).

the teeth, but touching them all along the alveolar border, terminating at each of its extremities with a kind of *bracelet* [ferule], or, better still, with a *true cap* [thimble-crown], which envelops the two last molars upon which we wish to take a firm support. Before applying this little apparatus we pierce each band with two holes in the horizontal direction, and precisely at the point corresponding to the irregular or oblique tooth. Finally, when it is applied, we pass through the holes a thread of raw silk, waxed, or of platina (wire), and twist it around the tooth to be replaced."[1]

Evidently his object in using two strips was to tie outstanding teeth to the posterior strip, and the instanding to the anterior.[2]

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[1] "Science and Art of the Dentist," by Desirabode, as translated by C. A. Harris.

[2] The principle of the double long-band in the days of Desirabode (1823) was probably borrowed from Fauchard's base for the support of artificial teeth. (See Fig. 22, Part II., p. 53.)

Thomas Bell (1830).—In referring to the Fox mechanism, Mr. Bell, in his work, explains what he regards as an improvement upon it made by himself. Instead of making the long-band in the form of a regular arch, he corrugates it upon a cast ("brass") of the dental arch, so that it will conform with the "depressions and elevations presented by the teeth," with the exception of the middle part, which does *not* rest in contact with the teeth to be moved.[1] (See Fig. 855.)

Gold Thimble-crowns and the Corrugated Strip (1823–30).—Instead of holding the jaws a short distance apart by blocks of ivory or bone (referring to the Fox blocks), Bell

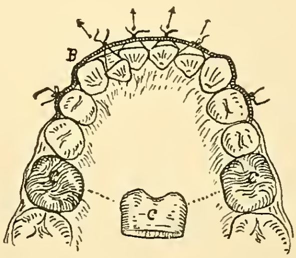

FIG. 855.—Plan of moving forward lower incisors by strings, thimbles, and corrugated long-band (Bell, 1830).

used gold thimble-crowns. These were not soldered to the strip, however, as suggested by Desirabode seven years earlier, but were applied to the teeth independently of the strip. He describes the thimble-crown as "a simple cap of gold, made to fit accurately to a molar tooth."[2] Bell, as did Bourdet forty years earlier, tied the extremities of the strip to the side teeth with strings. Mr. Bell evidently believed that he originated the corrugated strip

[1] "Anatomy, Physiology, and Diseases of the Teeth," 1830.

[2] See p. 101, same treatise (Bell).

and the independent thimble-crown, but Desirabode had already described the strip and thimble several years earlier.[1]

Harris, in 1839, also refers to the use of gold thimble-crowns as follows: "For the last twelve or fifteen years many practitioners, both in England and America, have substituted caps of gold for the blocks of ivory, . . . and instead of simply bending [curving] the bar [long-band] they now stamp it between a metallic cast and die, so that all parts except those immediately opposite the irregular teeth may be perfectly adapted to the dental circle. The caps of gold are entirely disconnected from the bar [long-band]. They were placed on the deciduous molars, and sometimes on the first adult molars. As these caps prevent the teeth from coming together, mastication is performed on *them*."

In the days of Bell and Harris these thimble-crowns were made (for permanent use) substantially in the same way as at the present time. For keeping the jaws apart nothing superior to them has since been invented.

As previously mentioned, Desirabode described in 1823 the soldering of the extremities of the long-band to "caps which embraced the last two molars." Harris, who wrote sixteen years later, also mentions that to secure sufficient firmness of an inside band he used gold caps so made that they would cover two teeth on each side.[2]

Fig. 856 represents Desirabode's "true cap" for two molar teeth. In a later edition of Harris's work (1850, p. 165), while explaining the long-band mechanism, he describes the construction of the double "caps" thus: "A

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[1] By the above remarks it will be seen that the gold thimble-crown so extensively used at the present day is no new invention.

[2] Harris also moved incisors in both jaws posteriorly, by the aid of inside strips of plate. (See chapters on Correction of Lower Incisors, Part XV., Section B.)

gold plate of the ordinary thickness should be swaged up over the first and second molars, if the latter has made its appearance, and if not, over the second bicuspid and first molar on each side of the jaw, so as to completely encase these teeth." If, when applying these caps to the teeth,

FIG. 856.—Double Cap (Desirabode, 1823).

they should not be found sufficiently thick to prevent the front teeth from coming together, he says "a piece of gold plate should be soldered on that part of each which covers the grinding surfaces of the teeth." In addition to this he says practically the same as he did in his first edition (1839), that *a small gold knob may be soldered on each side of such a cap for attachment of silk ligatures.*

While Harris speaks favorably of caps in combination with strips (long-bands), as being firmer and less uncomfortable to wear than the strip tied with strings, I think he does not mention Desirabode's description of such anchors or their combination with bows. (See Fig. 857.)

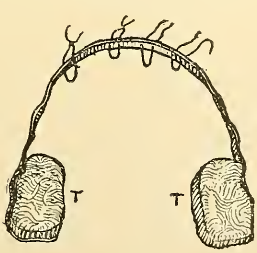

FIG. 857.—A single "strip" of plate soldered to Desirabode's gold double "caps" (Harris).

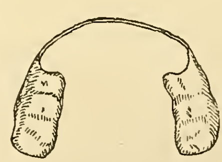

FIG. 858.—A similar mechanism (from Tomes).[1]

Fig. 858 represents a mechanism made similar to the Harris modification (1839) of Desirabode's (1823).

[1] Tomes's "System of Dental Surgery."

Fig. 859 illustrates an operation upon the upper teeth performed by Harris in 1844. Although Dr. Harris in his text does not clearly explain the connection of the long-band with the caps, it is fair to presume that, as he trans-

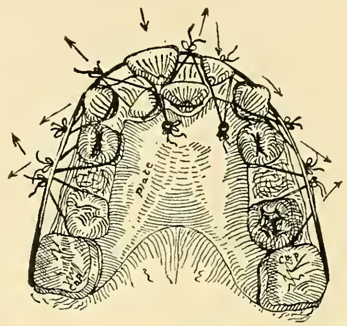

FIG. 859.—Upper teeth moved in different directions by tying them with strings to a long-band in combination with gold thimble-crowns (Harris, 1850).[1]

lated Desirabode's original French work into English, he must have known of, and probably adopted that combination. This is further made evident by Fig. 859, taken from his work.[2]

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[1] From Chapin A. Harris's "Principles and Practice of Dental Surgery," 1850.

[2] As the process is based upon a principle sometimes adopted in modern practice, a quotation from his work is given. Including a clause in which a clearer description of the mechanism might profitably have been given, he says: "Without going into a minute detail of the method which was adopted for procuring the appliance employed, it will be sufficient to refer the reader to Fig. [859]. This represents a plaster model of the teeth, alveolar border, palatine arch, and the apparatus employed for remedying the deformity. The second bicuspids were first extracted; then, by means of ligatures applied to the second molars and first bicuspids, and made fast to the band of gold passing around the outside of the arch, which [ligatures] being renewed every day, these teeth were brought out to their proper position in eleven weeks. This done, there was a space of nearly an eighth of an inch between the cuspids and first bicuspids; this was filled up by bringing back, with ligatures properly applied, the former to the latter. A ligature was next applied to the right lateral, passed through a hole in the gold band in front, and made fast. In ten days the tooth was brought out to its proper place. A ligature was now attached to a knob soldered on the gold plate [strip] behind the teeth, on the inner side

Different Plans of Attaching Strings to Long-bands for Drawing upon Teeth.—Prior to about 1846 the drawing of front teeth toward the long-band was accomplished only by connecting them with it by strings or by wire passed through holes in the long-band or caught over knobs, hooks, or notches made on or in it.

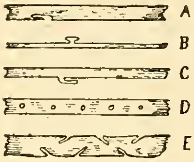

FIG. 860.—Sections of various forms of long-bands with catches for strings.

A, Part of long-band having a notch; B, part of long-band having a knob; C, part of long-band having a hook; D, part of long-band having holes; E, part of long-band having open slits.

Fig. 860 represents the middle section of five long-bands made of strips of plate, showing various means of catching strings. The forms shown by A and E were known to myself as early as 1864, and probably known to others much earlier. The forms shown by B and C were published in 1881,[1]

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of the alveolar border, and tied tightly in front of the projecting right central incisor. In about three weeks this was brought to a position beside the lateral incisor of the same side. The left central was then, in like manner, brought forward, and the right carried backward to its proper place. . . . To correct the irregularity in this case required, in all, twenty-one weeks."

That there were drawbacks to this mechanism we may infer from another quotation about this operation:

"It was found necessary, in consequence of the diseased action which the apparatus excited in the gums, to remove the mechanism every eight or ten days, and let it remain off, each time, twenty-four hours. It may be proper, also, to observe that every time the ligatures were removed it was taken from the mouth, and the teeth thoroughly cleansed."

The diseased condition of the gums referred to by Harris was evidently caused by allowing the strings to cut into them, making the removal of the mechanism for twenty-four hours every eight or ten days, a necessity. If strings are used as aids to anchorage they should be prevented from slipping by some kind of a gum-guard hook or ring on the teeth. (See Part VI., p. 242, and Part VIII., p. 431.)

[1] Illustrated by the author in the "Dental Cosmos," July, 1881. Dr. R. B.

but they are only modifications of the Winder cleats.[1] The form shown in D is that of Bourdet (1757).

Notches in long-bands are not advisable, because they weaken them greatly; even holes tend to weaken them somewhat. If holes are arranged in a straight or a zigzag line along the band and not across it, however, the long-band will generally be sufficiently stiff.

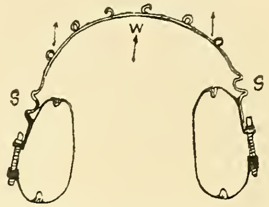

FIG. 861.—Mechanism for elongating the upper arch by elastic-rubber rings (A).

Some of the Author's Plans.—Fig. 861 represents a mechanism for elongating the upper arch by elastic-rubber rings, in combination with a scallop-wire bow, soldered to clamp-band anchors. The curves S, S, in the wire W, are for advancing its anterior part ahead of the teeth as they move forward. This is accomplished by straightening, so to speak, the curves in the bow. The teeth are moved by first catching the rubber rings on the instanding teeth; then, stretching them forward over some of the hooks, they are lodged on other hooks.

Another and generally a better plan when more than one tooth is to be moved is to stretch the rubber from one tooth through two hooks, and then catch it on another tooth to be moved. By this plan a less number of rings is not only

Winder devised the cross-cleats about 1870–72. Before these were used, wire loops were soldered to the extremities of long-bands by Schange, 1848.

[1] For information regarding some of the more useful plans of tying knots in strings (all of which are old to sailors), see chapter on Knots in Part XX.

sufficient, but the mechanism is less disfiguring to the patient. For moving forward instanding front teeth this is one of the best mechanisms yet known.

Fig. 862 illustrates the beginning of an operation for moving four instanding upper incisors laterally and

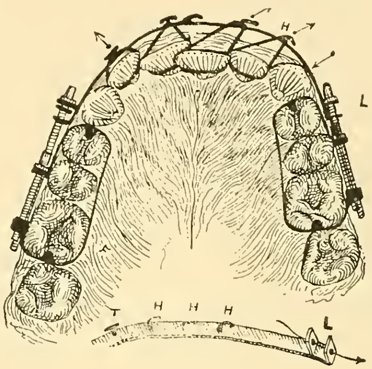

FIG. 862.—Moving upper incisors by elastic-rubber rings caught upon hooks on a long band anchored by clamp-bands (A).[1]

outwardly. It is done by an adjustable mechanism consisting of four very small elastic-rubber rings, caught over T's and hooks soldered to a round-wire long-band, H, fastened by lock-screws, L, to two clamp-bands serving as anchors. The relation of the hooks with the long-band, and also to the right-angle nuts for locking the latter to the anchor-bands by screws, is clearly shown by T, H, and L in the lower part of the figure. The screws and the long-band are confined to each other in the laboratory. (See Part VI., Fig. 283.)

After the clamp-bands had been screwed tightly to the bicuspids and first molar on each side of the jaw, the long-band was connected with them by the screws entering the posterior nuts on the buccal sides of the bands. Rubber

[1] From a lecture by the author, February 27, 1888. Published July, 1888, in "Brooklyn Medical Journal."

rings were then placed over the instanding teeth, stretched, and caught upon the hooks (as represented in the figure). In later stages of this operation the rubber rings were made more taut by drawing them through rings near the teeth to be moved, and catching them on hooks at a greater distance from the teeth.[1]

The relative value of the hook and the T on long-bands depends upon circumstances. The T serves as a double hook, and can be used to catch elastic rings from either direction. The hooks are made by soldering one end of each of several short pieces of wire, so that they will stand at right angles to the long-band and project forward; these are then bent in the directions desired. The hook is a modification of Dr. R. B. Winder's "cross-cleat." If this mechanism is properly made and carefully applied, the operation is easy and rapid.[2]

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[1] The construction of this mechanism is substantially explained in Part VI., p. 327, and Part VIII., p. 424.

[2] There is one other plan of making hooks for rubber rings and strings. This is by soldering gold-wire rings to the buccal side of the long-band, after the plan of Schange's wire loop (1848). The rings are afterward made into hooks by cutting them open. I supposed until of late that I originated such rings on long-bands and bow-wires, but upon reading Linderer's book (1848) I found that Schange had done nearly the same thing years earlier, though he had not used them on the front part of the bow.

CHAPTER LXXXIV.

OPERATIONS ON UPPER INCISORS BY SCREWS.

MOVING FRONT UPPER TEETH BY SCREWS IN COMBINATION WITH ROOF-PLATES.

GENERAL REMARKS ON PLATE-ANCHORS FOR SCREWS.—MEN WHO FIRST USED THE SCREW IN REGULATING TEETH.—ANCHOR-NUTS.—WILSON'S JACK.—OPERATION BY A STEEL SCREW-JACK IN CONNECTION WITH A BOX-PLATE.—PLAIN ROOF-PLATE WITH PUSHING-SCREWS, THE PLATE BEING ANCHORED BY CLAMP-BANDS.—PLAN OF SETTING A SMALL SCREW-JACK IN A PLATE.—TWO PLATES BEARING SCREW-JACKS.—OPERATION FOR CORRECTION OF INSTANDING LATERAL BY A JACK-PLATE.—CASES WHERE THE ANCHOR TEETH ARE SCATTERED AND THE ANCHORAGE IS WEAK.

IN 1849 William H. Dwinelle, M.D. (U. S. A.), used a screw-jack, and in the same year Charles Gaine, M.R.C.S. (Eng.), used screws with a plate for moving teeth. In writing the chapter on History (Part II.) I credited these men as first to use screw-power for this purpose; but after the plates for Part II. had been cast, I ascertained from Linderer's "Handbook" (published in 1848) that Schange had used the screw at least a year earlier. Schange's screw was used in combination with a narrow strip of plate (long-band) for moving posteriorly an outstanding upper central.[1]

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[1] See Fig. 946, Part XV., Chapter XCII., p. 989.

Since that time a great many screw-acting mechanisms have been invented for moving teeth. The best of these are represented by pictures in this work.

The simplest mechanism acting by this kind of power for moving instanding or outstanding teeth is a screw anchored into a hard-rubber plate. The screw may be simply fitted into a screw-cut hole made directly in the plate, or it may be connected by the barrel part of a screw-jack fastened into or on it. (See Part VI., Figs. 91, 93, and 94, pp. 220, 221.) Plates for such purposes are of three kinds, viz.: the box-plate, which covers more or less of the crowns of the side teeth; the plain plate, which closely fits only the lingual surfaces of such teeth; and the clamp-band anchor-plate. The plain (unaided) plate is seldom practicable, because not sufficiently firm; but generally the box-plate, when forced over the crowns of the side teeth, is firm; yet as there is danger of injuring the enclosed teeth by collections of *débris* under them, I regard this plate as far inferior to the plain plate, if fixed in place by clamp-bands embracing some of the side teeth.[1]

Anchor-nuts for Plates.—The form of a stationary nut for connecting a drag-screw with a plate depends upon the material of which the plate is made. For a gold plate only a plain nut that can be soldered to it is necessary. For a hard-rubber plate, however, this is not a proper form. One old plan for making screw-acting plates is to vulcanize one end of a steel Dwinelle screw-jack into the plate, leaving the other end to project so as to bear against the irregular tooth to be moved.[2] (Fig. 865.)

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[1] Among American dentists who recommend large plates are Drs. Kingsley, Keely, Abbott, and Littig.

[2] The author makes a distinction between a jack-screw and a screw-jack, as the former is only a part of the latter. This difference is now accepted by lexicographers.

Two superior plans of making nuts for attaching screws to plates are represented in Figs. 863, 864. The former plan of attachment is by means of a piece of platinum wire soldered to the jack. This, which I call the tail screw-jack, is represented by Fig. 863. This is one specimen of a class of such jacks. These tail-jacks are fixed to plates by projecting the wires through the holes in them. (See Part VI., Chapter XXIX., p. 309.) As they can be quickly

FIG. 863.—Tail screw-jack.

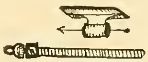


Fig. 864.—Drag-screw and nut for a rubber plate.

removed and others of different lengths substituted, and also be easily transferred from one part of the plate to another, they are very convenient for quickly improvising additions to any form of anchorage. This figure represents a simple pushing-jack; but the swivel-jack (not represented) is more useful, because it is capable of either drawing or pushing. Fig. 864 represents a form of non-detachable anchor-nut, and its screw, for a hard-rubber plate. This is made by soldering to a simple nut a piece of gold plate, serving as a foot, to be vulcanized into the rubber.

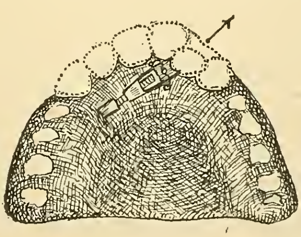


FIG. 865.—Moving an instanding lateral to line by a steel screw-jack anchored to a box-plate (Keely).[1]

Fig. 865 represents in outline an operation by Dr. Geo.

[1] "Ohio State Journal of Dental Science."

W. Keely for moving a left upper instanding lateral to line by means of an ordinary Dwinelle steel screw-jack in combination with a hard-rubber plate. This old-style box-plate covered not only the roof of the mouth, but also the side teeth. One end of the jack was embedded loosely in the right side of the box-plate, while the other was lashed to the left side by platinum wire. The free extremity of the jack so rested against the neck of the tooth to be moved that when it was lengthened it bore upon and forced it outward.

This mechanism, which is a very large one for so small an operation, is effective, but it cannot be regarded as being more practicable because it is large. There are others of the plate class more delicate, and less inconvenient to wear, that are equally effective.

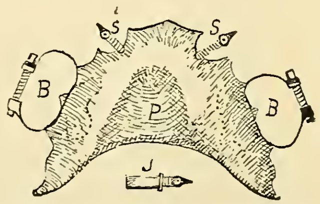


Fig. 866.—Screw clamp-band plate for moving instanding upper laterals to line (A).

Fig. 866 represents a mechanism for pushing two instanding upper laterals outward by screws. It consists of a hard-rubber plate, P; two anchor clamp-bands, B, B; and two small jack-sockets, J, containing the screws S, S. Upon the bicuspids on the plaster cast are first placed two gold clamp-bands, each having a broad wing projecting from its lingual side. These are embedded in the rubber plate, as explained in Part VI., p. 219. The little screw-jacks are cemented into holes bored into the anterior edge of the plate, made sufficiently thick to hold them firmly. The cement should be gutta-percha.

A plan of vulcanizing a jack (which is about one-eighth of an inch in length) into a plate is illustrated in a similar mechanism represented by Fig. 867. It is not necessary, however, to use metallic nut-barrels in the plate, as holes bored into it and then screw-cut with a tap are equally efficient. The screws may even be vulcanized into the rubber plate and then worked loose; the loosening of them, however, is sometimes difficult. When applied, the spindle-ends of the screws rest in holes in ferules cemented upon the instanding teeth.

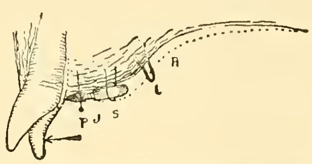
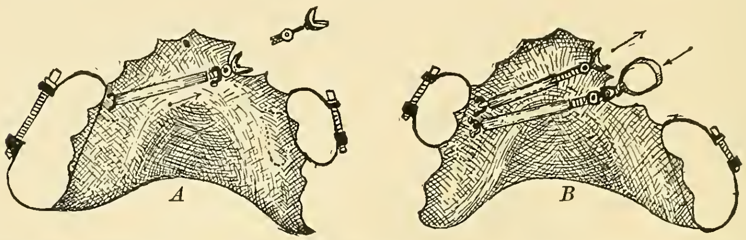


FIG. 867.—Sectional view, showing one plan of fastening a small screw-jack to a cast before applying the rubber.

Fig. 867, representing the plan of fastening a socket screw-jack to a cast before being vulcanized into a roof-plate. The jack J is first fixed on the cast by a small gold or platinum wire staple, S, placed astride the nut-barrel. It is further held by a pin, P, projected through the head of the screw, into the cast. A second wire, L, is then set into the cast for a hook to attach an elastic-rubber ring to. Clamp-bands (two, not shown) for anchoring the plate are also placed on the side teeth of the cast before the rubber for the plate R (see dotted line) is added. When applied the spindle-end of the jack is prevented from slipping off the instanding tooth by being lodged in a hole in a ferule cemented upon the tooth to be moved.

Figs. 868A and B represent two mechanisms for moving instanding left upper teeth to line. A consists of a hard rubber roof-plate having a gold tail screw-jack fastened to its right side with platinum wire (constituting the tail), and to the left side by a staple. The plate is made firm in the mouth by two clamp-bands embracing the side teeth. B represents a similar mechanism, consisting of two screw-jacks anchored parallel with each other to a hard-rubber roof-plate. One of these jacks was for pushing outward an instanding left upper lateral, the other for



FIGS. 868A, 868B.—Two modifications of clamp-band plates, operated by tail screw-jacks, for moving upper teeth to line (A).[1]

drawing inward an outstanding cuspid on the same side. The relation of the different parts is so clearly shown that it is not necessary to explain further than to say that the crutch-end of the pushing-jack fitted closely the tooth borne upon. The cuspid was embraced by a ferule connected with the other jack, which had a swivel.

C, in the footnote, represents a novel head of a swivel-jack. This form, which is better adapted for moving individual teeth than for moving groups of teeth, was devised by Dr. Cecil P. Wilson.[2]

The peculiarity of this head is a loop in combination with a flat fish-tail piece. Six pieces, constituting the head and

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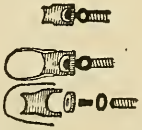
[1] Published in "Dental Cosmos," January, 1888.



[2] FIG. C.—Swivel screw-jack head with a loop (Wilson).

screw, are represented in the lower part of the figure as follows: a screw, a ring for the key, a short piece of wire for neck of the swivel, a button, a flat piece of hard gold or platinum and iridium, for fish-tail piece, and a gold ribbon. In the middle part of the figure these pieces are represented as united; at the top is the same less the ribbon.

To prevent union of wrong places in parts, while soldering them together, such places should be painted with a mixture of yellow ochre and water applied by a camel's-hair brush.[1]

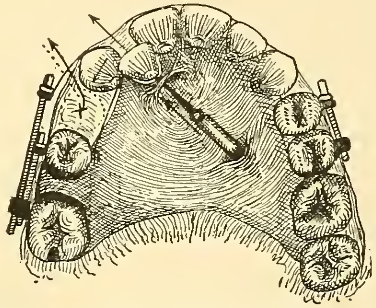


FIG. 869.—Making space for an upper instanding lateral where anchor teeth are weak (A).[2]

Fig. 869 illustrates a case of an overcrowded right upper cuspid and lateral. This case is of a class which sometimes puzzles the inexperienced dentist, because the teeth on the same side are too few and scattered to offer a sufficiently firm anchorage. In this case it was necessary to extract the right first bicuspid to make space for the two irregular teeth, cuspid and lateral.

Scattered Anchor Teeth.—One of the best means of aiding scattered anchor teeth is a plate made to cover not only the hard part of the roof of the mouth, and rest

[1] See Fig. 419 and description in Part VIII., p. 438.

[2] From a lecture by the author before the Brooklyn Dental Society, February, 1888. Published in the "Brooklyn Medical Journal," July, 1888, p. 86.

against the lingual walls of the opposite side of the dental arch, but also to dovetail into the spaces between the scattered teeth, some of which (teeth) are embraced by clamp-bands, as shown in this case. (Fig. 869.)

Here the right upper cuspid had forced the lateral into the posterior position. The right first molar, being decayed, had been extracted, leaving the second molar at liberty to drift forward (which it did) to within an eighth of an inch of the second bicuspid. Between this second bicuspid and cuspid stood the first bicuspid.

The most artistic plan of making room on the esthetic line for the outstanding cuspid and instanding lateral was by moving both bicuspids back to the second molar. But the patient objected to it because of lack of the necessary time; therefore no other alternative was left than to extract one of the bicuspids, or to decline to take the case. The taking out of the second bicuspid would have left on that side only one tooth (a molar) for anchorage by which to draw back the cuspid, while the extraction of the first bicuspid would leave two. The latter plan was followed, leaving the second bicuspid and the molar near each other.

To aid these scattered teeth for anchorage purposes, they were supported by the roof-plate being so shaped that projections from it extended between them as represented. The firmness of the plate and that of the scattered teeth was aided by two clamp-bands vulcanized to the plate. One of these embraced the left bicuspids, and the other the right second bicuspid and second molar.

To move the instanding lateral to line the base of a spindle-pointed screw-jack was vulcanized to the plate. This jack was not lengthened so as to bear upon the lateral until after the cuspid had been drawn back against the second bicuspid by a clamp-band splice,[1] one end of which was connected with the buccal side by a screw entering the posterior nut of the clamp-band, the other end being caught on a hook soldered to the lingual side of it. The figure represents the mechanism when first applied and in readiness to begin to draw the cuspid back. When this was accomplished the jack was lengthened so as to bear against the instanding lateral. To steady the free extremity of the jack its spindle extremity was projected through a small hole in a ridge on the plate.

The lesson inculcated by this case is not in advocacy of extracting a bicuspid, but to show how to increase the anchorage resistance where the teeth are few and scattered, and are too weak for firm anchorage without mechanical aid.[2] For description of a skeleton anchor for similar purposes, see Part XV., Chapter LXXVI., Sash Clamp-bands.

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[1] See form of this splice in Part VI., Fig. 118, p. 237.

[2] See concluding chapter in Part XVII. for consideration of the question of moving posterior teeth backward; also see Index.

CHAPTER LXXXV.

MOVING FRONT UPPER TEETH BY SCREWS ANCHORED BY FERULES AND BY CLAMP-BANDS WITHOUT PLATES.

OPERATION BY SCREWS ANCHORED BY A LARGE FERULE.—DRAG-SCREW MECHANISM FOR OUTSTANDING INCISORS.—DRAG-SCREWS AND LONG-BANDS.—OPERATION BY A SCREW-JACK ANCHORED BY A LONGITUDINAL SCREW CLAMP-BAND.—TRANSVERSE SCREW CLAMP-BAND IN COMBINATION WITH A JACK USED IN A SIMILAR OPERATION.—SCREW-JACK IN COMBINATION WITH A CLAMP-BAND AND FERULE FOR MOVING OUTSTANDING INCISORS.

ALTHOUGH plates (as anchors) in combination with screws have their uses, there are many cases that can be easier corrected by less clumsy anchors, such as ferules and clamp-bands and sometimes even by cribs; of the three kinds the clamp-band is generally the best. Some of these anchors are also less inconvenient to wear than others. We will first consider the more clumsy varieties.

Fig. 870 illustrates one of the more clumsy mechanisms, as applied for moving to line two instanding upper laterals. This mechanism consists of two stiff strips of plate, W and W′, two screws, S, S, and a large and broad gold anchor-ferule connected as follows: To the lingual side of the ferule (which fitted loosely around the centrals) was soldered the shorter strip of plate, bent as shown. Through each arm of this strip projected one of the screws, bearing against the instanding laterals. To prevent the inward movement of the centrals within the anchor-ferule, the other stiff strip of plate (which was of

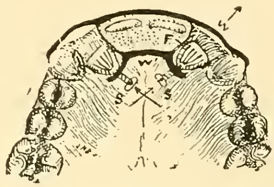

FIG. 870.—Moving laterals outward by screws in combination with a ferule (A).

sufficient length to rest upon the outstanding cuspids), was soldered to the labial side of the ferule.

When the mechanism was ready for application the ferule was cemented on the centrals with phosphate of zinc. To reduce the inconvenience of wearing this mechanism

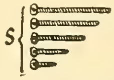

FIG. 871.—A set of screws.

several lengths of screws were used. (See Fig. 871.) The mechanism is practicable, but it is not as valuable as several others explained in this work.

Fig. 872 represents a mechanism for drawing posteriorly outstanding upper incisors. It consists of a gold anchor clamp-band, B, two gold ferules, P, P, and two swivel-screws, with two pieces of platinum wire connecting them with the ferules around the teeth to be drawn upon. On the lingual side of the clamp-band are two oscillating-nuts on a rivet projecting through three gold ears, one being between the nuts. On the free extremity of each screw is a swivel made of a bent piece of stiff plate. In a hole through one extremity of the swivel is tied one end of the wire, to connect the screw with the ferule.

The clamp-band being applied and the ferules cemented on the outstanding teeth, the latter are drawn upon by the

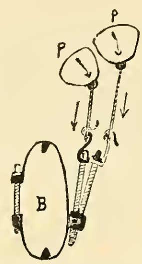

FIG. 872.—Mechanism for drawing outstanding incisors into line (A).[1]

screws turning in the oscillating-nuts. For moving the incisors laterally the string or wire may be carried over some of the adjacent teeth, if sufficiently firm.

Drag-screws and Long-bands.—Drag-screws may also be successfully used in combination with a long-band by first firmly attaching the latter to side teeth, leaving it (long-band) to bridge over the teeth to be moved; then, having attached the platinum draught-wires to the teeth (to be moved), pass them through holes (or little rings soldered to the long-band), thence back, and fasten to swivel-screws outside of the dental arch, and in connection with the rear nuts of the clamp-bands. In the chapter on Lower Incisors this plan may be found more fully explained.

To return from this digression to the main subject, Fig. 873 illustrates the beginning of an operation for moving a stubborn instanding left upper central to line by a screw-jack. The dotted line shows the desired position of the tooth. Several unsuccessful attempts had been

[1] Published in the "Dental Cosmos," April, 1881, and March, 1886.

made upon the case by others, who had used elastic-acting things; the use of a screw finally led to success.

The mechanism, which was made of gold, consisted of a screw-jack anchored to the right upper first molar and bi-

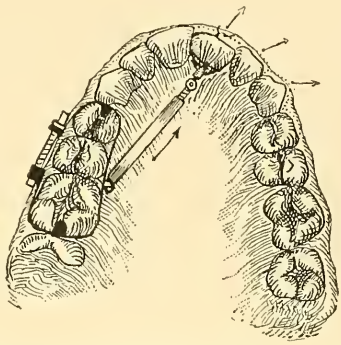

FIG. 873.—Moving a central by a screw-jack (A).

cuspids by a longitudinal screw clamp-band. The screw-jack, of the spindle-pointed variety, was held in place on the instanding central by a little gold socket tied to the tooth by platinum wire. This attachment was not very

FIG. 874.—Tightening the screw.

firm, but, as this operation was performed before I knew of quick-setting cements, I thought it to be the best at that time. (See Fig. 874.)

By daily turning the screw the (left) central gradually moved forward to line, moving the neighboring lateral and cuspid in the directions indicated by arrows. When the operation was completed the several teeth were held in place by a small, narrow gold roof-plate.

Fig. 875 represents a part of a mechanism similar to the one last described. It is a transverse screw clamp-band.[1] The parts consisted of a lingual bar, A; ribbon-band, B; bolt; and nut, H. To it was attached the end C of the screw-jack, by a rivet passing through two ears soldered to the bar A. The opposite end, S, of the jack rested in a little socket, V, which was tied by platinum wire to the in-

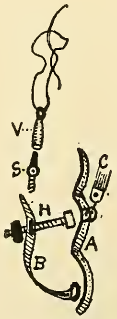

FIG. 875.—Transverse screw anchor-band (A).

standing tooth. By the broad anchorage of three side teeth this mechanism rapidly moved an instanding incisor to its proper place. The necessity for using great power in this case (as also in the one precedingly illustrated) was the crowded condition of the front teeth. The mechanism pushed or wedged the instanding tooth outward between the adjacent teeth. The jack was held in place on the incisors by the socket fastened by platinum wire, twisted tightly around the neck of a tooth. A

[1] Devised in 1879.

piece of wire twisted to form a ring, and made similar to Dr. Fuller's twisted-wire lever for turning teeth, would have been superior to this wire and socket. (See description of Fuller's lever in Part XVIII.[1]) A cemented ferule, having a hole in it for the spindle of the screw, would have been superior to the socket and wire.

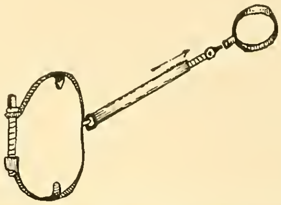

FIG. 876.—Screw-jack and longitudinal screw clamp-band anchor (A).

Fig. 876 represents a mechanism similar to the one partly represented by Fig. 875, an improvement upon the one by Fig. 872. The improvement lies in substituting for the transverse screw clamp-band one having a longitudinal screw. This is not only simpler, but is more easily made and far less difficult to use. To apply it, the broad ferule is first cemented upon the instanding lateral, after which the anchor-band is screwed on the right bicuspids and first molar; then the spindle-end of the jack is placed before a little cup on the ferule and screwed into it until it presses the tooth outward.

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[1] This operation was performed before phosphate of zinc was used in dentistry for cementing ferules on teeth.

INTERDENTAL SPACES.

SECTION A............................DIVISION II.

CHAP. LXXXVI. Separating Upper Incisors by { Plate and Skeleton Mechanisms.

" LXXXVII. " " " " { Duplex-acting Metallic Springs.

" LXXXVIII. " " " " Duplex-acting Screws.

" LXXXIX. Widening Spaces between Upper Incisors by Duplex-acting Mechanisms operated by Screws.

" XC. Widening Spaces between Upper Incisors by Triplex-acting Screw Mechanisms.

" XCI. Closing Interdental Spaces by Screw-acting Mechanisms.

IRREGULAR PULPLESS TEETH AND IRREGULAR LIVING TEETH IN HEALTHY AND IN DISEASED SOCKETS.

SECTION A ....DIVISION III.

CHAP. XCII. Moving Pulpless Teeth in Healthy Sockets, and Living Teeth in Diseased Sockets.—Whitlowic Abscess.—Loculosis Alveolaris.

CHAPTER LXXXVI.

SECTION A.................DIVISION II.

WIDENING SPACES BY ELASTIC RUBBER.

SEPARATING FRONT UPPER TEETH TO MAKE SPACE FOR OFFSTANDING TEETH, BY PLATE AND BY SKELETON MECHANISMS.

GENERAL REMARKS ON DUPLEX AND TRIPLEX ACTING MECHANISMS OPERATED BY ELASTIC-RUBBER RINGS IN COMBINATION WITH BOW-PLATES AND WITH LONG-BANDS.—OPERATION BY A MECHANISM ANCHORED BY A PLATE.—OPERATION BY RUBBER RINGS IN COMBINATION WITH LABIAL LONG-BANDS, ANCHORED BY CLAMP-BANDS.—BY A LINGUAL LONG-BAND ANCHORED BY CLAMP-BANDS.—OPERATIONS BY RUBBER RINGS IN COMBINATION WITH ARM CLAMP-BANDS.—INSTRUMENTS FOR PLACING RUBBER RINGS.

IN this section we have to consider operations for widening and for closing interdental spaces. This chapter and the three that immediately follow will be upon the subject of moving front teeth farther apart to make room for instanding or outstanding teeth. Then there will be chapters on closing of spaces that are too wide.

The process of separating teeth to make more room has been practised for many years; indeed, it probably dates from early times; the primitive plan was that of pressing between the teeth blocks of wood so placed that the line of the grain was transverse to that of the dental arch.

Later, linen, or cotton tape was used instead of wood. After the vulcanization of rubber was invented (1839) blocks of that material were in many cases found to be practicable, though painful to wear; still later, gold separating mechanisms were invented. Some of these are simple in construction and others are complicated; which of them is the best depends upon the circumstances of the case, and (sometimes) upon the skill of the operator. There are two classes of metallic mechanisms: the first of these cause space only, for the irregular tooth or teeth, and are duplex in action; the second not only cause the space to be widened, but also cause, at the same time, the outstanding or instanding tooth to move into the space—hence they are triplex in action. Each class may arbitrarily be subdivided, one subdivision embracing those that are attached to anchor-plates covering some part of the gum or palate; the other, embracing those that are skeleton, and in no way are associated with plates.

Some of the duplex mechanisms act by elastic-rubber rings, others by spring-wire, and others still by screws. Several rubber-acting mechanisms are illustrated in Part VI., pp. 244–246 and 259–262; the majority of the spring and screw acting mechanisms are explained on pp. 250–259. There are others, however, that were reserved for this Part (XV.). Of the nine simple mechanisms illustrated on p. 259 for separating teeth, four (J, K, M, L) represent those which act by elastic-rubber rings; the remainder, by metallic springs. These figures, and the text accompanying them, so clearly show how they are made and used that it is unnecessary to dwell upon them further than to say that they are very practicable and easily managed.

Bow Anchored by a Plate.—Fig. 877 represents a common deformity of the teeth, being corrected by an improved combination of old mechanical parts. This mechanism consists of a rubber ring, R, and a hard-rubber roof-plate, P, having four gold clasps, C, and a round gold-wire bow, B, the extremities of which are bent to extend over the approximal valleys between the cuspids and the first bicuspids, thence into the rubber plate, where they are anchored. This bow-plate is a modification of a mechan-

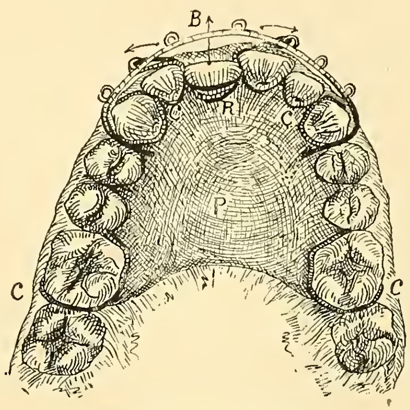

FIG. 877.—Moving an instanding upper central forward by rubber rings (A).

ism published in an early work by Sir John Tomes.[1] The aim of this operation was to slightly widen the space at B and draw the incisor forward. When the plate was inserted in the mouth, a rubber ring was placed over the instanding central (shown by the checkered and black lines), then stretched forward and laterally, each way, and caught on open rings. Later in the operation rubber rings were used to draw upon *all* the incisors at the same time.

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[1] This bow-plate consisted of a roof-plate having attached a narrow strip of plate, the extremities of which were set into the sides of the roof-plate, leaving the middle part in the form of a bow to lie along the labial surfaces of the front teeth. This form of bow-plate has several later (erroneous) claimants.

The improvement in the one used in the above operation (Fig. 877) consists in making the bow of round wire, and soldering to it open rings to hold the rubber rings, and arranging the rubber to act in three ways.

The mechanism, when left to act upon the teeth for twenty-four hours, was removed, cleansed, and reapplied with a new rubber; then it was worn another twenty-four hours, when the cleansing was repeated, and so on daily until the abnormality was corrected.

The drawback of this mechanism is a slight weakness of anchorage and the filthiness necessarily resulting from accumulation of food *débris* between the plate and palate-tissues. I now use clamp-bands, or Tomes clasps, instead of plain clasps to fasten plates to teeth, because they are firmer.

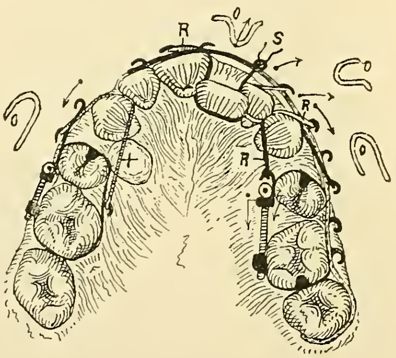

FIG. 878.—Making space for an instanding left central and lateral, and moving the tooth to line, by elastic-rubber rings and a labial long-band (A).

Labial Bow Anchored by Clamp-bands.—Fig. 878 illustrates a somewhat common form of irregularity of the upper teeth, in a patient about seventeen years of age. The operation was performed in stages by elastic-rubber rings and a gold round-wire long-band and two clamp-bands. By this mechanism the patient was enabled to graduate the force at will, thus moving the teeth without causing much pain.

Fig. 879 represents the metallic part of the mechanism, completed near the close of the operation.

The patient had lost her left first bicuspid, possibly extracted to relieve an outstanding cuspid. When I first saw the case the right first bicuspid, left central, lateral, and second molar stood in the posterior position, as shown.

To make sufficient room, on the left of the medial line, for the instanding incisors, it was necessary to extract the

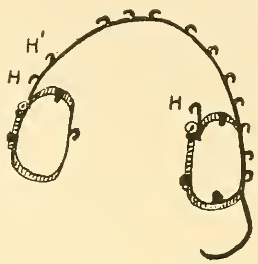

FIG. 879.—Final appearance of the metallic part of the mechanism (A).

instanding first bicuspid and force posteriorly the right cuspid. This cuspid, as well as the left cuspid, was moved by elastic-rubber rings caught upon hooks on the clamp-bands, one of which was bound around the second bicuspid and first molar on each side of the dental arch.

The tightening-screw of the right anchor-band was on the buccal side of the teeth, and that of the left anchor-band was on the lingual side. On the buccal side of the right band was first soldered a short arm of wire having two hooks, H, H′, and on the buccal side of the left band were also soldered hooks and a stiff strip bent to clasp around the second molar. There was also a lingual hook, H.

In Fig. 878 the mechanism is represented as if all were applied at one time. In the process, however, the cuspids were moved back before the other teeth were started, and before the long-band was added. Having placed a clamp-band on the teeth of the right side to serve for an anchor, the right cuspid was drawn upon by a rubber ring (shown as checkered) attached to it. The ring was first caught on the lingual hook, and thence stretched over the cuspid and caught on the posterior buccal hook. The left cuspid was similarly drawn upon by another rubber ring, first caught on the lingual hook, thence stretched over the cuspid, and caught on one of the buccal hooks as shown. To prevent these rings from sliding upward on the cuspids and then into the soft tissues, guard-rings—not shown in the picture—were worn on the cuspids.

After the cuspids had been moved sufficiently to make room for the incisors (not represented in figure), the long-band with its several hooks was soldered to the arms on the anchor-bands as shown. These hooks served for lodgment of other rubber rings for drawing forward the in-standing incisors, as shown in Fig. 878.

The forms of the rubber rings when stretched are approximately represented in miniature diagrams, o, o, o, o, outside of the main figure.

Lower incisors are easily corrected by a similar mechanism. (See chapter on Correction of Lower Incisors, Part XV., Section B, Division I, p. 993.)

Lingual Bow Anchored by a Clamp-band.—Fig. 880 illustrates the beginning of an operation for drawing to line an outstanding right upper lateral incisor for a girl sixteen years of age. The mechanism consisted of a gold-wire bow, w, anchored to the lingual sides of the clamp-bands, c, c, embracing the cuspid, bicuspids, and first molar. The bow served as subanchorage for the elastic-rubber ring, stretched over the outstanding tooth and caught upon two of several small open gold rings soldered to the wire bow as shown.

The object of having more than two hooks was to enable the placing of the rubber ring during the earlier stages of the operation so that it would bear against the adjacent teeth (central and cuspid) to move them farther apart; and when moved sufficiently to admit the lateral between

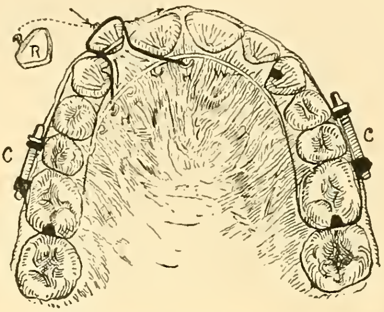

FIG. 880.—Making space for an outstanding lateral and drawing the tooth to line by a rubber ring.

them, the rubber ring could be moved and caught on different hooks, situated nearer each other.

The rubber ring was replaced by a new one every third day until the tooth was drawn inward to line. To prevent the rubber ring from slipping upon and injuring the gums, a guard-ring, shaped as represented by R, at the left of the figure, was placed upon the tooth.

The object of using so large a mechanism for so small an operation was to enable the process of correction to be carried on without possible drawbacks; the patient meanwhile attended school a hundred and fifty miles from my office.

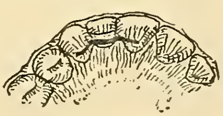

FIG. 881.—The retainer as applied.

Fig. 881 represents the tooth being retained in its position by a very thin gold ferule, less than one-eighth of an inch in width, having a cross-piece of platinum wire, that rested on the lingual surfaces of the adjacent teeth as shown. The ferule was cemented on the lateral with phosphate of zinc.

Short-arms Anchored by Clamp-bands.—Fig. 882 illustrates an operation for moving farther apart the left upper central and cuspid, and, at the same time, moving an *instanding* left lateral up between them. The patient being

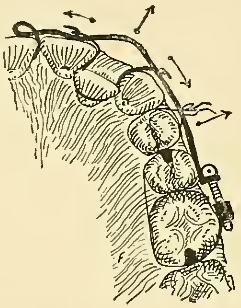

Fig. 882.—Making space, and moving an instanding upper lateral to line by an elastic-rubber ring in combination with a clamp-band having a buccal arm (A).

nearly of adult age, the case required a strong mechanism. This consisted of a rubber ring and a piece of gold wire, one end being soldered to a clamp-band fitted to the left second bicuspid and first molar, the other resting on the centrals. The arm was also otherwise steadied by being fastened with platinum wire to the left first bicuspid.[1]

To increase the space for the instanding lateral, hooks were soldered sufficiently far apart on the wire arm to cause the rubber ring to bear hard against the approximal sides of the teeth adjacent to the interdental space, and move them in opposite directions. This rubber ring (election) was stretched taut from hook to hook two or three times in order to obtain sufficient force; the rubber was renewed daily until the operation was completed.

[1] See Fig. 293, Part VI., p. 336.

Fig. 883 represents an operation for making room and moving into line an outstanding left upper lateral by an elastic-rubber ring, R. It was caught upon two hooks on a gold-wire arm projecting from the anterior part of the lingual side of a clamp-band embracing the left cuspid, bicuspids, and first molar.

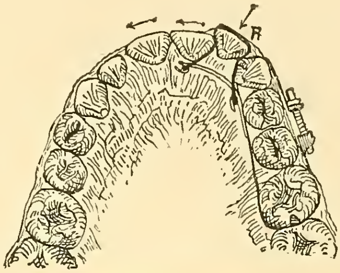

FIG. 883.—Making space, and moving an outstanding left upper lateral to line by a rubber ring in combination with a clamp-band having a lingual arm (A).

The patient performed most of this operation at her home by simply catching the rubber on one hook, thence stretching it over and around the lateral, and catching it on the other hook as represented in the figure; this was renewed on alternate days. The rubber ring so acted upon the central and cuspid as to widen the space, and thus made room for the outstanding lateral at the same time that it was drawing it into position between the teeth. The instruments used in placing the rubber is represented in Fig. 950A, p. 997.

In the case of very short teeth, a clamp-band made of flat gold ribbon is not always a firm anchorage; but if made of round platinum wire the size of a pin, it generally remains firm. The only difficulty with round-wire clamp-bands is that they require more space between teeth and are easily twisted when tightening the screw.

CHAPTER LXXXVII.

WIDENING INTERDENTAL SPACES BY SPRINGS.

SEPARATING UPPER TEETH BY DUPLEX-ACTING METALLIC SPRINGS TO MAKE SPACE FOR CUSPIDS.

GENERAL REMARKS ON METALLIC SEPARATING-SPRINGS IN COMBINATION WITH PLATES.—THE TOMES SPRING-PLATE.—MODIFICATION OF THE TOMES SPRING-PLATE.—SMALL METALLIC SEPARATING-SPRINGS WITHOUT PLATES.—AN OLD FORM OF SPRING ANCHORED TO A FERULE.—SPECTACLE-BOW WIRE SPRINGS WITH FERULE.—DOUBLE SPRING.

TO make the necessary space for teeth out of line where the adjacent teeth are too near one another, the latter, of course, must be moved farther apart. In Part VI. the old plans of wedging by blocks of wood, elastic rubber, and flat V-shape springs were considered, as also were some of the modern plans of using flat metallic springs.[1]

We now take up the subject of treating cases by the use of round-wire springs. The value of metallic springs (like that of screws) depends upon the circumstances of the case. There is a class of cases in which springs can be made practicable for a short time, and for a short time only; and there is another class in which such springs can be relied upon throughout the entire operations; but there are no springs that are practicable in all cases. There are three plans of anchoring these springs for separation of

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[1] See Part VI., pp. 244, 245, 250, 259.

teeth—by plates, by ferules, and by clamp-bands; cribs, although rickety, are also sometimes used.

Among the earliest (if not the first) efforts to use metallic springs in combination with plates for separating teeth were those made and published by Tomes. Many other dentists have since made mechanisms upon the same principle as this, under the impression that they were entirely novel. The one represented in Tomes's work consisted of two pieces of flat spring-wire, one extremity of each of which was soldered to the posterior part of a roof-plate, the free extremities projecting forward and being so ar-

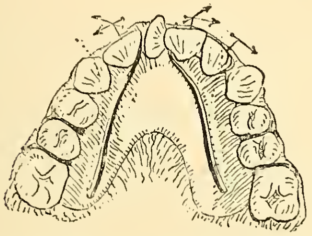

FIG. 884.—Separating incisors by a metallic duplex-acting mechanism, to make more space for a turned central (Tomes).

FIG. 884A.—Side-view of the Tomes clasp.

ranged that when pressed together and placed between two front teeth, and then liberated, the springs bore in opposite directions upon the teeth and moved them farther apart. Fig. 884 illustrates this mechanism as applied. If the reader will bear in mind the philosophy of this mechanism he will notice the relationship to it of several later ones devised by different dentists. I include the result of some of my own efforts among them. In this figure is also represented the Tomes clasp that held the plate in place. (See Fig. 884A, representing a side-view of the Tomes clasp.)[1]

[1] The author is not certain that Sir Tomes invented this clasp. This name is here given to it for convenience of identification.

Fig. 885 illustrates an operation for making more room for outstanding upper cuspids by increasing the spaces between the laterals and first bicuspids with hair-pin springs. In this case the centrals did not require to be moved forward. The mechanism used consisted of two Austin springs anchored to a hard-rubber roof-plate. Each

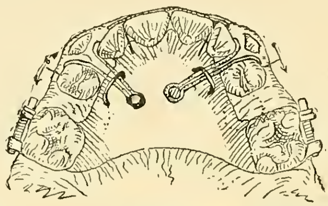

Fig. 885.—Separating teeth to make space for outstanding cuspids, by a modification of the Tomes mechanism, and that by Austin (A).

spring was made of steel wire bent upon itself, resembling in form a hair-pin; these were fixed to the plate by staples, also platinum rivets made of pins taken from a porcelain tooth. The roof-plate was anchored to the first molars by gold clamp-bands as shown.

To make room for the first bicuspids to be moved posteriorly, the second bicuspids (which stood in the posterior position as marked by the dotted lines) were extracted. In applying the regulating mechanism the arms of the springs were sprung into place when the plate was put in the mouth.

The laterals were prevented from moving forward by the anterior arms of the springs resting against the forward sides of the broad staples; the centrals were held by a strip of gold along their labial surfaces; this was connected with the plate by two thin ribbons of gold, between the centrals and laterals. This clumsy mechanism was removed and cleansed every day.

Small Metallic Springs for Separating Teeth.—On pp. 259, 260, in Part VI., small separating mechanisms, acting by metallic springs without plates for anchors, are illustrated and explained. Some of these (wire) springs are more practicable than others, but few of them are superior, if equal, to some that will be illustrated and explained in this Part and others following it. Some of the smallest and simplest of separators are made upon the plan of a circular spring, resembling a steel clamp, for holding rubber coffer-dam on teeth.

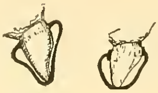

FIG. 886.—Round steel-wire separating-springs as applied (A).

Fig. 886 represents two modifications of such separators, and illustrates their application between centrals; these are practicable for separating teeth a short distance. Each consists of a piece of round steel spring-wire about the size of an ordinary knitting-needle, bent upon itself as represented, and having its extremities flattened (by hammering) to the form of a wedge. When it is placed on the teeth these extremities, by the powerful spring, will slowly approach each other between the teeth and force them apart. To prevent a separator from slipping off, the wedge parts are made to impinge between the necks just above the greatest diameter of the crowns; and to prevent it from sliding too far toward the gums, the bow of the spring is made of a size that permits it to rest on the ends (corners) of the teeth as represented.

FIG. 887.—Flat steel separating-spring (A).

Fig. 887 represents a similar separator, differing in the spring being flat instead of round. A set of various sizes of these two kinds will enable the dentist to easily select one to fit exactly any case in hand. Both kinds of these separators are applied by the fingers or by small clamp-forceps.

For many years practitioners have separated teeth by U-shape, flat metallic springs made like a gun-lock spring, having their ends turned outward. (See Fig. 888.) For further explanation of this spring, see Part VI., p. 250.

FIG. 888.—Flat gum-lock spring.

FIG. 889.—Round-wire spring for separating teeth.

Fig. 889 represents a similar separator, the only difference being that this one is made of round wire instead of flat. Both of these are used for separating first bicuspids from the laterals, to make room for outstanding or instanding cuspids, but when unaided these springs are very rickety. (Fig. 890.)

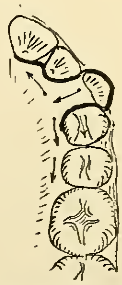

FIG. 890.—One plan of applying the round-wire spring (old).

Various other modifications of these prototypes have been devised by dentists, but the main difference in them lies in the plan of anchoring them. Some are anchored by plates, others by ferules, cribs, and clamp-bands.

Fig. 891 illustrates an operation for making room for an outstanding left upper cuspid by a wire spring of this class. The process began with the extraction of the left second bicuspid, which stood inside the line of arch (see dotted line); the moving of the first bicuspid back was accomplished by a curved spring made of a piece of gold spectacle-bow wire, one end of which was soft-soldered to a platinum ferule.[1] Near the other end of the spring were soldered two round-wire spurs, which projected between the centrals and lateral for holding the spring steady. (See

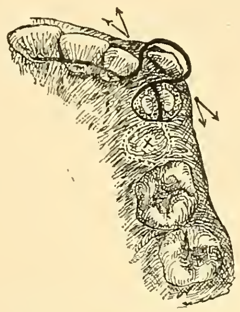

FIG. 891.—Making room for a left upper cuspid by a spring anchored by a ferule.

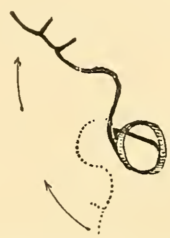

FIG. 892.—The spring and its anchor (A).

Fig. 892.) When the mechanism had been fitted to the teeth the ferule was cemented upon the first bicuspid, after which the spring was sprung between the teeth. It acted upon the lateral, central, and bicuspid in the directions indicated by arrows. The cuspid moved naturally.

Although a wire bow is practicable for separating bicuspids and molars, it is not equally so for such operations as this, because of the difference between the socket resistance of the bicuspid and that of the lateral. In this case the resting of the free end of the wire upon the central aided in equallizing the resistance to the two extremities of the spring, so that the first bicuspid was finally moved along the track of the extracted second bicuspid without

[1] Devised in 1886. This is a slight modification of a mechanism I devised a year earlier, 1885. This earlier one differed only in the anchor being a clamp-band instead of a ferule. Since these dates similar mechanisms have been re-invented by other dentists.

materially disturbing the lateral. The special advantage of anchoring the spring by a ferule, over that of a roof-plate, lies in the lessening of inconvenience to the wearer.

Separators formed as shown in Figs. 889–892 may be regarded as the prototypes of all modern metallic springs of this class for separating teeth. Among the dentists who have occasionally used similar prototype springs for many years are Drs. E. C. Baxter and A. N. Chapman, and later Dr. S. H. Guilford.

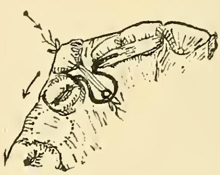

FIG. 893.—Moving a bicuspid to make room for a cuspid (A).[1]

Fig. 893 illustrates an operation by a mechanism similar to the one last described. This operation was for separating the right upper lateral and first bicuspid, and for moving into line an outstanding cuspid after having extracted the second instanding bicuspid.

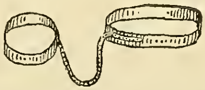

FIG. 894.—Similar mechanism, without the string ring.

Fig. 894 represents a similar mechanism. It consisted of a piece of gold spring-wire (cut from an old spectacle-bow) and two ferules. These were soldered together as shown. One of these ferules was of a size to embrace the first bicuspid; the other, the lateral and central.

The object sought in embracing two incisors in one

[1] Devised in 1885.

ferule (Fig. 893) was to gain sufficient resistance to the bicuspid, thus enabling the latter to be moved without materially disturbing the anchorage. It did, however, start the incisors slightly, but not sufficiently to do any harm.

After the ferules were cemented upon the teeth (with phosphate of zinc), the spring between them was left to do its work. When the teeth had separated a short distance an elastic-rubber ring (lapped three times) was tied with a string to a small gold ring subsequently soldered to the spring, and then stretched and tied by platinum wire to the cuspid to be moved.

To make the wire hold firmly it was forced sufficiently high on the cuspid to reach above the "cheeks" of its crown. (The figure 893 represents the case at this stage.) The wire caused some inflammation of the gum around the cuspid, but the operation was otherwise regarded as entirely successful.

Instead of wire I now cement a very thin, broad ferule to such cuspids, the ferule being cut narrower on the lingual side than on the labial side; but on all sides it is left as wide as is the visible part of the crown. Upon the ferule is soldered a small wire knob upon which is caught the wire, or a rubber ring.

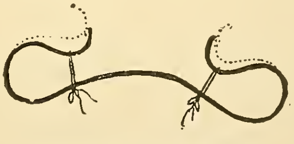

FIG. 895.—Double Spring.

Some time after the two mechanisms last described were invented, Dr. Guilford devised one similar to both; but instead of the spring being soldered to the ferules the ends played loosely in holes made in them, similar to a mechanism devised by Talbot several years earlier. (Fig. 824.) About the time Dr. Guilford claims to have made this modification Dr. Jackson experimented with springs made on a similar plan. One of these was a double spring, or a spring on each extremity of a piece of steel wire, which extended across the dental arch substantially as represented in Fig. 895; this is a modification of the old style transpalatine flat spring, used by Dr. C. N. Peirce, and other dentists many years ago.

CHAPTER LXXXVIII.

WIDENING INTERDENTAL SPACES BY SCREWS.

SEPARATING FRONT UPPER TEETH BY DUPLEX-ACTING MECHANISMS.

GENERAL REMARKS ON SEPARATING TEETH BY DUPLEX-ACTING MECHANISMS OPERATED BY SCREWS.—OPERATIONS BY THE H-SEPARATOR.—BY TWO HOOKS MOVED BY A SCREW.—BY A SINGLE HOOK AND A SCREW.—BY A SCREW MECHANISM CAUSING LEVER ACTION.

IN the two preceding chapters there were explained several operations and mechanisms for widening interdental spaces by the use of rubber rings and by metallic springs. There now remains for explanation the mechanisms, and operations by screws. Of all duplex-acting machines for simply moving teeth a considerable distance apart, there is probably none superior to the H-separator or some of its modifications. In Part VI. (pp. 253–256) several of this class are illustrated and described; in this chapter will be shown their application to the teeth.

Sometimes it is necessary to temporarily separate teeth a short distance before these mechanisms can be applied. The separation can be accomplished by pieces of tape, wooden wedges, or any of the steel separators designed for making room between teeth for the insertion in cavities of wire pegs[1] or wart-shape plugs. (See pp. 394, 395.)

Fig. 896 illustrates the plan of an operation for separating upper centrals, by one of this class of duplex-acting mechanisms, to make space for the insertion of wart-shape plugs for retaining purposes. It is also useful for making spaces between teeth for insertion of some machines for regulating teeth. The mechanism consists of two thin gold ribbons, a screw, and a strip from thick plate. To the ends of the strip are soldered the ribbons, as shown in the figure. To the free ends of the ribbons are soldered two nuts, one smooth, the other threaded, for the screw. To the middle of each ribbon (not shown) is soldered a gum-guard ear to prevent it from sliding upon the gum.

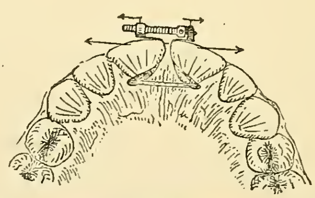

FIG. 896.—Separating upper incisors by the H-separator operated by a lever-key (A).

The process of the operation is first to place both of the ribbons between the teeth to be separated; then the screw is turned (by a right-angled lever placed in a hole in the bulb of the screw) in the direction that will move the nuts farther apart.[2] The ribbons are narrow, so as to ride above the cavity when the separation is for the purpose of setting pegs. If it is impossible to push the ribbons sufficiently far up on the teeth to clear the cavity, the ribbons may be

[1] Among the earliest to insert wire pegs in teeth, I have recently ascertained, was Dr. A. H. Baker, who did it about 1879 or 1880.

[2] Published in the "Dental Cosmos," 1886. (A.)

narrowed, or be substituted by a narrow wooden wedge, that will push the gum above the cavity.

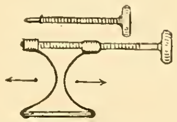

FIG. 897.—Modification of the mechanism operated by a thumb-wheel screw (A).

Fig. 897 represents a modification of this separator, operated by a thumb-wheel screw, two lengths of which are shown.[1]

Fig. 898 illustrates one of my early plans of operation for separating the teeth by a screw. This one (performed

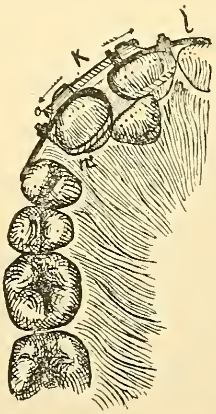

FIG. 898.—Separating teeth by a screw to make room for a lateral (A).

in 1873[2]) was for forcing farther apart the right central and cuspids, to make room for an instanding lateral.

Fig. 899 represents this mechanism, which consisted of

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[1] Since these separators were invented by the author, several modifications of them (called matrices) have been introduced by other persons, as new inventions, to aid in filling cavities.

[2] This mechanism was probably the first one ever used for separating teeth by a screw. Published in the "Dental Cosmos," March, 1878. (A.)

two stiff strips of gold plate bent like a hook, each having a nut soldered to its back as shown. A short piece of gold ribbon extended from each hook terminated in a small screw, which projected between the teeth to be moved and the teeth adjacent; thence through holes in the long arms of the hooks, to bind them to the teeth hooked upon.

After these hooks were firmly fastened (to the teeth) by nuts on these screws, the teeth were forced apart by a

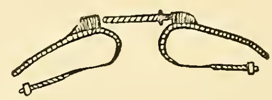

FIG. 899.—The Mechanism (A).

screw placed in the stationary nuts (on the hooks), one of which was smooth and the other threaded. The mechanism was operated by turning the screw by a wrench fitted to a square collar soldered to it.

This mechanism is here represented more to show the prototype of the screw-acting separators than for a recommendation of its value. There are several improvements (the triplex-acting) to be presented that are more useful.

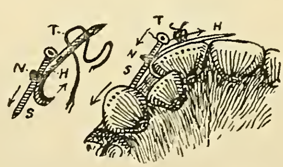

FIG. 900.—Making room for a lateral by a screw and one hook (A).

Fig. 900 illustrates a similar operation for making space for an instanding lateral by a mechanism I devised in 1873. This in form may be regarded as a part of the last one described, and useful only when there is a cavity or hollow for lodgment of the spindle-end of the screw.

The mechanism consisted of a screw, S, platinum wire, T, and a hook, H. The hook was made of stiff silver plate, bent to fit the right central, to which it was tied with the platinum wire. To the back of this hook was soldered a screw-cut nut, N, in which played the screw having a globular head; the other end, being spindle-shape or pointed, rested in a depression in the anterior approximal wall of the cuspid.

The central and cuspid were forced farther apart by turning this screw by a lever (caught in a hole in its head) so as to bear hard against the cuspid, and at the same time cause the hook to bear equally hard against the central. The lateral was subsequently drawn into line by a string connecting it with the screw.

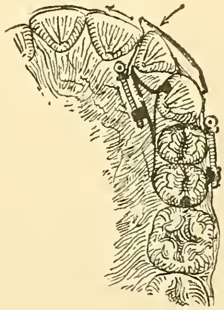

FIG. 901.—Moving an outstanding left upper lateral by a duplex-acting lever (A).

Fig. 901 illustrates an operation for moving an outstanding left upper lateral to line by a duplex-acting mechanism consisting of a clamp-band, a pliable lever, and a drawing-screw. To the labial surface of the anterior extremity of the clamp-band is connected, by a thin V-shape gold ribbon, one end of the lever. The free extremity of the lever, which is a narrow piece of flat wire, extends forward and rests on the anterior and most prominent part of the outstanding lateral. This stiff piece is made easy to act, by being filed thin at one place. (See Fig. 902.) To the free end of the lever is soldered one end of another piece of gold ribbon, on the other end of which is soldered, at right angles, a smooth-bore nut.

In use this ribbon lies between the lateral and central, and is connected with the clamp-band by a screw and nut, and brace projecting forward from the lingual side of the band as shown. The brace served as a track for the head of the screw to slide on, and to prevent the screw from

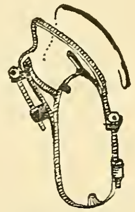

FIG. 902.—The Mechanism (A).

bending while drawing upon the gold ribbon. To prevent the distal angle of the lateral incisor from turning anteriorly, another, but shorter, arm was soldered to the anterior end of the clamp-band; this projected forward and rested upon the labial surface of this part of the tooth. (Fig. 902.)

This is one of the mechanisms that must be constructed with exactness in order to be practicable.

In the figure the ribbon is represented at an angle that causes it to appear too thick. It is as thin as ordinary writing-paper. The thickness of the lever and its V-shape attachment is represented edgewise at the right of the main figure. The office of the ribbon was twofold—to draw upon the lever and to make wider the space between the central and the cuspid. (See arrows in Fig. 901.)

CHAPTER LXXXIX.

WIDENING INTERDENTAL SPACES BY SCREWS (*Continued*).

WIDENING SPACES BETWEEN UPPER FRONT TEETH AND MOVING INSTANDING TEETH INTO LINE BY WEDGE-ACTING MECHANISMS OPERATED BY SCREWS.

GENERAL REMARKS ON OPERATIONS FOR CORRECTION OF DEFORMITY BY CAUSING THE OFFSTANDING TEETH TO ACT AS WEDGES BETWEEN OTHERS.—PLAN OF OPERATION BY A CONCENTRIC SCREW MATRIX-WRENCH IN COMBINATION WITH A BRIDGE-PIECE.—BY A SIMILAR MECHANISM.—BY A GOLD RIBBON DRAWN UPON BY SCREWS.

WHEN a tooth stands in a posterior position because of lack of room, and it requires considerable force to move it into line, the correction may sometimes be accomplished by drawing the instanding tooth (wedge-like) in between the teeth (forcing the latter farther apart) by a loop drawn upon by a screw projecting through a bridge.

Fig. 903 illustrates the beginning of an operation for moving an instanding right upper lateral to line by a modification of the matrix-wrench.[1] It differs from it in that there were two screws concentrically arranged instead of one, and that the barrel was cylindrical instead of rect-

[1] For details concerning the construction of the matrix-wrench, see pp. 344, 439. See also description of a similar mechanism in chapters on Correction of Cuspids (Part XV.).

angular. The philosophy of the action is to draw the instanding tooth like a wedge in between the cuspid and central: this is not a first-class operation, but one that is successful where the interdental space is nearly as wide as the instanding tooth. Briefly, the main part of this mechanism may be said to be a cylindrical matrix-wrench,

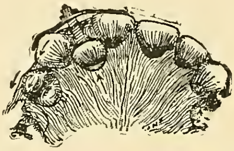

FIG. 903.—Separating teeth and moving an instanding lateral to line by a concentric screw mechanism and a loop (A).

having the outer surface of its barrel screw-cut for a large second nut (shown in black). This acts upon a bridge-piece consisting of a narrow strip of stiff plate having a hole through its middle part to accommodate the screw. On one end of the inside screw is a smaller nut, just above the larger one. On the other end of the screw is soldered a loop that embraces the instanding tooth. (See Fig. 904.)

The tube-screw having been placed outside this smaller screw, and the bridge-piece laid across the interdental space so as to rest on the adjacent teeth, the free extremities of both screws projecting through the hole in the bridge, and are held there by the nuts, which being gently tightened, firmly hold all parts of the mechanism upon the tooth. The smaller screw draws the loop partly into the tube-screw and tightens it upon the cuspid, firmly holding it to the end of the tube or outer screw. The tooth is moved by turning the larger nut.

Fig. 904 represents the separate parts of this mechanism (so like the matrix-wrench, illustrated on pp. 344, 439, and which was published in the "Dental Cosmos" in

1878). When necessary to exert great force, this mechanism will meet the emergency; fortunately, however, such extra force is seldom needed. If the bridge will not rest steadily on the teeth, the extremities should lie between studs or in tubes soldered to ferules cemented on these

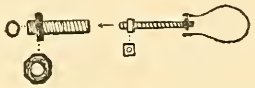

FIG. 904.—The mechanism in parts (A).

adjacent teeth. The ferules should be as thin as paper, in order that the interdental space may not be materially narrowed; nicety of finish is essential in order to make the mechanism work properly.

This mechanism has no advantage over, if, indeed, it is equal to, several of the triplex-acting mechanisms represented in Part VI., p. 258. (See plan of operation by these inventions, by the author, in the following chapter.)

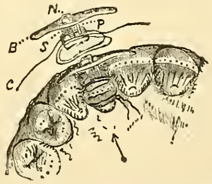

FIG. 905.—Plan of moving to line an instanding lateral by a modification of the concentric screw mechanism (Shaw).

Fig. 905 represents a plan for moving an instanding right upper lateral to line by a modification of the mechanism last described. This modification, devised by Dr. S. J. Shaw,[1] differs mainly in that, instead of its screw being

[1] Dr. Shaw's modification was published in the "Dental Cosmos," 1888, ten years after the author's matrix-wrench was published, and one year after the concentric screw mechanism last described was published in the same journal. This probably was not known to Dr. Shaw when he devised this one. (Fig. 905.)

fastened to the instanding tooth by a gold loop, it is tied to it by a wire, C. The mechanism is represented separately just above the main figure. To prevent the instrument from turning upon the tooth when the nut N is tightened upon the bridge-piece, a piece of plate is soldered to the lower end of the screw S (to rest on the outer surface of the tooth), and to this plate a pin, P, is soldered, parallel to the screw S, to project through a second hole in the bridge B while the screw is moving in the other hole by the nut N.

The credit of being first to originate the pin P and the square plate as here illustrated belongs to Dr. Shaw.

Fig. A in the foot-note illustrates a process of moving two instanding and two outstanding upper incisors to line by one of my earliest mechanisms (published in the "Dental Cosmos," March, 1878), shown here as a prototype.[1]

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[1] There were two gold ribbons soldered to screws and acted upon by nuts. One of these ribbons had two screws, the other only one. They are represented separately by V and O in the upper part of the figure. The screws projected through a stiff strip of gold plate, B, less than one-eighth of an inch in width, bent so as to lie along the lingual surfaces of the right cuspid and all the incisors, yet not in contact with the left central and the right lateral.

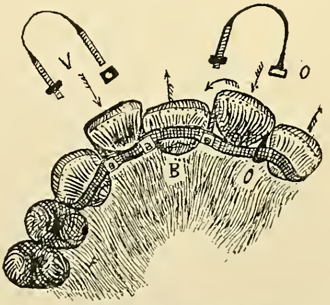

FIG. A.—Evening upper incisors by screw loops (A).

When the mechanism was ready to apply, the screws of loop V were first projected between the teeth, and thence through the bar B, where they were held in place by the nuts (shown in white). The other loop, O, was placed between the teeth, and held at one end by a nut, and at the other end by a rectangular link. These loops, when tightened, caused the entire mechanism

Fig. 906 illustrates the middle stage of a process for the correction of an instanding left upper lateral by a duplex-acting mechanism, after having made room for the posterior movement of the adjacent cuspid by the extraction of the left first bicuspid.

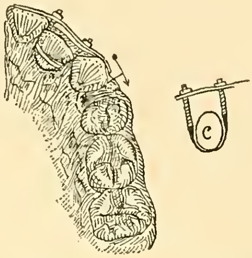

FIG. 906.—Moving a lateral to line by a double loop drawn upon by two nuts (A).[1]

Although such a mechanism as this is effective in some cases, it is not as philosophical as some of the triplex-acting mechanisms, which will be considered in the next chapter.[2]

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to bear and draw upon all the teeth, the bar B pushed on the right central and left lateral, while the loops drew upon the right lateral and left central, causing them to move in the directions indicated by arrows.

Occasionally the degree of resistance of the teeth that are to be moved requires the use of more teeth in the anchorage; in such cases a corresponding length of the bar B is necessary.

The drawback to this more complicated than philosophical mechanism is the difficulty encountered in applying the transverse screws between the teeth. I have discontinued such screws in my practice. The representation here is for showing one prototype from which all my duplex and triplex mechanisms started.

[1] This is another prototype that led up to triplex-acting mechanisms, published by the author in the "Dental Cosmos," March, 1878.

[2] In Part VI., pp. 256–262, many modifications of these are illustrated. The principal mechanism of this class, which was published by me in the "Dental Cosmos" in 1884, had its prototype in another of mine, which also was published in the same journal. See "Dental Cosmos," March, 1878, and November, 1884. See also Fig. 162, Part VI., p. 258.

CHAPTER XC.

WIDENING INTERDENTAL SPACES BY SCREWS (*Continued*).

OPERATIONS BY THE POWERFUL TRIPLEX-ACTING SCREW MECHANISMS.

MAKING SPACE, AND AT THE SAME TIME MOVING INSTANDING AND OUTSTANDING TEETH TO LINE, BOTH ACTS BEING CAUSED DIRECTLY BY TRIPLEX-ACTING MECHANISMS HAVING NO SPECIAL ANCHORS.—OPERATIONS BY OTHER FORMS OF TRIPLEX-ACTING MECHANISMS HAVING CLAMP-BANDS AS ANCHORS.—OPERATIONS FOR MAKING SPACE FOR A TRANSPOSED CUSPID BY A MECHANISM HAVING TWO SCREWS.—SASH-ARM MECHANISMS FOR WEAK ANCHOR TEETH.

FORCING teeth farther apart was formerly regarded as a necessary preliminary step to moving offstanding ones into the arch, but it is so no longer. In the preceding chapter a few mechanisms for wedging the tooth into line were described. The problem of accomplishing the double act of making space for and drawing an offstanding tooth into line by a mechanism acting in three different directions at the same time, was solved by the author several years ago; afterwards several of these mechanisms, both duplex- and triplex-acting, were made public; some of these operated by elastic rubber, others by screws. As a detailed explanation of many of the mechanisms has already been given, it is not necessary to repeat all now. (See Part VI., Chap. XXIII.)

Fig. 907 illustrates the beginning of the first operation for making room for, and at the same time moving to line, an offstanding tooth by screw power. This upper right lateral was corrected by one of the simplest and most effective of the triplex screw-acting class of mechanisms.

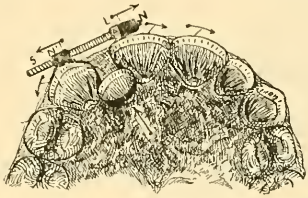

FIG. 907.—Making space, and at the same time moving an instanding lateral to line by a triplex-acting mechanism (A).

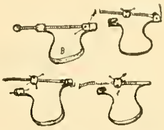

FIG. 907A.—Four of the author's set of powerful triplex mechanisms.

Fig. 907A represents this and three similar mechanisms. This mechanism (Fig. 907) consisted of a gold ribbon with a smooth-bore nut soldered to one end, N, and a screw-cut nut soldered to the other, N′, connected by a screw, as represented.

To apply it, all that was necessary in this case was to place the ribbon over the instanding tooth, leaving the nuts to rest upon the external surfaces of the adjacent teeth. All were operated by turning the screw by a lever placed in a hole in its bulb L. This screw forced the nuts farther apart and, by this act, caused the ribbon to move the teeth adjacent to the interdental space farther apart, and at the same time to draw the instanding tooth into its place between them. The different directions of force upon the different teeth are indicated by arrows.[1] (See Part VI., pp. 256–258.)

[1] In 1889, several years after the above triplex-acting mechanism was published, Dr. Angle made a slight modification of it. This variation is confined

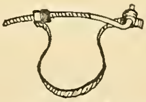

FIG. C.—Angle's Modification.

to the form of the shank of the screw, it being bent at right angles to enter a nut, soldered transversely to the ribbon, as represented in Fig. C. See detail illustration of the author's set of triplex mechanisms in Part VI., p. 258.

Fig. 908 illustrates an operation for moving two slightly instanding laterals by two triplex-acting screw mechanisms. When the teeth are too tapering to retain such mechanisms, slipping must be prevented by some auxiliary, such

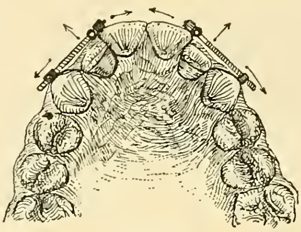

FIG. 908.—Making space, and at the same time moving two laterals of unfavorable shape into line, by two triplex-acting mechanisms (A).[1]

as a ferule or a clamp-band. This case required ferules. These were made cylindrical and cemented on the teeth with phosphate of zinc. The sides of the ferules being parallel, the ribbons were by them prevented from slipping off. (For making this mechanism, see Part VI., p. 256.)

When one or both of the nuts upon the ribbon slip on the adjacent teeth, they also require the aid of ferules; this aid, however, is seldom necessary. If before the cement hardens the middle of the approximal sides of the ferule on the instanding tooth is slightly dented, the depression will usually be sufficient to keep the ribbon in its proper place. The ferule must be very thin.

Another plan for preventing the slipping of the ribbon is by the use of a finger clamp-band; this finger consists of round or flat wire, or a narrow strip of stiff plate. (See Fig. 910.)

Fig. 909 illustrates an operation for moving to line a right upper instanding lateral by a triplex mechanism aided by such a finger, extending, from a clamp-band, along the

[1] Published in the "Dental Cosmos," November, 1884. (A.)

lingual side of the dental arch, and bearing on the edge of the ribbon. If the finger depends solely upon the edge of the ribbon for its lodgment, its usefulness will sometimes

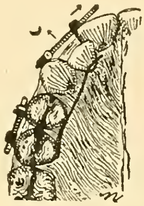

FIG. 909.—Moving an instanding upper lateral by a triplex mechanism, aided by a finger clamp-band (A).

be brief; it soon ceases to bear, because the moving instanding tooth carries the ribbon away from it.

To prevent this trouble a spur may be soldered to the lingual side of the ribbon to project lingually. (See Fig. 911.)

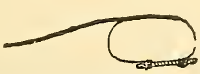

FIG. 910.—The finger clamp-band (A).[1]

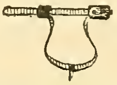

FIG. 911.—Triplex-acting mechanism having a spur for lodgment of the finger (A).

This spur is made of a piece of platinum wire about one-sixteenth of an inch in length. It projects above the wire finger and holds the entire mechanism in place until the tooth moves into line.

Fig. 912 illustrates an operation for moving an outstanding right upper lateral by a gold mechanism consisting of a triplex-acting ribbon in combination with a clamp-band, C, serving as an anchor. For anchorage this band embraced the right cuspid and two bicuspids.

The ribbon was guided by a piece of stiff round wire, L, of the size of a large pin, bent U-shape, and soldered to the lingual side of the anchor-band as represented. To the

[1] Devised in 1887.

anterior end of this band (buccal side) was soldered one end of the gold ribbon R. This ribbon is of the thickness of note-paper, one-sixteenth of an inch in width, and of a sufficient length to extend over the outstanding lateral,

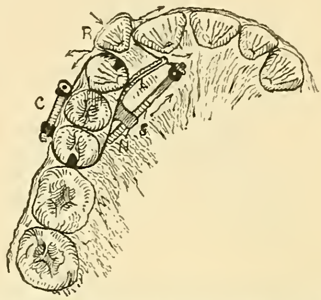

FIG. 912.—Drawing an outstanding upper lateral to line by a triplex-acting mechanism in combination with an anchor-band (A).

and inward through the U-wire to the head of the screw. On the end of this ribbon was soldered a smooth-bore nut, which held it on the pivotal extremity of the screw, which turned in a nut, N, soldered to the middle of the lingual side of the anchor-band.

To apply the mechanism the anchor-band was placed on the cuspid and bicuspids, then the ribbon R over the outstanding tooth, one part being between it and the central, the free extremity already being projected through the U-wire L. The pivotal end of the screw S was run into the smooth-bore nut on the ribbon, which was then tightened upon by turning backward the screw by means of a lever placed in a hole in a bulb on it. The drawing of the gold ribbon taut caused the lateral to move inward.

One object of the wire L was to limit the action of the ribbon R upon the central and the teeth adjacent to it; to aid in holding the ribbon in its proper place on the lateral a piece of wire (not shown in the diagram) was soldered across the loop close to the ribbon.

There was a slight drawback in the action of this mechanism in this case. The tendency was to move the cuspid too far outward by the leverage of the screw in causing the draught upon the ribbon. In subsequent operations I overcame this difficulty by increasing the anchorage, by making the clamp-band sufficiently large to embrace more of the side teeth, and by having the wire L of sufficient length to rest upon the lingual walls of the teeth beyond the one being moved. Fig. 913 represents, on a reduced scale, this modification.

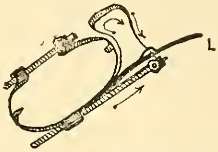

FIG. 913.—The Modification (A).

If there is liability of the ribbon injuring the gum by slipping upward on the tooth, this may be prevented by placing upon the outstanding tooth a gum-guard ring for the ribbon to rest upon.

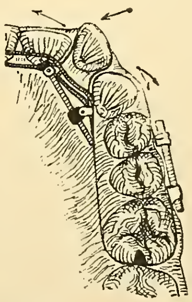

FIG. 914.—Moving an outstanding upper lateral by a triplex mechanism having a long U-wire arm (A).

Fig. 914 illustrates an operation for moving to line an outstanding left upper lateral by a mechanism similar to the one represented by Fig. 913. It differs from it in that instead of the nut in which the draught-screws play being stationary, it tilts. This nut, N, is hinged between ears soldered to the clamp-band B. Fig. 915 represents a similar

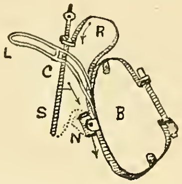

FIG. 915.—Limited-acting triplex mechanism (A).

mechanism, showing clearly the different parts, B, L, R, S, N. In the U-wire L is the cross-wire, C, made of stiff gold about the size of a pin.[1]

Spacing for a Transposed Tooth.—In the "freaks" of nature is sometimes found transposition of anatomical parts, such as the muscles and the blood-vessels, mentioned in the chapters on Etiology. When teeth erupt in places that properly belong to others, as, for instance, a cuspid between the bicuspids, it generally may be said that they belong to that class of phenomena.[2] In Delabarre's work (1830), as well as in works of later authors, mention is made of transposition of teeth, such as laterals in places of centrals and centrals in places of laterals.

One of the most curious instances of transposition of teeth of which I have heard was a case in Paris (I have seen only the cast), in which was a molar in the place of

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[1] After the tooth was moved into line it still required turning. This was subsequently effected by an elastic-rubber ring caught upon the end of a short wire lever on the lingual surface of a ferule cemented on the tooth. The rubber ring was stretched and caught over the lingual nut on the clamp-band, the drag-screw meanwhile having been removed. In some instances I have moved to line, as well as turned, outstanding teeth by such a ferule and rubber ring connected with an anchor clamp-band. Such operations are illustrated elsewhere in this work. (See chapters on Turning, etc.)

[2] See Etiology, Part III., p. 83.

an upper central incisor. Cases of this character occurring among the cuspids and bicuspids are not uncommon.

The following figures illustrate an anomaly of this class that came under my care in 1887. In this case, when first seen, there was a prominence of the gum and an apparently

Fig. 917. Fig. 916.

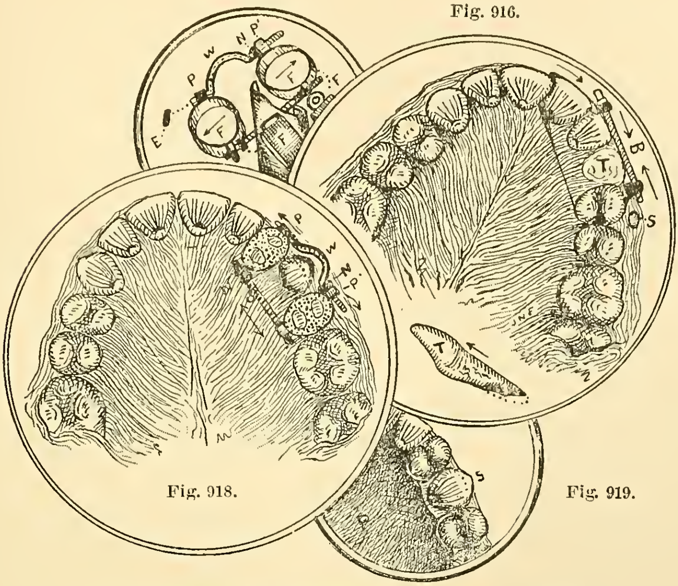

Fig. 918. Fig. 919.

FIGS. 916, 917, 918, 919.—Transposed cuspid and its treatment.

forthcoming tooth on the buccal side of the arch, over a deciduous first molar that was present between the partly erupted bicuspids; the deciduous cuspid was also present. These deciduous teeth were extracted, and the case rested for a few months for nature to show her intentions in the matter.

Fig. 916 illustrates the case after the respite; the first and second bicuspids had fully erupted, and the new tooth was pointing through the gum at S. The apex of the root of the first bicuspid was apparently in the place where that of the cuspid-root should have been. The crown of the first bicuspid inclined posteriorly toward the second bicuspid, so that the new tooth was cramped between these two and could not fully erupt.

The question to decide was whether this new tooth be an adult cuspid or a supernumerary tooth. Though at that time it was difficult to determine its identity, it was necessary to liberate the tooth so that it could further erupt. This was accomplished by separating the bicuspid teeth by moving the first into the space T left by the extracted deciduous cuspid. A clamp-band, B, was first applied as shown in Fig. 916, but thinking it too early it was removed, and an attempt made to separate the bicuspids by interposing between them a wooden wedge. The first bicuspid appeared to be moving satisfactorily until there was about an eighth-of-an-inch space; then it was discovered that instead of the first bicuspid moving anteriorly all this distance, the second bicuspid and first molar had also moved, posteriorly. This suggested the idea that possibly there was a cuspid in the alveolus above the place where the deciduous cuspid had been extracted.

As the nature of the unerupted tooth between the bicuspids had not yet been ascertained, the wooden wedge was now withdrawn, and the first bicuspid acted upon again by the clamp-band, placed as before, to embrace the first bicuspid, left central, and lateral. In about two weeks the first bicuspid had moved forward, leaving a space about three-sixteenths of an inch. While this first bicuspid was moving forward, the central and lateral moved back sufficiently to do away with a lap of the left central over the right. The bicuspid had now moved sufficiently forward to prove that the new tooth was an adult cuspid. The left central, lateral, and first bicuspid embraced in the clamp-band were now in contact, but, owing to the new cuspid's great breadth, there was not yet sufficient space between the bicuspids for it. To make the space wider it was necessary to extract, or to use something that would act with great power between and upon both teeth adjacent to the space. The incisors were held in place by a ferule having a cross-wire. The second molar appearing through the gum behind the first molar, together with the shortness of the bicuspids, at first suggested extraction of the second bicuspid to insure accommodation for the new tooth; but as this course would not have been scientific, it was not performed; therefore I devised a mechanism for the emergency.

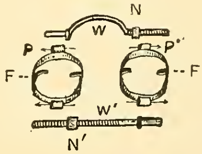

FIG. 920.—The mechanism in parts (A).

Figs. 917 and 920 represent this mechanism, and Fig. 918, its application. This widener consisted of two ferules, F, F′, and two push-screws, W, W′, one, W, being partly curved, the other, W′, being straight. The screws were for forcing the bicuspids farther apart. On the labial side of one ferule, F, was soldered a short tube, P; and on the corresponding side of the other, F′, a rectangular nut, P′. On the opposite side of these ferules, but reversely, were soldered a similar tube and nut. The office of these was to furnish lodgment for the extremities of the screws, one end of each of which was square, with a shoulder behind it; they were made square to fit the correspondingly shaped holes in the nuts, and the shoulders were for preventing the screws from being forced too far into them when in action. On the opposite extremities of the screws were loose nuts, N and N′, which, when turned along the screws W, W′, impinged against the tubes, which were round and smooth-bore. The buccal screw W was curved in order to extend around and not press upon the prominence of the gum covering the new tooth. The nuts, when turned on the screws, forced the ferules, and the bicuspids within them, farther apart.[1]

In about three months these teeth had moved sufficiently to make ample space. (See Fig. 918.) They were then retained there by two small gold half-clasps anchored into a hard-rubber roof-plate. This retainer is partially represented in Fig. 919. Two ferules, connected by a wire, would have been a better retainer. (See Fig. 819.)

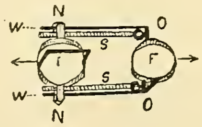

FIG. 921.—Separating machine; modification of the one last described (Wilson).

Fig. 921 represents a mechanism used for widening the space between an upper lateral and first bicuspid, to increase space for an unerupted cuspid. This mechanism, which is similar to the one used in the operation last explained, was devised (subsequently) by Dr. C. P. Wilson, without having any knowledge of mine. It consists of four parts: two screws, S, S; a ferule, F, having two round-wire arms or guide-rods, W, W; two smooth-bore nuts, O, O; and a gum-guard ring, I. This ring I has soldered to it two double-bored nuts, N, N, one bore, in each, being smooth, to admit of the play of one of the guide-rods, the other bore

[1] Several years after this mechanism was invented by me a matrix made very similar to it, for aid in filling teeth, was brought out by another dentist as original with him.

being threaded for one of the pushing-screws. The other end of each screw was of spindle form, and played in the smooth hole in the nut O.

The object claimed in having the arms, for sliding in the nuts N, N, was to cause the ferule F and gum-guard ring I to move on a straight line, and to aid in strengthening the connection between the ferule F and the nuts bearing the spindle-ends of the screw. This mechanism was easily operated and was very effective.

CHAPTER XCI.

CLOSING INTERDENTAL SPACES BY SCREWS.

PARALLEL MOVEMENT OF CROWNS AND ROOTS OF TEETH BY SCREW-ACTING MECHANISMS.

GENERAL REMARKS ON DIAGNOSIS AND PROGNOSIS.—SCREW-ACTING MECHANISMS BEST FOR THESE OPERATIONS.—THE DIRECT AND THE INDIRECT PLANS OF OPERATIONS.—THE FIRST MECHANISM FOR SUCH OPERATIONS.—SEVERAL MODIFICATIONS.—THE INTERDENTAL BLOCK MECHANISM.—MECHANISM WITH TWO SCREWS.—THIMBLE-CROWN SCREW MECHANISM.—PHILOSOPHY OF ACTION AND REACTION.—A SCREW MECHANISM AND THE AUTHOR'S MODIFICATIONS OF THE SAME FOR LATERAL MOVEMENT OF CROWNS AND ROOTS.[1]

THE closing of wide spaces between central incisors to make room for unerupted laterals is often found necessary in early life, but there are times where it would be too early to begin the operations. These are where there are no signs of approaching laterals (although they may really exist deeply), and where there are no signs of laterals, yet at the same time the cuspids are about to erupt. After the cuspids have fully erupted it is then proper to draw the centrals together, whether there are laterals or not. If the operation for drawing the centrals together is

[1] For theory and practice concerning interdental spaces, see Part XIII., p. 599.

premature the cuspids are liable to erupt too far forward and stand against the centrals, which not only closes the gates to possible laterals, but causes, by these four large teeth being together, a coarse facial expression. To prevent this coarseness, artificial laterals should be inserted and worn permanently, unless natural laterals finally appear, when the artificial ones should give way to them. Such artificials are more important to females than to males.

The cases that need immediate treatment are those showing signs of the presence of laterals under the gums, and are prevented from erupting by there not being sufficient space for them. If the laterals are not sufficiently developed to erupt, the operation should be delayed until they are ready to come forth.

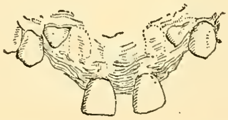

FIG. 922.—Interdental space requiring delay in operation.

Fig. 922 represents the case of a young girl, requiring delay of operation. By postponing it (operation) the centrals and the hidden unerupted laterals served as wedges to prevent the erupting cuspids from moving farther to-

FIG. 923.—The first root-moving machine (A).[1]

ward the centrals (toward the medial line). After the cuspids had erupted a little farther, the centrals were drawn together by my original mechanism (see Fig. 923), thus making room for the laterals to erupt before the cuspids

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[1] Devised by the author, October, 1880.

had time to materially interfere. It was necessary, however, in the latter stages of the operation, to force one of the cuspids farther away from the central. This was done by a mechanism consisting of two broad ferules interposed by a screw, operating in nuts soldered to the labial sides of the ferules.

The importance of constructing mechanisms on strictly philosophic plans for these operations cannot be overestimated. No indifferently planned mechanism can be relied upon for accomplishing complete success. In Part XIII., pp. 615–653, I have given considerable detail regarding the philosophy of these operations and the mechanisms used, but in this chapter further details and several modifications of the mechanisms will be given.

Fig. 924 illustrates the beginning of an operation (for a girl nine years of age) for closing an unsightly space between the upper centrals. This case required the lateral

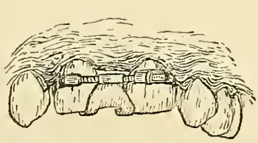

FIG. 924.—Lateral movement of teeth. Indirect operation (A).

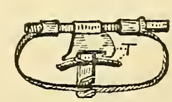

FIG. 925.—The Mechanism (A).

movement of the crowns, also (the lateral movement) of the roots. Fig. 925 represents the mechanism used. It consists of two parts, a clamp-band, and a guide-piece made as represented by T′, T″, in Fig. 926.[1]

The operation was conducted upon what I call the *in-*

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[1] This mechanism is similar to one represented by Fig. 644, Part XIII., p. 647, the only difference being in the form of the outer plate of the guide-piece. This variation in form is in the end of the plate, T′, T″ being bent so as to approximate the form of a hook to catch over the cutting-edges of the central incisors as shown in Fig. 924.

direct plan, consisting first in drawing the crowns of the centrals into contact by tightening the clamp-band on the necks of the teeth, and then in drawing the roots toward each other by continuing the same tightening process. In

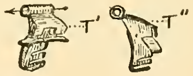

FIG. 926.—Bottom and side views of the guide-piece (A).

the first stages only the crowns move, in the second only the roots; the latter change is caused by the corners of the crowns (in contact) acting as a fulcrum to each other. For further information regarding the details of the philosophy of this class of interesting operations, see Part XIII., Chapter LX., p. 615.

Fig. 927 illustrates the case of a boy about eight years of age, for whom an operation by the *direct* plan was performed to clear the way for unerupted laterals, which were prevented from appearing by lack of room between the centrals and cuspids. This consisted in drawing together the crowns of upper centrals (to close a space between them), and at the same time causing the lateral movement of their roots toward each other.

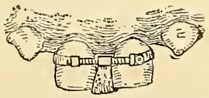

FIG. 927.—Lateral movement of the roots of upper centrals. Direct operation (A).

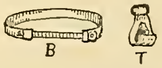

FIG. 928.—Clamp-band and Trough-piece (A).

Fig. 928 represents the different parts of the mechanism. Usually in this class of cases the centrals are not so far apart that a mechanism like that represented by Fig. 923, or Fig. 628, p. 634, would not remain upon the crowns after their ends are brought in contact, nor would it slip off while the roots are being moved; but in this case the inclination of the crowns, if in contact, would have been so great that a clamp-band, simply, would slip off. To render the band sufficiently firm, it was necessary, therefore, to prevent the ends of the crowns from being drawn into contact. This was accomplished by interposing between them a gold block, in breadth corresponding nearly with the width of the interdental space. This block was soldered into the middle of the trough-piece as represented by T in Fig. 928.

In the application of the mechanism it was necessary to gently force the block between the teeth; this force, however, was sufficient to cause pain, but as soon as the clamp-band was tightened upon the necks of the teeth, the pain, caused by the pressure of the necks upon the distal part of the walls of the sockets by insertion of the block, immediately ceased. The clamp-band was enabled to remain firm by means of the block, and the operation went straight forward to success.

Fig. 929 represents a similar mechanism, consisting of a clamp-band and three interchangeable blocks, of different

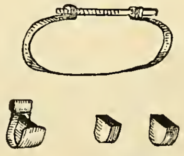

FIG. 929.—Mechanism with a set of detachable blocks (A).

sizes, devised for use in a *direct* operation for closing an interdental space between the centrals. The patient for whom this was used was a girl about eight years of age. The centrals had erupted about an eighth of an inch apart, and appeared to be drifting still farther from each other, thus encroaching upon the territory belonging to the unerupted laterals.

This operation consisted in moving parallel to each other the two centrals. The blocks were used to prevent too great inclination of their crowns, thereby preventing the slipping of the clamp-band. These were graduated so as to prevent the mesial corners of the crowns (centrals) from moving too far at a time, and from approaching each other more rapidly than the roots, when the clamp-band was tightened upon their necks.

The process of tightening the clamp-band upon the necks of the centrals by turning the screw drew the crowns against the block, and then held them there while the roots were being compelled to approach each other simply by continuing the same process of tightening the band. After the roots had moved a short distance this block (in the trough-piece) was taken away and replaced by a thinner one. When the roots had again approached each other sufficiently to be nearly parallel, this thick block was removed and a thinner one applied. In this way the process was kept up until the thinnest block was used, and finally none at all; when soon the crowns were in contact, and the roots were parallel to each other.[1]

If the form of the teeth is not favorable for retaining such a block it should have a delicate flange to extend slightly under the corners of the centrals.

In Part XIII., p. 624, is represented a mechanism that I devised to act upon the same principle. Instead of adjusting-blocks being used to prevent the crowns from moving too rapidly, a small adjusting-screw is so interposed that

[1] In Part XIII., pp. 621–625, the philosophy of the direct and the indirect operations for lateral movement of the teeth is explained; and on pp. 647–650 the first operation of the kind ever performed is also illustrated and explained.

the movement of the crowns can be conducted with greater ease, with exactness, and without removal of the mechanism from the teeth.

Figs. 930, 931, and 932 represent another mechanism that acts without the block or the second screw. This consists of a screw and two crowns (Fig. 931); the latter having (after the Talbot plan) soldered transversely across each a

Fig. 930.—View of crown and tube.

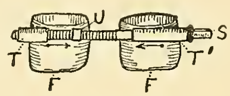

Fig. 931.—Front view of mechanism (A).

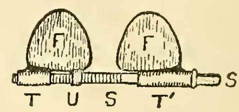

Fig. 932.—Top view of mechanism.

piece of tubing.[1] In these figures F, F represent the thimbles; T, screw-cut tube or piece of "piping"; T′, smooth-bore "piping"; U, staple; S, the screw. Although this mechanism is easily operated, it cannot be relied upon to be sufficiently firm in all cases; therefore (as means to an end) it is not as philosophical as those previously described, which have no weaknesses.

Several years after the mechanisms for lateral movement of crowns and roots had been published in the "Cosmos" by the author, attempts were made by others to perform the lateral movement of crowns and roots by the use of ferules and a bolt, instead of thimble-screws, but they failed because of weakness of simple ferules as anchors.

To make this point clearer, and show the effect of the socket resistance upon mechanisms used for lateral movement of roots, and to show the importance of firm anchorage, let us observe the effect of strain upon simple gold bands and a screw that is small in size and not too stiff to

[1] In 1884 E. S. Talbot devised his tubed (not thimble-crown) ferule, a piece of tubing soldered transversely to a ferule.

bend when in operation. To make the subject plain, the illustration will be given in the form of a question and an answer, accompanied by the two following figures.

When a delicate screw is tightened upon ferules, what is the effect of the resistance of the alveolar septum between the sockets of the roots of the teeth acted upon? Under these circumstances the roots, serving as long arms of

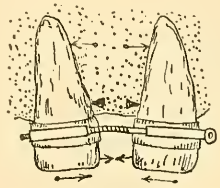

FIG. 933.—Showing the effect of strain upon a delicate screw.

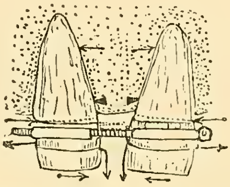

FIG. 934.—Showing the effect of strain upon ferules.

levers, easily cause the screw to bow upward, as shown in Fig. 933, provided the ferules remain firm; on the other hand, if the screw should be so stiff as not to bend, it would be pretty sure to start the ferules off the teeth. In tightening the screw the strain always tends to move the mesial sides of the ferules downward from their original positions, as indicated by dotted lines in Fig. 934. The arrows in the figures show the directions in which the different parts of the teeth move, and also the directions of the forces upon different parts of the ferules.

Notwithstanding the weakness of ferules, they may be practicable in early age, at a time when the alveolus is soft and easily absorbed, provided they (ferules) are made as broad as the crowns are long.[1]

Although bands flare in some places when strained, it is not so with thimble-crowns. They mutually sustain all their

[1] Perhaps the influence of the screw when sprung, as illustrated in Fig. 933, might be more plainly understood by taking two extracted incisors and apply-

parts. Notwithstanding the thimble-crown mechanism is superior to the ferule kind, it is not, as before said, as philosophical as other mechanisms previously described.

Fig. 935 illustrates an operation for a patient about ten years of age, treated by L. L. Howell. This case is presented principally to show that a tooth can be successfully moved a considerable distance. The left upper adult cen-

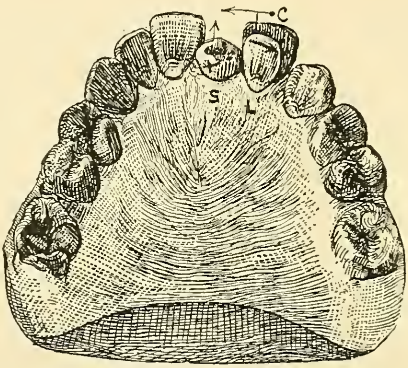

FIG. 935.—Lateral movement of an upper central by a screw (Howell).

tral C stood in the left anterior position, directly in front of the left lateral L. In the place belonging to this central stood a defective supernumerary tooth, S.

This dentist had been advised by another to extract both the outstanding (left) central and the supernumerary tooth, and then to transplant the former into the socket of the latter. This advice was given with the view that to attempt to move the left central sufficiently to properly place it would not only destroy its pulp, but also cause dis-

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ing the mechanism to them, and then, taking hold of the end of the roots with the fingers, forcing them apart. By this act it will be seen that, unless the ferules are fixed firmly upon the crowns, their mesial sides next to the gum will flare from the tooth by the strain on the screw, and these sides (mesial) of the ferule will become loosened, if not started toward the cutting-edges of the tooth.

coloration of the tooth. The plan of operation finally adopted was to extract the supernumerary tooth and then to move the central to its proper place by a screw-acting mechanism.

When the central had been moved about half-way to the place desired, the operator was again advised by the same person (previously referred to) to stop and inform the patient that it would be unsafe to move the tooth any farther. With this opinion I did not coincide, but suggested that if the tooth be moved slowly it would probably reach its proper place uninjured. The operation was successfully completed in that way, without killing the pulp.

As the mechanism used in this operation may serve in some respects as a lesson on the subject of complicated mechanisms, I shall enter more fully into the details of the operation than in explaining the majority of cases. The construction of the mechanism, which was in two parts, was several times altered and improved during the operation. That which was finally used, and the one adjudged to be the best, is represented in two parts by Figs. 936, 937, and 938.[1]

In these figures the letters A, A represent an anchor consisting of two thin, broad platinum ferules, united (by solder) somewhat after a plan by Drs. Barrett and Boswell.[2] One of these ferules embraced the right first molar, and the other the right second bicuspid. D represents a

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[1] Dr. Howell says that he had taken the principle of the draughting part of the mechanism, by which the first stage of the operation was accomplished, from figures of mechanisms published several years earlier by the author of this treatise. (See "Dental Cosmos," January and April, 1881. See Part XV., Chapter XCVII., p. 1014, on Correction of Incisors by Draught-strings and Drag-screws.) There is, however, considerable that is novel which belongs to Dr. Howell.

[2] See Part VI., p. 332, Fig. 287.

strip of platinum and iridium plate, one extremity of which was soldered to the buccal surfaces of the ferules, and the other to a broader piece of pure gold plate, E. This piece E rested on the labial surfaces of the right lateral and central, and was used as a base to support staples for holding strings, T, and preventing them from slipping from their places. N represents a stationary nut soldered to the anchor-bar D; S, the drag-screw that drew upon the strings T.

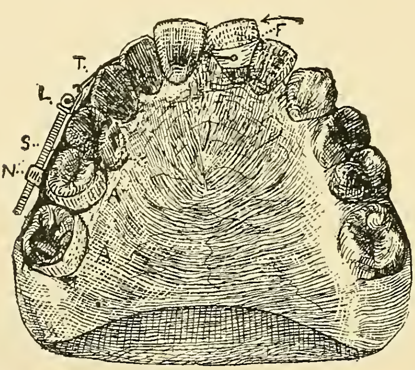

FIG. 936.—Appearance of the case at the close of the first stage of the operation.

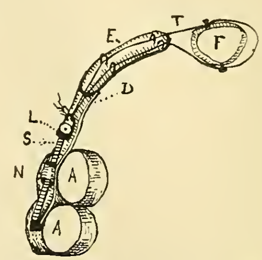

FIG. 937.—The first part of the mechanism used (Howell).

L represents a simple swivel-piece, to which the strings were tied. This swivel-piece was made of a narrow strip of plate bent at right angles. In one end of this was a hole for the screw, and in the other a hole for attachment of the strings to connect a narrow ferule, F, on the malposed left central, with the screw.

When this mechanism was applied the broad ferules A, A were first cemented to the molar and bicuspid, after which the narrow ferule F was placed on the central to be moved; the strings T were then added and made taut by the screw S. These were retightened by the patient two or three times a day by turning the screw. The patient was seen only twice before the tooth had moved to the position shown in Fig. 936. The crown was then nearly in its proper place, but the root had not been moved sufficiently.

The first stage of the operation having been completed, the second part of the mechanism was applied to the opposite side of the arch, to push the root of the (left) central into its proper place. Fig. 938 represents the case nearly completed. The mechanism consisted of two anchor-ferules, A, A (soldered together), for the bicuspids; on the buc-

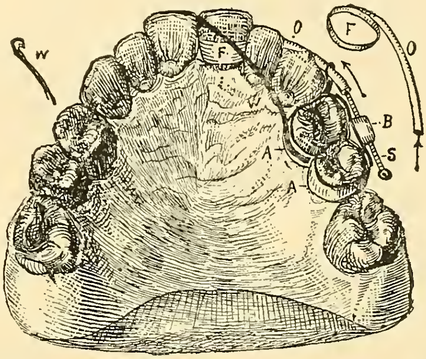

FIG. 938.—The case with the remaining part of the mechanism used in the second stage of the operation (Howell).

cal side of these ferules was soldered a screw-cut nut, B. In the nut played a screw, S, pointed at one end to rest in a socket in the end of a piece of large, stiff platinum wire, O, the other end of the wire being soldered to a ferule, F, cemented close to the gum of the (left) central to be moved.

When the screw S was turned forward, it pushed against the end of the wire O, which in turn moved the neck and root of the irregular central. To hold the crown of this tooth in place while its root was being moved, one end of a stiff piece of platinum wire, W, was soldered to the lingual side of the anterior ferule A, while the other was hooked around the corner of the crown of the central. The direction of force of the screw S was not in line with that which was necessary to move the root, but by confining the wire O to the ferule A by a wire loop, the direction was sufficiently curved to push the tooth into the supernumerary socket. (See Fig. 939.)

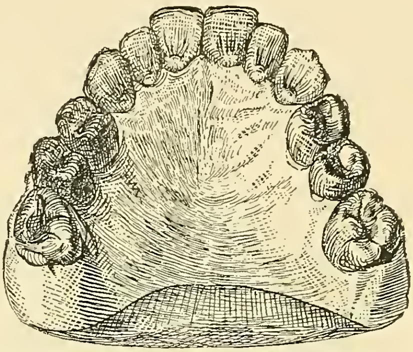

FIG. 939.—Appearance of the case at the completion of the operation.

Fig. 940 represents a mechanism for the lateral movement of the crown and root of a left upper central. This consists of a very stiff piece of screw-cut (18 k.) gold wire, W (filed flat on two sides); a hard-rubber roof-plate, P, having anchor clamp-bands, B, B; a broad, movable (18 k.) gold

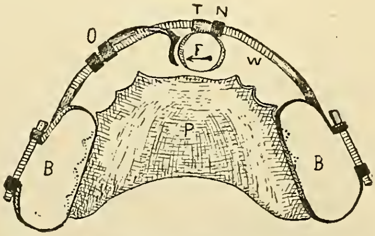

FIG. 940.—Mechanism for the lateral movement of the root of a central by the direct process (A).

ferule, F, soldered to a smooth-bore tube, T (sliding on the wire W); two screw-cut nuts, O, N; and a movable brace-wire (having a crutch extremity) made of stiff (18 k.) gold. The extremities of the wire W are soldered strongly to the buccal sides of the clamp-bands.

The mechanism is operated by playing the nut N upon the screw-cut wire W, and pressing against the end of the smooth-bore tube T, causing the ferule F (cemented to the irregular tooth) to slide along the wire W, thereby moving the tooth within the ferule.

To prevent the crown from moving while the root is being forced through the alveolus is the office of the crutch-arm. This arm, which is soldered to a piece of smooth-bore tube on the wire W, is forced forward from behind by the nut O causing the crutch to bear against the corner of the crown. The ferule-tube and the crutch-tube are prevented from turning on the wire W by being formed to correspond with the opposite flat sides of the screw W.

Another plan of fixing a crutch-brace is to solder the posterior end of it directly to the wire W, and then corrugate it "shorter" as the root of the irregular central moves toward it. The crutch is prevented from slipping off the central by a broad knob-ferule, below the ferule F.

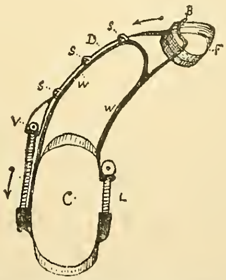

FIG. 941.—Modification of a Howell mechanism for lateral movement of the crown and root of a central (A).

Fig. 941 represents a modification of the Howell mechanism (Fig. 937) for a slight lateral movement of a left upper central. This modification (by the author) consists of a longitudinal screw clamp-band, C (gold); broad ferule, F; stiff arch-wire, W (gold); draught-wire, D (platinum); and gold brace-wire, B; screw, V; and staples, S, S, S.

The clamp-band (which is sufficiently large to embrace the two right bicuspids and first molar) is first made; then to it is soldered, on the buccal side, a nut in which plays the swivel-screw V. This is connected by a delicate platinum draught-wire, D, with the broad ferule F (by solder), embracing the malposed central.

These elements may be said to constitute the principal parts of the mechanism; but to prevent the draught-wire D from bearing upon the intervening teeth and forcing them inward, it is passed through the rings S, S, S, soldered to the outer part of the U-shape wire W, W, extending along the labial and lingual surfaces of the teeth.

A stiff brace-wire, B, soldered to the U-wire W, W, prevents the crown of the central from swaying too rapidly to its right while the root is being moved laterally. This brace-wire B is curved more and more from time to time, to allow the crown of the tooth to move only so fast as the root moves toward its proper place. The crutch end of the brace B is prevented from slipping off the tooth by a knob on the lower margin of the broad ferule F. This slight modification was suggested to my mind by the Howell mechanism. These two last-described mechanisms are weak, as engines of force, hence are only practicable for moving teeth very short distances. To move roots through alveolar tissue of considerable thickness requires very powerful machines, such as represented by Fig. 929.

All these side-acting mechanisms (Figs. 936–941) operate upon the philosophy of placing the base of power on other teeth than those to be moved; more might be said upon this kind of leverage, but as this properly belongs to the subject upon elevating teeth, the reader is referred to the first chapter in Part XVII. See also (by Index) the chapter upon moving roots *en masse*.

CHAPTER XCII.

SECTION A..................DIVISION III.

PULPLESS TEETH AND DISEASED SOCKETS.

MOVING PULPLESS TEETH AND LIVING TEETH IN HEALTHY OR IN DISEASED SOCKETS.

MOVING PULPLESS TEETH WHEN THE SOCKETS ARE HEALTHY, AND MOVING PULPLESS TEETH THAT ARE LOOSE FROM DISEASED SOCKETS.—GENERAL REMARKS UPON MOVING PULPLESS TEETH THAT HAVE HEALTHY SOCKETS AND THOSE THAT HAVE DISEASED SOCKETS.—TEETH LOOSENED FROM LOCULOSIS ALVEOLARIS.—TEETH LOOSENED FROM WHITLOWIC ALVEOLAR ABSCESS.—THE TWO DISEASES COMPARED.—THE SCREW THE BEST AGENT FOR MOVING PULPLESS TEETH.—OPERATION FOR CORRECTING A PULPLESS UPPER INCISOR BY A SCREW.—THE SCHANGE MECHANISM.—OPERATION FOR A PATIENT FIFTY YEARS OF AGE.

IT has been asserted that irregular teeth which have lost their pulps cannot be successfully regulated. It would be injudicious to attempt to move a pulpless tooth in a socket a part of which is necrosed, before removing the dead part and curing the living tissue surrounding it; this would not be so, however, with a pulpless tooth in a socket showing no signs of disease, provided the operation is carried on slowly. The force from weak elastic rubber will sometimes prove practicable, but that from scallop-gold wire is better, and that from the screw is superior to all.[1] Nearly all pulpless front teeth in healthy sockets can be safely moved by screws—even pulpless teeth that have more than one root.

If, however, the socket of a tooth has had an abscess in it, or if the socket-tissues around the tooth have wasted away by absorption sufficient to extensively expose the root—especially if there is no union of tissue in some places with the root—the attempt to move the tooth might be unwise. But if the teeth are firmly attached in the shallow sockets, where there is no tendency to loculosis, an attempt to move such teeth a short distance might be advisable. If the apex of a root should lose its attachment to the socket—especially if it be a lingual molar root—amputation of the dead part (the part having no union with its socket) would place the tooth in possible condition for success.[2] The moving of such teeth, however, is not recommended except in cases where it is very important to increase antagonism or to improve facial expression.

The question is not whether it is possible to move pulpless teeth, but whether the tooth will be worth the trouble and expense of the operation.[3] Especially does this doubt apply to the cases of those patients who are so indifferent to the care of their teeth as to permit the ravages of socket disease to become excessive; nor can it be for the interest of any dentist to advise an operation of no value to the patient. It would be better to advise the extraction of such

[1] Regarding treatments for necrosis of the alveolus, see papers published by the author in the "Dental Cosmos," July, August, September, October, 1878. These papers give the results of about two hundred experiments upon all kinds of dead bone, and embrace results upon living bone obtained by vivisection. ("Sulphuric Acid *vs.* Creosote Treatment.")

[2] The first operations of amputation of roots were publicly described by the author in the "Dental Cosmos."

[3] For explanation of amputation of roots, see Part XX.

a tooth standing in an undesirable position, and the substitution of an artificial one.

Moving Loculitic Teeth.—One of the most aggravating causes of drifting of teeth is disease of the roots and sockets, and the two most common causes of looseness are loculosis alveolaris and whitlowic alveolar abscess. To prevent the play of such teeth back and forth greatly retards the progress of the diseases and helps toward cure.

If the sockets are greatly affected with loculosis or any other form of pus-flowing disease—more especially whitlowic abscess—an attempt to move the teeth would probably be unwise; but if the teeth are fairly firm they may be successfully moved and retained if great care is exercised. The sockets, however, should first be treated, for to move teeth before an approximate cure has been effected would be experimental, and would probably result in failure, because such sockets are too soft and yielding.

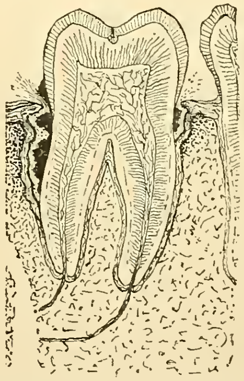

FIG. 942.—Loculosis alveolaris, or pocket disease of the alveolus.

Differential Diagnosis of Loculosis Alveolaris and Whitlowic Alveolar Abscess.—Fig. 942 is a section view illustrating a case of loculosis alveolaris, with a deep pocket on one side and a shallow one on the opposite side of a molar tooth, both of which are in a pyorrhœic or pus-flowing condition, discharging at the necks.

Fig. 943 illustrates a case showing similar external appearance to that shown in Fig. 942, but the cause of discharge is quite different. At the bottom of this socket there is an alveolar abscess, caused by a dead pulp. In Fig. 942

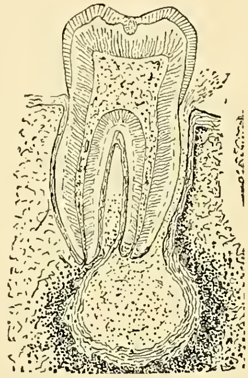

FIG. 943.—Whitlowic alveolar abscess.

the pockets contain deposits (calcareous) lodged on the roots (shown in black). In this case the external aspect resembles one of whitlowic nature. Instead of the pus finding vent through the usual channels (the walls of the socket), it has travelled along between the lining membrane of the socket and the root, and found exit at the neck of the tooth.

The two diseases thus differ widely in the cause and its location, the incipient stage of one being at the apex of the root, and the other at the neck of the tooth. Occasionally in loculitic cases nearly the entire socket is diseased, but generally it is confined to only one side, and in extent ranges from a slight distance below the annular lip of the gum to the entire length of the root.

Living teeth made loose by loculosis alveolaris may be made useful esthetically (if not for mastication), provided they be moved gradually and then held firmly in their new places, but not otherwise.[1]

Another condition of sockets which may be included in these classes is that which results from death of the pulp before the roots of the teeth are fully developed. These cases are usually confined to the upper central incisors of boys and girls who have fallen against something and loosened, if not broken, their teeth. Such cases, though difficult to cure, should be treated before the teeth are moved. For further information concerning this class of cases, see Part XX., chapters upon central incisors the crowns of which have died before the roots were fully developed.

In many loculitic cases more or less of the teeth are missing, but even under these circumstances the teeth may be prudently corrected if the sockets are not too extensively diseased, because the teeth when corrected can be held firmly by a plate bearing artificial teeth. The most satisfactory results that I have had after such operations are those in cases where missing teeth have been substituted by artificial teeth mounted on the same plate. I have noticed that even the teeth that are held steady by clasps projecting from the plate are benefited by them. To reiterate, I have noticed that teeth thus held steady have become firmer than teeth that have not been clasped. Of course such cases should receive treatment for the cure of the disease before they are regulated, and after being regulated the accretions upon the roots should be removed every six or twelve months. These favorable results are entirely from

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[1] For several papers on Loculosis Alveolaris by the author, see three papers in "Independent Practitioner" of 1885–86. For etymology and definition of this socket disease, see foot-note, Part XIII., p. 605.

the lateral prop to the loose teeth, supported by the stimulation of the personal pride of the patient in the beauty of the dental arch, which prompts her to wear the plate continually and to keep the teeth clean.[1]

Fig. 944 illustrates an operation for moving a pulpless outstanding right upper central to line by a screw operated through a long-band anchored to the side teeth by two

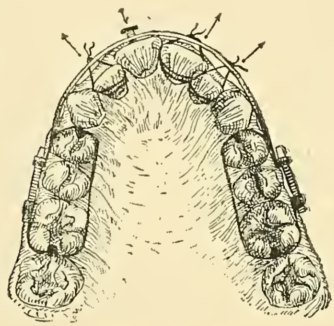

FIG. 944.—Moving a pulpless incisor (A).

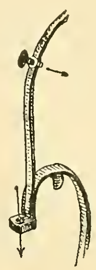

FIG. 945.—The screw part of the mechanism (A).

clamp-bands. The ends of the long-band were soldered to these anchor-bands. (See Fig. 945.) This soldering was necessary to give rigidness to the mechanism.

The thumb-screw worked in a threaded hole made through the long-band at a place "off against" the outstanding tooth. To prevent this part of the long-band from being weakened, a small collar, made of thick plate, was soldered around the hole.

To cause pressure upon the pulpless tooth, this thumb-screw was advanced against it, the pressure being renewed twice a day. To make sufficient space for this tooth the other incisors were drawn outward by strings placed around

[1] In inserting partial sets of artificial teeth I think it is always beneficial to clasp or otherwise embrace any loose teeth (in loculitic sockets) that may be present.

them and tied to the long-band as shown. This mechanism is effective when properly made, but pulpless teeth may be moved successfully by other mechanisms acting by screws.[1] Pulpless teeth can, however, be moved by elastic rubber, but not as safely.

I do not claim to be the first person to use a screw, through a long-band, to bear upon incisor teeth. This was done before by Dr. Schange, and published by Linderer in 1848.[2]

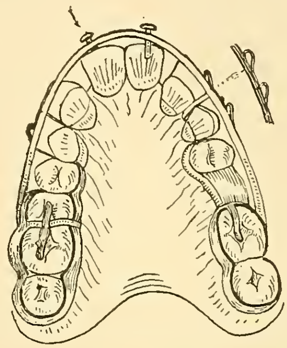

FIG. 946.—Mechanism used by Schange (1848).

(See Fig. 946.) But the anchoring of the long-band by a screw-tightening band instead of a crib, so far as I know, was originated by the author.

Fig. 947 illustrates the beginning of an operation for closing a quarter of an inch space between the upper central incisors of a woman fifty years of age. The first bicuspids, the first molars, and the left third molar were missing. The sockets were considerably affected with loculosis alveolaris, or, as the French denominate it, pyorrhœa alveolaris; the disease, together with the improper antagonism of the front teeth, caused the space. This case is presented

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[1] Nearly all forms of screw-jacks, when attached to anchor teeth by ferules or by clamp-bands, are effective for this purpose.

[2] "Handbuch der Zahnheilk.," 1848, zweiter Band.

more for the purpose of showing that age and socket disease are not always bars to success, than to illustrate the process by which the deformity was corrected.

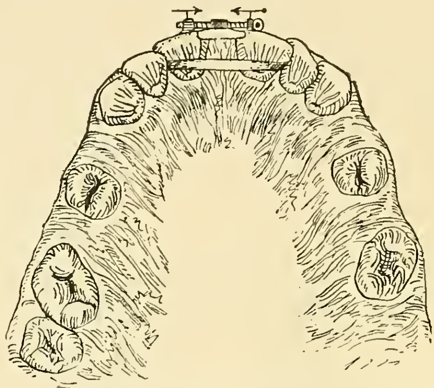

FIG. 947.—Moving loculitic teeth and closing an interdental space (A).

The first step in the operation was the cure of the disease. This was accomplished in four sittings (one week apart), and consisted in the removal of all the concretions from the roots of the teeth by delicate steel instruments, and the cleansing of the pockets by injecting water into them by a large concentric barrel-syringe devised for this purpose, and subsequently treating them with equal parts of wood-creosote and alcohol by a screw-acting alveolar-abscess syringe having a nozzle so delicate that it easily reached to the bottom of the pockets.[1]

After curing the disease the case was rested four weeks, and then the operation for closing the interdental space was commenced. The centrals were drawn together by a gold clamp-band applied as represented in the figure.

In Part XIII., p. 628, a plan for closing such spaces by

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[1] For the author's views regarding loculosis alveolaris (pocket disease of the alveolus), see "Independent Practitioner" (now the "International Dental Journal") for October, 1885, and for April and September, 1886.

wedges was explained and illustrated. It is seldom prudent, however, to practise by this plan. To close a space between central incisors by wedges inserted between the centrals and the laterals might improve the position of the centrals, but the laterals would be liable thereby to be forced out of their proper place. This result is also possible when wedges are used between laterals and cuspids, but as the cuspids are generally firmer than the incisors, they are not so liable to be disturbed. In the above case, however, wedges could not be used in any place because of weakness of the socket-tissues. This mechanism was worn about three weeks, the operation being mainly carried on by the patient. The space could have been closed in less time, but this operation, as in all my loculitic cases, was conducted slowly.

To hold the centrals together after the space was closed, all that was necessary was to wear a small U-shape gold plate having two spurs; but as there were spaces made by loss of some of the side teeth, artificial substitutes were added.

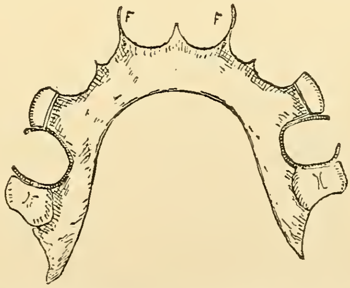

FIG. 948.—The retaining mechanism in combination with artificial teeth (A).

Fig. 948 represents this plate bearing the two small spurs F, F (gold wires), and four artificial teeth. These retaining-spurs projected between the centrals and laterals.

Fig. 949 illustrates the case when completed, and after the mechanism was inserted. Personal pride kept the artificial teeth in the mouth, and the plate kept the retaining-spurs permanently between the centrals and laterals.

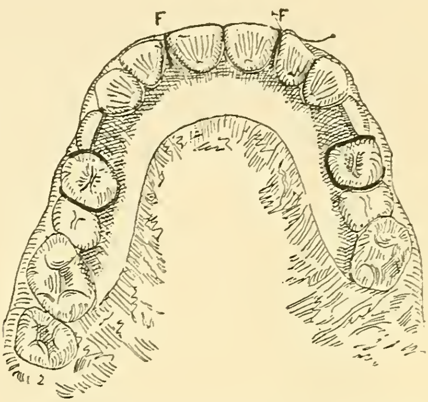

FIG. 949.—Appearance of the case when completed.

One great advantage of combining a retainer with artificial teeth in this case was retardation in the progress of the disease of the sockets. I would not have it inferred from this remark, however, that the appearance of cure of loculosis can be depended upon as lasting, because the original causes (systemic) still remain.

When the plate had been inserted in the mouth, there still remained slight protrusion of the corner of the left lateral; this was finally ground away (see arrow) until the arch was regular.

LOWER INCISORS.

SECTION B .... DIVISION I.

CHAP. XCIII.	Moving Lower Incisors laterally by	Strings, and by Rubber Rings in Combination with Band-anchors.
" XCIV.	" " " "	Strings, and by Rubber Rings in Combination with Long-bands and Skeleton Sub-anchors.
" XCV.	" " " "	Metallic Springs, with Plates.
" XCVI.	" " " "	Metallic Springs without Plates.
" XCVII.	" " " "	Scallop-wire Bows, and by Drag-screws.

CHAPTER XCIII.

SECTION B..................DIVISION I.

MOVING LOWER FRONT TEETH BY ELASTIC RUBBER.

GENERAL REMARKS ON OPERATIONS BY ELASTIC-RUBBER RINGS ONLY, AND BY RUBBER RINGS ANCHORED BY FERULES OR BY CLAMP-BANDS.—VARIOUS OPERATIONS FOR CORRECTION OF JUMBLED INCISORS.

IRREGULARITIES of the incisors of the lower jaw, like those of the upper jaw, may sometimes be corrected by the old plan of simply tying the incisors with strings to the adjacent teeth, or by stretching elastic-rubber rings around and among the teeth so as to draw upon them in the direction desired. Another plan is to connect the rubber rings with a U-shape plate covering more or less of the lower dental arch. Superior to this plan, however, is that of using strings or rubber rings in combination with such anchors as ferules or clamp-bands; because by properly placing hooks upon the anchors any direction of draught, upon the teeth to be moved, can easily be obtained. These hooks may be long or short; or they may be arms projecting from the anchors, or they may be anchored long-bands.

Leaving the consideration of long-band sub-anchors for the next chapter, our present brief remarks will be mainly confined to rubber and bands. As the philosophy of applying draughts has already been explained in Part IX., Chapter XLII., p. 460,[1] it will not be repeated.

When more than one rubber ring is necessary, or when it is desirable to have the draught made in more than one direction, there should be two or more anchor-hooks located at different places on the anchor-ferule, or on the anchor clamp-band.

When it is desirable to have the draught made in a different direction from that of the location of the anchor-band, the hooks may be soldered on the free extremity of a stiff wire arm projecting from a plate, or from a clamp-band, substantially as illustrated in Part VI., pp. 340, 341, and further illustrated in Chapters LXXV., p. 804, and LXXVIII., p. 834, on Upper Incisors (Part XV.).

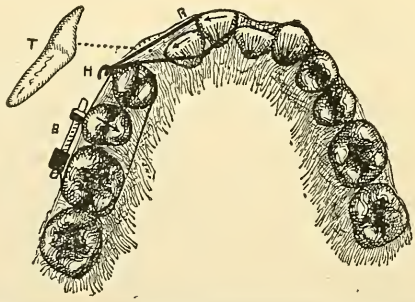

FIG. 950.—Moving lower incisors by an elastic-rubber ring anchored to a clamp-band (A).[2]

Whenever lower incisors are jumbled, overlapping one another, and the dental arch is already of proper size, and enlargement of it would be injurious, esthetically and practically, it is proper to extract one of the incisors, provided the space can be filled by the remaining teeth. The theory of this is fully explained in Chapter LXIX., p. 721.

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[1] See also Part VI., pp. 724, 725.

[2] From a lecture by the author before the Brooklyn Medical Society, February 27, 1888. Published in "Brooklyn Medical Journal," July, 1888.

Fig. 950 illustrates the second step in an operation for moving jumbled lower incisors for a boy about eleven years of age. The first step was the extraction of the left lateral T to make room. To please the patient, and to give opportunity for nature to act, the operation was then suspended for a few weeks. Finding that the correction of the deformity had made only slight progress, art (second step) was applied to assist. A clamp-band was placed on the two left bicuspids and first molar; a rubber ring, R, was then placed over the two centrals, and stretched, and caught upon the hook H, on the anchor-band, as represented in the figure. The traction caused not only the two incisors to move away from the right lateral, but it also forced the left central outward. The right central then moved of itself into line.

The use of mechanisms of this class is only advisable when the tooth is to be moved posteriorly or sidewise. When the incisors require to be moved directly forward, or nearly so, the round-wire long-band (bearing rings) anchored by clamp-bands is superior. Such mechanisms will be found explained in the following chapter.

FIG. 950A.—Rubber ring-placers (A).

Fig. 950A represents three instruments for placing the elastic-rubber rings on the hooks on the anchor. These placers (which are easily made from old excavators and root-pluggers) are among the most useful of all instruments that I have; by them, rings can be stretched, and caught on hooks in the most remote part of the mouth.

Ferule-anchors are used on the same principal as clamp-bands.

CHAPTER XCIV.

MOVING LOWER INCISORS BY STRINGS AND RUBBER RINGS IN COMBINATION WITH LONG-BANDS ANCHORED BY STRINGS, CLASPS, AND BY CLAMP-BANDS.

GENERAL REMARKS ON THE LONG-BAND MECHANISMS FOR CORRECTION OF LOWER FRONT TEETH.—OPERATION BY A LONG-BAND HAVING BIFURCATED EXTREMITIES ANCHORED BY STRINGS.—BY A LONG-BAND ANCHORED BY CLASPS.—OPERATIONS BY LONG-BANDS ANCHORED BY CLAMP-BANDS.

AN old plan (and one by many now followed) for correcting irregular lower incisors is that of tying the teeth to a long, narrow strip of plate substantially as suggested by Bourdet in 1786.[1] Fox (who wrote later, 1814) in substance says of this old plan of Bourdet's: "For cases of young children a strip of gold plate about one-sixteenth of an inch in width, and bent to fit around the dental arch, was formerly fastened by ligatures to the deciduous molars, and then each irregular tooth was tied with the strings, which passed through holes drilled in the strip for them."

For correction of the upper teeth, in the days of Fox, the jaws were sometimes held a short distance apart by thin blocks of ivory or bone projecting between the upper and lower molars. Each block was connected with the

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[1] See Part VI., p. 315.

strip of plate by a short piece of plate riveted at right angles to each. Such blocks are seldom used now.

Since 1873, clasps, thimble-crowns, ferules, and clamp-bands (as anchors for strips) are regarded as superior to strings.[1]

Bourdet, in making his long, narrow strip of plate for moving lower incisors outward, had the sides of the extremities hollowed like a fish's tail; they were bent at right angles to the strip, so as to project inward and fit between the buccal walls of some of the side teeth, to which the strip of plate was tied by strings. Although this anchorage was not reliable, the mechanism came into general use, and continued in use for nearly a century. The more skilful members of the profession, however, adopted ferules and thimble-crowns for anchors, as suggested by Desirabode, and clasps as suggested by Bell.

Another and a simple plan (though inferior in principle) for aiding in anchoring extremities of a long-band, is to bifurcate them about one-third of an inch, and then bend the two parts so as to fit upon and around the curved surfaces of the teeth in a way that when the middle part of the band has been tied to the front teeth the extremities of the strip will neither move posteriorly nor toward the gums. One of the parts is bent inward so as to project between the teeth, while the other is so bent that it will rest on the grinding surface of the teeth. To prevent the latter from interfering with antagonism of the teeth, it should rest in a sulcus.

Fig. 951 illustrates an operation performed in 1864 for moving lower instanding teeth by such a bifurcated strip.[2] Although this is firmer than the plain strip tied with strings, it is not very firm; therefore patients wearing it

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[1] See Part VI., p. 337.

[2] See Part VI., Figs. 252, 253, pp. 314, 315.

should be taught to be careful not to get it out of its proper place.[1] But little can be said in favor of any of the non-metallic anchors.

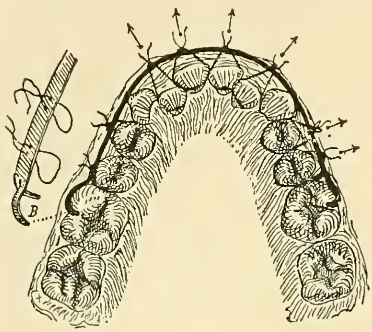

FIG. 951.—Drawing lower incisors forward by strings in combination with a long-band having bifurcated extremities (A).

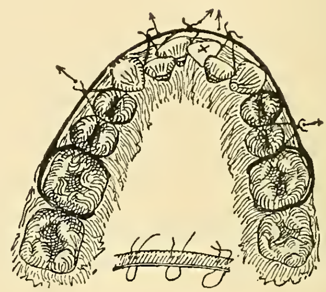

FIG. 952.—Moving lower incisors forward by strings and a long-band having clasps (after Bell and Harris).

Fig. 952 illustrates an old plan of operation for correcting jumbled lower incisors and bicuspids by linen strings in combination with a long-band anchored by clasps, as suggested by some of the older dentists. Before applying the mechanism the right central incisor was extracted to make room for the remaining teeth. The construction of the mechanism is shown so plainly by the figure that it is only necessary to further state that the best material to make it of is (18 k.) gold. The irregular teeth are connected with the long-band by strings passed entirely around each tooth, and then drawn through holes in the long-band, and tied firmly to it. (See the small diagram at the bottom of illustration.) These strings should be renewed whenever they become loose, which usually occurs after a day or two.

In cases of patients who are sufficiently intelligent to be careful, this mechanism can generally be relied upon;

[1] Bifurcated extremities of long-bands were devised in 1864. (A.)

but it is not equal to the round-wire long-band (bearing-hooks), anchored by clamp-bands.

Fig. 953 illustrates a plan of drawing four lower incisors forward by strings tied through holes in a flat long-band, the extremities of which are attached to single-tooth

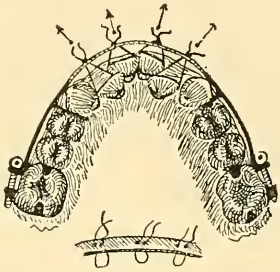

FIG. 953.—Moving forward lower incisors by tying them with strings to a long-band anchored by small clamp-bands (A).

clamp-bands embracing the first molars. To give steadiness to the long-band each clamp-band had two ears, and the long-band had two spurs of round wire projecting lingually over the grinding surfaces of the teeth, and along the approximal valley between the cuspids and bicuspids. The ends of the long-band were rigidly soldered to the anchor clamp-bands.

In applying this mechanism the anchors are placed upon the teeth and tightened upon them by turning the screws with a right-angle lever-key; after this the irregular teeth are tied tightly to the long-band by the strings.[1]

The long-band should not lie so far forward of the front teeth as to interfere with the lower lip; nor should it be so close to the front teeth as to leave insufficient room for moving them outward.

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[1] Sometimes ferules soldered to the long-band after the plan of Desirabode will serve the purpose of clamp-bands. (See Part VI., Fig. 271, p. 321.)

Fig. 954 illustrates the case of a girl seventeen years of age, for whom an operation was performed for moving into line the lower right central and the laterals after the left central had been extracted to make room for them.

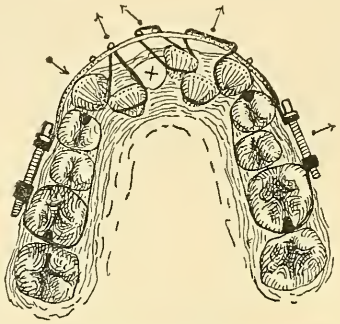
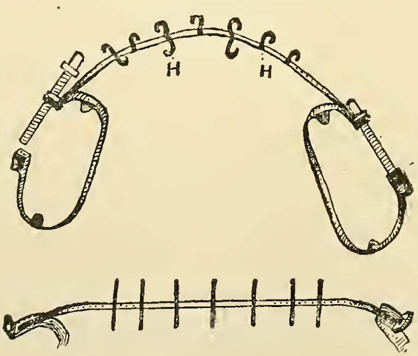


FIG. 954.—Drawing lower incisors forward by rubber rings in combination with a long-band anchored by large clamp-bands (A).

Fig. 955 represents the mechanism used. It consisted of three very small rubber rings and a long-band (made of round gold wire about the size of a large pin), the ends of which were rigidly soldered to gold clamp-bands. At differ-



FIGS. 955, 956.—The Mechanism (A).

ent places on the long-band were also soldered cross-pieces of smaller wire about one-fourth of an inch in length. (See Fig. 956.) These wires were then bent into hooks as represented by H, H in Fig. 955.

The metallic part of the mechanism, when ready to be applied, was firmly anchored into place by tightening the clamp-bands upon several side teeth. The elastic-rubber rings were placed around the irregular incisors, then stretched forward and caught upon the hooks, H. Some of the rings were carried below and some above the long-band before being thus caught on the hooks,[1] and some of them were stretched in opposite directions in order to bear upon the adjacent teeth and have a triple effect. In other words, they were applied so as to draw an instanding tooth forward and at the same time make room for it by forcing the adjacent teeth away from it. (See rubber on the right central.)

This mechanism was easily and effectively managed by the patient. The time used to complete the operation was six weeks.

FIG. 957.—Crib-retainer temporarily used (A).

The first retainer used after the teeth were regulated is represented by Fig. 957. This was made of gold wire in crib-like form, a modification of an old and similar form by Richardson. One of these wires rested on the lingual

[1] When the author first exhibited this mechanism to the profession he believed that he was the first inventor of every part of it, excepting, of course, the prototype (flat strip), which was more than a century old. But several years afterward he ascertained that Professor R. B. Winder had antedated him in the cross-pieces. Dr. Winder soldered narrow, flat strips of plate to a long, flat band in 1872. To him, therefore, so far as is known, belongs the credit of priority in devising cross-cleats in combination with long-bands; all the difference between them is that the author's are of round-wire instead of strips of plate. But Schange used the wire loops on the extremities of a long-band, off against the side teeth (not on the middle part, so useful in operations on the incisors). In 1848 were published, through Linderer, these wire loops soldered to a long-band.

and the other on the labial surfaces of the teeth. After a few days this loose and unreliable retainer was substituted by another less conspicuous and more efficient. It consisted simply of a small U-shape hard-rubber plate, as represented by P in Fig. 958. It was worn four months.

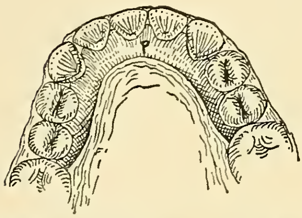


FIG. 958.—Hard-rubber plate—the permanent retainer (A).

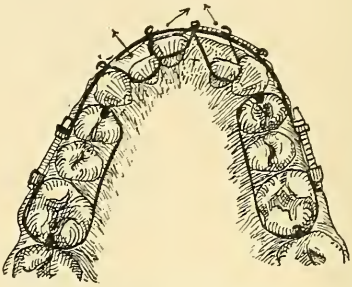


FIG. 959.—Moving three lower incisors by elastic-rubber and round-wire long-band anchored by clamp-bands (A).

Fig. 959 represents an easy operation for correcting jumbled lower incisors by one of the best mechanisms for this purpose, which consists of a round-wire long-band and three rubber rings. The first step in this operation was the extraction of the right central. The next was the application of the hard part of the mechanism as shown. The rubber rings were then caught on the instanding teeth, and stretched in the proper direction, through little open rings soldered to the long-band. Instead of using small rubber rings, as here represented, I now use "election rubber rings," and make one of them do the work of two or three smaller rings, by stretching it outward and inward around the teeth and hooks.

CHAPTER XCV.

MOVING LOWER INCISOR TEETH BY METALLIC SPRINGS IN COMBINATION WITH PLATES.

GENERAL REMARKS ON THE VARIOUS MECHANISMS OF THIS COMBINATION.—STEEL SPRINGS WITH A BOX-PLATE FOR MOVING INSTANDING INCISORS.—OPERATION BY STEEL SPRINGS ANCHORED TO A PLAIN PLATE.

THE plan of moving lower front teeth, like that of moving upper front teeth, by elastic metal, is old. Fauchard, in 1746, and several other writers of a little later date, mention the use of this quality in metal. But the springs were not anchored by plates; they were anchored by strings (now obsolete in expert practice). Springs and their anchors are at present combined in a great variety of ways, but all are modifications of a few prototypes devised later than 1746. Several of these have been illustrated while considering operations upon the upper teeth; some others that are to follow may be new, but most of them can only be regarded as variations of them.

Fig. 960 represents one form of mechanism for moving outward instanding lower laterals. It consists of two steel springs, one extremity of each of which is vulcanized in a hard-rubber box-plate fitting the lower molars. Before vulcanizing, each wire is bent into proper form for spring action, and one extremity is flattened; the wire is also covered with tin to prevent oxidation while in the mouth.

This kind of mechanism (which is more frequently used in Europe than in America), when properly made, remains

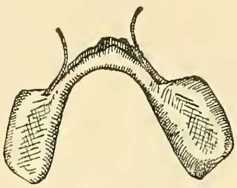


FIG. 960.—Mechanism for moving instanding lower laterals (Coffin).

firm on the teeth and is practicable. It should, however, be removed two or three times a day and cleansed to prevent injury to the teeth. By properly bending the springs, or by anchoring them in advantageous places in the plate, it may be made suitable to meet the wants of many cases.

Drs. Coffin (father and son), of England, have probably devised more modifications of box-plate mechanisms having steel springs than have been put forth from any office in the United States. Springs in combination with plain plates, or in combination with skeleton metallic anchors, such as ferules, clamp-bands, and cribs, are generally preferred in America, because they are less clumsy.

Fig. 961 illustrates an operation for moving instanding lower incisors forward and the second bicuspids outward. The mechanism used was only a slight modification of an old one devised by Taft, and later by Coffin, Quinby, and others. Having made a plaster cast, the double springs s, s are tinned and bent to resemble the letter S, and so arranged that they bore upon the incisors and bicuspids. These springs are anchored to the plaster cast by staples made of platinum wire and forced into it. The rubber is then packed under the springs and about the staples in the usual way for a plate, and vulcanized, scraped, and polished.

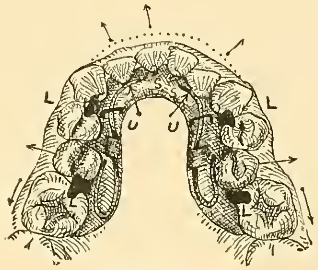


FIG. 961.—Moving instanding lower teeth outward by wire springs in combination with a plain plate (A).

The springs are held to the plate by a prominence on the plate, burying the middle part of each. They are further confined to the plate by two wide staples, U, U. To prevent the plate from slipping down the teeth, and injuring the gums, four lugs, L, are vulcanized into it (plate); these lugs, which rest on the side teeth, are made of rolled-gold wire bent as shown. The mechanism is removed and cleansed daily, and the springs rebent twice a week to keep up the pressure on the teeth.

CHAPTER XCVI.

MOVING LOWER INCISOR TEETH BY METALLIC SPRINGS WITHOUT PLATES.

OPERATION BY A WIRE SPRING ANCHORED BY A CRIB.—BY WIRE SPRINGS ANCHORED BY A FERULE.— BY SCALLOP-WIRE SPRINGS ANCHORED TO CLAMP-BANDS.—CORRUGATED-GOLD-RIBBON MECHANISMS.

INSTANDING or outstanding front lower teeth may be moved by properly formed wire springs anchored to the side teeth by cribs or by ferules; but longitudinal screw clamp-bands are better, because by these the springs are very firmly held in place, and the mechanisms are as easily applied and removed as the others.

Cribs may be made of flat strips, but generally they are made entirely of round gold, or of steel wire so bent around the side teeth that they will grip them at the necks, leaving the regulating-springs to press against the teeth to be moved.

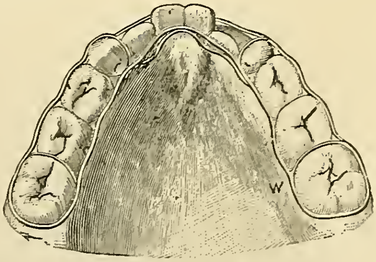


FIG. 962.—Plan of moving instanding laterals by a modification of the "Atkinson crib" mechanism (Jackson).

Fig. 962 illustrates a plan of moving instanding lower laterals, advocated by Dr. Jackson. It consists of springs anchored to the side teeth by cribs, W, made by the wire extending along and around them;[1] this is on the plan followed by Dr. W. H. Atkinson and others.[2]

Fig. 963 illustrates the beginning of an operation for moving forward the lower right central and lateral by a wire spring anchored by two ferules.

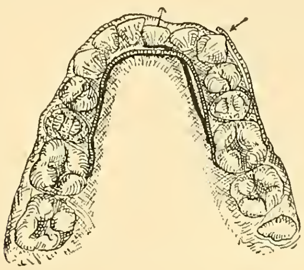


FIG. 963.—Moving forward a lower incisor and a cuspid by wire springs anchored by ferules.

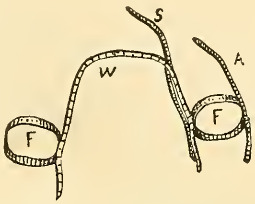


FIG. 964.—The Mechanism (A).

Fig. 964 represents this mechanism independently; it is made of gold, and in parts, as follows: two wire springs, S, A; two ferules, F, F; and a supporting-bow, W, which connects the other parts. In constructing this the ferules were made to closely fit the two second bicuspids, after which the supporting-wire (hard gold, about the size of a large pin) was bent to conform to the gums along the lingual side of the dental arch, and soldered to the lingual surface of the ferules. The springs S, A were also of hard gold wire bent as shown; both of these were fixed to the ferules by soft solder, to prevent injuring the elasticity.

To apply this mechanism the ferules were forced snugly upon the teeth, leaving the springs bearing upon the offstanding teeth. As it was necessary to remove the mechanism daily to cleanse it, and to rebend the springs so that

[1] From "Dental Cosmos."

[2] See Fig. 832, Part XV. All cribs are but slight modifications of Delabarre's cribs, published in 1820 and 1826.

the pressure upon the offstanding teeth would be maintained, no cement was used until the incisors had become loosened; then they were cemented, and the springs left to finish the work. To prevent slipping of the spring s, it was placed between the bow w and the gums.

Fig. 965 illustrates the beginning of an operation for moving forward the lower lateral incisors by two wire springs.

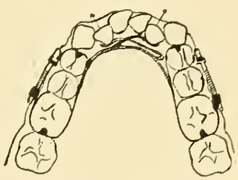


FIG. 965.—Moving forward lower incisors by wire springs anchored by clamp-bands (A).

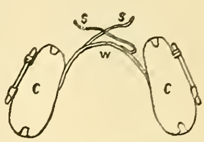


FIG. 966.—The Mechanism (A).

Fig. 966 represents the mechanism independently. It consists of two clamp-bands, c, c, a supporting wire-bow, w, and two springs, s, s. All of these are made of gold and soldered together with soft solder.

To apply the mechanism the clamp-bands were screwed to the bicuspids and first molars, leaving the bow resting under the end of the tongue. The springs were then placed so as to bear against the lingual walls of the instanding incisors, and then left to do their work.

When the force of the springs was weakened by the forward movement of the incisors, the mechanism was removed and the springs rebent (so as to give increased force), and then reapplied to the teeth. It was removed daily to cleanse it and the teeth.

As will be seen, the force against the tooth on one side of the arch was caused by the spring anchored on the opposite side. This crossing of the springs so acted upon the dental arch that it was enlarged instead of reduced in size; the springs also caused the teeth adjacent to those to be moved to receive more reactive force from the instanding teeth than would have been the case had each spring acted upon teeth of the side to which they (the springs) were anchored.

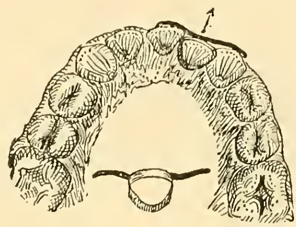


FIG. 967.—Moving an instanding lower incisor to line by a wire soldered to a ferule-anchor (A).

Fig. 967 illustrates a small part of a larger operation, the part being for the correction of an instanding lower right lateral. The mechanism used consisted simply of a piece of gold spring-wire, about the size of a pin and three-fourths of an inch in length, soldered to the labial side of a ferule which closely fitted the instanding tooth. Before applying the mechanism the extremities were so bent that

FIG. 968.—Two similar mechanisms.[1]

when the ferule was placed upon the tooth the extremities of the wire bore hard upon the labial sides of the adjacent teeth, thus causing a draught upon the instanding tooth. When this tooth had moved outward sufficiently to weaken the draught, the ferule was removed and the extremities bent still more; then it was replaced upon the instanding

[1] Concerning the history of this mechanism, see Part VI., p. 370.

tooth, which in two days moved into line. The same mechanism, which had heretofore been used without cement, was now cemented to the tooth, and left there as a retainer for three months. Fig. 968 represents two of these very practicable and useful little mechanisms.

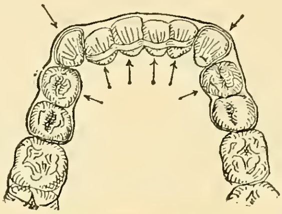


FIG. 969.—Plan of moving lower front teeth forward by traction of a metallic ribbon.

Fig. 969 illustrates a plan of operation by Dr. B. S. Byrnes, for moving instanding lower incisors to line by spring-power of corrugated gold ribbon.

Fig. 970 represents an edge view of the mechanism.

There is no doubt but that in some cases such ribbons are practicable, but they must be skilfully made. The plan is to make the ribbon by rolling gold wire to the thickness of writing-paper. This is cut to about one-sixth

FIG. 970.—Edge view of the mechanism (Byrnes).

of an inch in width, and of a length that when the ends are united by solder the loops can be forced snugly upon the teeth. After this, the ribbon is corrugated by depressing it between the teeth with a burnisher. When the loop becomes too loose to maintain sufficient force, it is removed, cut shorter, and resoldered to make it smaller. Although the principle of this mechanism is not wholly new, I think that to Dr. Byrnes, more than to any other man, is due the credit of developing what there is in corrugated strips of metal.

FIG. 971.—Corrugated strip for drawing upon a front tooth (Byrnes).

Fig. 971 represents a mechanism constructed on the plan of one made by Dr. Byrnes. It consisted of a thin strip of metal, to each end of which was soldered a narrow ferule, after which the strip was corrugated as shown. I think that this mechanism (in which the corrugation was carried to the extreme) was designed to draw an outstanding tooth to line. Supposing it to have been an outstanding upper cuspid, the larger ferule would be placed over one of the molars on the opposite side of the mouth, after which, the corrugated strip being stretched diagonally across the dental arch, the other ferule is placed over the outstanding tooth. The character of the force from this, as from the other mechanism, is continuous. The spring pulls like a rubber ring. The question is not whether this corrugated strip can move teeth, but whether it is, or is not, superior to rubber.

In using the strip it is important that the anchorage be sufficiently firm to do its work without being *itself* materially disturbed. When the anchor tooth is not sufficiently firm I would suggest soldering a wire or a narrow but stiff strip of plate to the buccal side of the ferule, to rest evenly upon the outside of adjacent teeth.[1]

[1] See Fig. 295, Part VI., p. 339, Lever Ferule. (A.)

CHAPTER XCVII.

MOVING LOWER INCISORS BY INTERMITTENT FORCE FROM SCALLOP-WIRE BOWS, AND BY DRAG-SCREWS, IN COMBINATION WITH STRINGS OR WITH SMALL WIRE.

METALLIC BOW MECHANISMS FOR CAUSING INTERMITTENT FORCE. —SCALLOP-WIRE MECHANISMS.—SCREW-WIRE BOW ANCHORED BY GUM-GUARD BANDS.—DETACHABLE DRAG NUTS AND SCREWS.—SWIVEL DRAG-SCREW.—BARBED DRAG-SCREW.—PLATINUM WIRE IN COMBINATION WITH SWIVEL DRAG-SCREWS, AND IN COMBINATION WITH LONG-BANDS.—THIMBLE-NUT FOR PROTECTION OF THE SOFT TISSUES.

IN the preceding chapters different plans for correcting lower front teeth by *continued force*, through the use of elastic materials such as rubber and metallic springs, were explained; there now remain for consideration the plans of moving teeth by intermittent force. It is true that intermittent force can sometimes be applied to upper teeth by lever ferules adjusted to any desired pressure, and there maintained by lodgment of the levers against knobs on plates or against pegs set in holes in the plate. Such levers and knobs for moving upper teeth are illustrated in one of the earlier works of Sir John Tomes, and copied by other authors into their works. This plan, however, is now superseded by better plans not only by Tomes but by other dentists.

For moving lower teeth this plan is practicable only to a limited degree, therefore it will not be considered. This chapter will be upon mechanisms operated by wire bows, plain and scallop, and by screws. (See Part XVIII., on Elongation of the Dental Arch.)

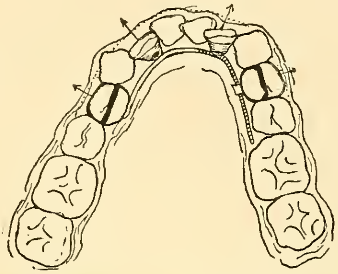


FIG. 972.—Moving forward instanding laterals by a wire bow anchored by gum-guard ferules (A).

Fig. 972 illustrates an operation for moving forward the lower laterals by an adjustable wire bow (gold) anchored by two guard ferules. The left extremity of the bow was attached to one ferule by solder; the opposite extremity, which was screw-cut, was attached to the other ferule by a nut. These connections were on the lingual side of the ferules.

The pressure on the teeth was increased by lengthening the part of the bow anterior to the nut by running the screw so that its end was nearer the nut. The anterior part of the bow was held to the incisors by ferules cemented upon them; these ferules are represented in the figure.

This mechanism is simple, and useful for moving forward upper as well as lower front teeth; but I do not regard it as equal to a scallop-wire mechanism.

Scallop-wire Mechanisms.—In Chapter LXXXII. are explained several machines of the scallop-wire class, for the correction of irregular upper teeth by intermittent force from inelastic wire. By such mechanisms a character of force can be given that closely approximates that from the use of the screw.

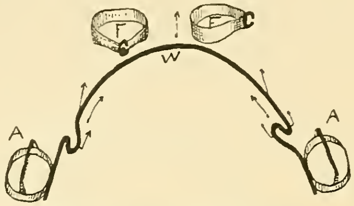


FIG. 973.—Mechanism for moving forward instanding incisors (A).

Fig. 973 represents a mechanism, belonging to this class, which is effective for moving forward the lower or the upper incisors. It consists of two bicuspid gum-guard ferules, A, A (serving as anchors), and a wire bow, W, the extremities of which are bent zigzag as shown. The ends of this wire are soldered firmly to the ferules.

To apply the mechanism, the ferules are placed on the second bicuspids, leaving the wire bow to bear against the lingual sides of the instanding incisors. To hold this bow against these teeth, two ferules, F, F, having lingual rings, are cemented on them. The bow rests in these open rings. Instead of open rings, which are clumsy, I sometimes use small lugs (after the plan by C. P. Wilson) soldered midway of the breadth of the ferules. To increase the pressure upon the teeth, the bow is elongated by enlarging the curves in the wire bow by means of wide beak-forceps. This lengthening of the bow is repeated on alternate days, until the teeth are moved into their proper places.

As in the above-mentioned chapter, there are other kinds of anchors—the crib, the clamp-band, etc.—all of which are applicable for the lower teeth. In Part XX. there are also presented a class of similar scallop mechanisms, suitable for retaining teeth in place after being corrected. It is not necessary, therefore, to further dwell upon this class.

Drag-screw and Cord Mechanisms.—Of all the mechanisms thus far known for applying intermittent force, those acting by screws are the best. The degree of value of screws, however, depends upon the circumstances of the case. The principle upon which the mechanism is constructed also governs the value of its action.

One class is based upon the use of the screw in combination with a string or small wire,[1] but the philosophy of action is not equal to those that do not use strings or wire.

To explain by words or to illustrate by diagram all the possible modifications of such mechanisms that have strings or wire is unnecessary. A few illustrations with brief explanations will be sufficient to show the principle of all. The plan is simply to connect the tooth to be moved with the head of a screw by a string or wire, the screw in turn being connected with a nut or some distant tooth serving as anchorage. The anchor may be a plate, ferule, clamp-band, or a long-band.

The draught is caused by the screw drawing upon the string (or wire, if used) attached to the tooth to be moved. This is practicable even though the tooth be at considerable distance from the screw. The drag-screw may be on the same side of the dental arch or it may be on the side opposite to it. The string tied to the irregular tooth may be extended over adjacent teeth, or through a hole in an arm projecting from an anchor, or through a hole in a long-band. It is possible by this class of mechanisms to move teeth in the opposite direction from the direct line

[1] These mechanisms were published by the author in the "Dental Cosmos," Vol. XXI, pp. 207, 208, April, 1879.

of the screw. Even one tooth can be moved in one direction, and another in a different direction, by one string or wire.

Attachments for Plates, also for Clamp-bands, and Other Small Anchors that Require no Plates.—There are several kinds of small anchors for drag-screws, some of which require plates, and others no plates.

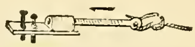


FIG. 974.—Rivet-nut for a plate (A).

Fig. 974 represents one form of detachable engine, and the plan of attaching it to a plate. It consists of a screw, and a nut soldered to a piece of sheet metal, through which are two holes for platinum-wire rivets to fasten it to a plate.

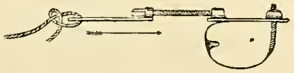


FIG. 975.—Swivel drag-screw in combination with a transverse screw clamp-band (A).

FIG. 976.—Swivel drag-screw in combination with a longitudinal screw clamp-band (A).

Figs. 975, 976 represent two forms of small mechanisms in which the draught-screw is a part. Both of these are anchored by clamp-bands, one having a transverse screw, the other longitudinal. The connection between the draught-string, or wire, and the screw is made by a form of swivel—a nut soldered to a strip of plate.

FIG. 977.—Swivel and Screw (A).

Fig. 977 represents a swivel that is superior to the others. By either kind, however, the draught can be made in nearly a direct line with the long axis of the screw.

This swivel (Fig. 977) is made up of three parts—a washer, a bow, and a hook.

If while turning a screw the swivel should tend to turn also, the latter act may be prevented by holding the nut with pincers while the screw is being turned. Fig. 419, on p. 438, Part VIII., shows the plan of construction of different forms of this swivel.

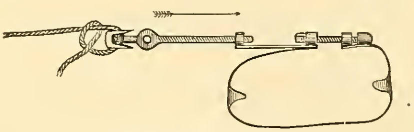


FIG. 978.—Barbed Drag-screw (A).

Fig. 978 represents a mechanism having a barb-hook on the screw for attaching to it a string or wire. This is used only in places where the passing of wire through a hole would be difficult.[1]

There are several forms of drag-screws that are attachable by hooks; some of these are for single anchorage teeth, but the better variety are for plates and long-bands that embrace more teeth.

FIGS. 979, 980.—Two single tooth-anchor mechanisms (A).

Figs. 979 and 980 represent plans of attaching drag-screws directly to anchorage teeth.[2]

Tissue-protecting Nut.—To prevent the end of a screw from irritating the tissue of the cheek, a thimble-nut on its free extremity may be used;[3] but if the screw is short-

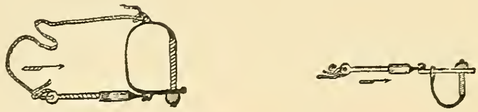
[1] Instead of a lever-key, the screw may be turned by a watch-key, if the nib of the screw be made square, as represented in Figs. 975 and 976.

[2] Published in the "Dental Cosmos," April, 1881.

[3] *Ibid.*

ened and the end filed smooth, the thimble-nut is not necessary.

Figs. 981 and 982 represent plans of anchoring by single tooth clamp-bands.



FIGS. 981, 982.—Plans of attaching screws to teeth by clamp-bands (A).

Figs. 983 and 984 represent other detachable drag-screws and nuts. Instead of soldering the nuts to ferules, clamp-bands, or long-bands, they are made to catch into holes in long-bands.

FIGS. 983, 984.—Detachable drag-screws for long-bands (A).

Improper Plan of Using Draught-cords.—Mention has been made that by a string an irregular tooth may be moved, even if it is situated at considerable distance from the screw. The distance, however, depends somewhat upon the kind of mechanism used. For illustration: if an attempt were made to draw forward an instanding upper central by having one extremity of the traction-wire extend from it, along the outside of the dental arch, to a drag-screw connected with a band on a molar on the right side of the mouth; and the other extremity of the wire extend along the labial surface of the opposite side of the arch to a screw connected with a band on a molar, the pressure of the wire, while drawing outwardly the instanding tooth, would cause the laterals, cuspids, and bicuspids to move inward, unless these adjacent teeth were very firm. Should the adjacent teeth move inward, the dental arch would be reduced in size, and therefore the front teeth would be so cramped that they would interfere, if not prevent the instanding central from having sufficient space to take its proper place in the arch. If, however, the draught-wire can be prevented from resting on the teeth adjacent to the one to be moved, by a long-band for the draught-wire to project through and rest outside of and slide upon, the dental arch would not be reduced in size.

Wire vs. Strings.—Platinum wire, where it is not to extend through holes, or around any angle so sharp that it will break, is superior to strings, because it does not stretch and is also less liable to slip out of place. To obviate breakage of the wire, however, all that is necessary is to solder transversely to the long-band, and close to the hole, a piece of wire (see Fig. 986) for the draught-wire to slide over.

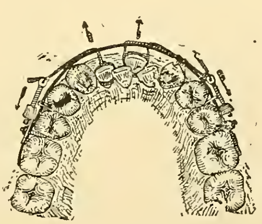


FIG. 985.—Drawing lower incisors forward by strings sliding on a long-band by drag-screws (A).

Fig. 985 illustrates the beginning of an operation by one of my old-style mechanisms, without this cross-wire. The anchor part of this mechanism (published by me in 1881[1]) consisted of a long-band anchored to the bicuspids by transverse screw clamp-bands. After the long-band was firmly secured on the teeth, a string was tied to the right outstanding central, and then the extremities were projected

[1] "Dental Cosmos," 1881.

through holes in the middle part of the long-band, and thence along the right side to a screw in a nut soldered to the buccal surface of the right extremity of the long-band. This string having been made taut upon the right central by the screw, another string was similarly tied to the left lateral, and then projected through other holes in the middle part of the long-band, thence along the left side of the dental arch, and tied to another drag-screw, in a nut soldered to the other extremity of the long-band. The strings being tied directly to the screw-heads was a fault in this mechanism, because in turning the screws the strings were twisted too much. The next operation here presented was free from these faults.

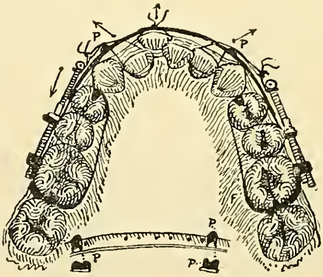


FIG. 986.—Moving forward instanding lower incisors by platinum wire in combination with swivel drag-screws and a long-band (A).

Fig. 986 illustrates the beginning of an operation for moving three instanding lower incisors outward to line by a similar mechanism, but superior to it in several points. It differs in that the anchors were longitudinal screw clamp-bands, instead of transverse, and that platinum wires were used instead of strings for connecting the teeth with the drag-screws. To prevent the wire from breaking by chafing through the holes in the long-band, a lump of gold solder (grooved) was placed on the border of some of the holes as indicated by P, P, P, P, in the figure.

To prevent the wire from slipping off the long-band bridge, as it is liable to do if it is narrow, it is sometimes necessary to have it play through small rings soldered to the outer surface of the long-band. In this case the grooved lumps of solder were sufficient. When rings are used, the long-band may be made of round German silver or gold wire.

There are cases in which more than one tooth can be simultaneously moved by one wire; as a rule, however, it is better practice to move only one tooth. When two wires are used, and they are anchored oppositely (as in this case), there is little or no danger of starting forward the anchor teeth. Both wires may be tightened at the same time, but it is better to tighten one at a time. When such a mechanism is properly made and firmly anchored upon the teeth, the management of it is easy. For further consideration of this subject, see chapters on Elongation of the Dental Arch, Part XVIII.

UPPER CUSPIDS.

SECTION C.....................DIVISION I.

CHAP. XCVIII.	Moving Upper Cuspids by	Strings and Rubber Rings in Combination with Metallic Anchor-bands.
XCIX.	" " "	Hook and Concentric Springs in Combination with Plates.
C.	" " "	Curved Springs without Plates.
CI.	" " "	Screws in Combination with Plates. Screw-jacks in Combination with Plates.
CII.	" " "	Hook-screws in Combination with Metallic Anchors. Screws, Draught-ribbons, and Wires with Clamp-bands.
CIII.	" " "	Screws in Combination with Short-bands and Bridges.
CIV.	" " "	Clamp-bands with Splices and Elastic Rubber.
CV.	" " "	Screw-jacks aided by Elastic Rubber and Clamp-bands. Screw-jack with an Interdental Block Clamp-band.
CVI.	" " "	Sliding Needles.
CVII.	Moving Upper Cuspids: case in which a partial set of artificial teeth plays a part.	

PARTLY ERUPTED AND INCLINED TEETH.

SECTION C.....................DIVISION II.

CHAP. CVIII. Correction of Inclined and Partly Erupted Upper Cuspids by Spur-plates, and by Screw-acting Mechanisms.

CHAPTER XCVIII.

SECTION C .... DIVISION I.

MOVING UPPER CUSPID TEETH BY STRINGS AND BY ELASTIC-RUBBER RINGS IN COMBINATION WITH METALLIC ANCHOR-BANDS.

GENERAL REMARKS.—OPERATION BY STRINGS IN COMBINATION WITH GOLD CAPS.—OPERATION BY ELASTIC-RUBBER RINGS IN COMBINATION WITH FERULES HAVING KNOBS AND HOOKS.

IRREGULARITIES of the upper cuspids are found so much more frequently than those of the lower that the latter seem few in comparison. Generally the correction of these (upper cuspids) improves the facial expression more than does that of the lower. Still it is sometimes necessary to correct lower cuspids, not only to gain proper facial expression, but to prevent irregularities that would be liable to occur in adjacent teeth by their pressure upon them.

These teeth generally appear through the gums at an age between eight and twelve years. In the upper jaw their position and their relation to the lateral incisors and first bicuspids are such that they often erupt in the anterior position. Indeed, they are often found so far outside of the esthetic line that some parents regard them as supernumeraries, call them "tusks," and apply to the dentist for their extraction. In sections of the world where races are greatly mixed, outside eruption of the upper cuspids is so general that an ignorant person might regard the deformity as normal to the race.

As every dentist well knows, the simple fact that a cuspid erupts outside the arch need not cause alarm, as no harm will result if, soon after eruption, sufficient space be made in the dental arch for it. The first bicuspid in the upper jaw generally appears through the gum before the cuspid does, and if there is sufficient space for the cuspid it is seldom necessary to resort to mechanical aids to force it home. But when there is not sufficient space, the aid of mechanical auxiliaries becomes requisite, and even the extraction of a bicuspid may be necessary to insure success.

There are some cases in which the upper cuspids by erupting in the anterior position crowd upon the roots of the laterals, and either force them inward, or to overlap the centrals. When the anterior part of the arch is already sufficiently prominent, and it does not require widening, the jumbled arrangement of the teeth can generally be best aided (the necessary space made) by extracting some tooth (on one or on both sides of the arch) posterior to the cuspid.[1]

Whether one or two teeth should be extracted depends upon the extent of the overlapping, and also upon the relation of the centrals to the medial line of the jaw. This is true whether the overlapping of the teeth occurs on one or both sides of this line.

The question as to *which tooth should be extracted* having been discussed at length in Part XIV.,[1] we shall confine ourselves to the different kinds of operations and the

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[1] See Part XIV., on Extraction, p. 657.

mechanisms used in such operations. (Refer through Index to Swaying of Teeth.)

It generally requires greater force to move cuspids than it does to move any of the other anterior teeth. Their long and sometimes flat-sided roots and the unfavorable shape of the crowns (often insufficiently erupted for the regulating mechanism to hold upon them) require at times considerable skill. Cases, however, that cannot be corrected by *any* means are seldom found.

Occasionally strings are used for moving cuspids, but not so frequently as in the first half of the nineteenth century. Instead of strings, elastic-rubber rings, wire springs, and screws are now used, but a few words about strings may be useful. C. A. Harris, in his early work, explains, as follows, a plan for using them in combination with caps: "A gold plate of the ordinary thickness is swaged up over the first and second molars, if the latter have made their appearance, and if not, over the second bicuspid and first

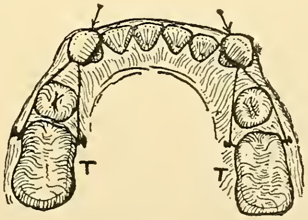

FIG. 987.—Old plan of moving lower cuspids backward by strings anchored to Desirabode caps (Harris).

molar, on each side of the jaw, so as to completely encase these teeth. [See T, T, Fig. 987.] If these caps, on applying them to the teeth, should not be sufficiently thick to prevent the front teeth from coming together, a piece of gold plate should be soldered on that part of each which covers the grinding surfaces of the teeth; and having proceeded thus far, a small gold *knob* should be *soldered* on each side of *each cap*, to each of which [knob] a ligature of silk should be attached. These ligatures should now be brought forward and tied tightly around the cuspidati. When thus adjusted, the mouth will present the appearance exhibited in the above figure."[1]

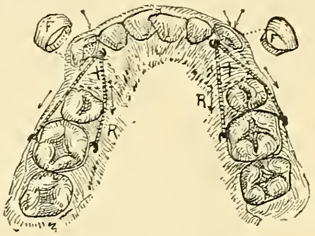

FIG. 988.—Moving outstanding cuspids to line by rubber rings in combination with Harris ferules.

Fig. 988 illustrates the beginning of an operation for moving to line two outstanding upper cuspids, after having extracted the first bicuspids to make room for the former. The means used on each side of the dental arch consisted of two rubber rings in combination with four platinum Harris ferules, all of which had one or two hooks. On each side of the dental arch a ferule was cemented upon the first molar, and another upon the cuspid, after which a rubber ring was caught on the hook on the buccal side of the molar-ferule, and stretched over the cuspid hook, thence caught upon the lingual molar hook.[2]

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[1] Regarding the subsequent steps of the operation by this plan, Dr. Harris says: "By this means the cuspidati may, in fifteen or twenty days, be taken back to the bicuspids; but if, in their progress, they are not carried toward the inner part of the alveolar ridge, the outer ligatures may be left off after a few days, and the inner ones only employed to complete the remainder of the operation."

[2] *Harris vs. Magill.*—The first to solder knobs on ferules for the purpose of attachment of strings or elastic-rubber rings has recently by one writer been

Fig. 989 represents an anchor-band that is sometimes serviceable. This consists of a gum-guard ring having a

FIG. 989.—Gum-guard Anchor-band (A).

piece of wire, B, soldered to one side to rest on the adjacent teeth.

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erroneously credited to be Dr. Magill, and he calls it the "Magill band." Harris describes exactly the same thing in his work published in 1839 and again in 1850. As this band was invented more than forty years before Dr. Magill used it, and as Magill does not claim it as his invention, and distinctly declares he never has, it is wrong to place him in the light of a claimant of that which every well-read dentist knows belongs to another.

CHAPTER XCIX.

MOVING UPPER CUSPID TEETH BY HOOKS, ARMS, AND CONCENTRIC SPRINGS, IN COMBINATION WITH PLATES.

OPERATION FOR MOVING A CUSPID BY A HOOK-SPRING ANCHORED TO A ROOF-PLATE.—A MODIFICATION OF THE SAME MECHANISM.—SPRING IN COMBINATION WITH A CLAMP-BAND ANCHOR-PLATE.—MOVING A TOOTH BY A CONCENTRIC SPRING ANCHORED INTO A ROOF-PLATE.

THE mechanisms for moving upper cuspids by springs are generally made similar to those for moving other teeth by springs, the difference being in the variation of the positions and the forms necessary to the cases in hand. Springs for moving cuspids are anchored by plates, ferules, clamp-bands, and sometimes by wire cribs. The latter, though sometimes practicable, are not, however, regarded with much favor, because they are generally rickety and troublesome.

Fig. 990 illustrates the beginning of the first stage of an operation for moving posteriorly, by a hook-shape spring, a left upper cuspid and first bicuspid, to make space for placing on line an instanding lateral. The second bicuspid (instanding) had previously been extracted to make way. One extremity of the spring s was vulcanized into a hard-rubber roof-plate. (The hook-spring is here represented as drawing upon the cuspid before the bicuspid had been moved from it. In practice, however, the latter was moved first.) The plate P was held firmly in place by two clamp-bands, B, B, around the right bicuspid and left first molar.

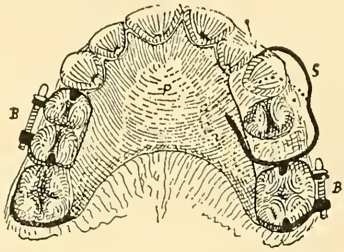

FIG. 990.—Moving a cuspid and first bicuspid posteriorly by a hook-spring and a plate. First stage (A).

First Stage.—Having screwed the clamp-bands tightly around these side teeth, the free extremity of the spring was drawn forward and caught upon the bicuspid (indicated by a dotted line). After the tooth had been drawn into the socket of the extracted tooth the spring was applied to the cuspid, as shown in the figure.

The principal object in having the plate large was to support the left molar as anchorage, which otherwise would have moved forward when drawn upon by the spring. By having the plate of a size and shape to bear upon all the teeth except those to be moved, and also upon the alveolar ridge, the anchorage resistance was considerably increased.

Second Stage.—After this cuspid and bicuspid had been moved sufficiently to liberate the instanding lateral, they were held in place by a wire finger projecting from a hole in the plate (not shown in the figure). The spring was then bent nearly straight, to extend farther forward and alongside, but not in contact with, the instanding lateral.

To the extremity of this spring the instanding tooth was tied by a linen thread, as shown in Fig. 991.

Excepting the clamp-bands for anchors, this mechanism is not original with me, nor is it new to the profession.[1]

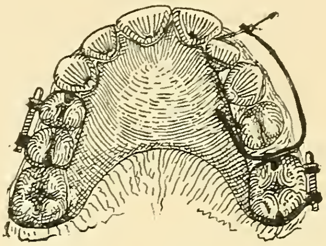

FIG. 991.—Moving outward and turning the lateral by the same wire spring. Second stage (A).

Fig. 992 represents a mechanism constructed for moving an instanding upper right cuspid outward to line. The force was given to the tooth by a steel-wire spring, S, in combination with a hard-rubber plate, P. To hold the spring in place, its posterior extremity was bent at right angles and projected through a hole in the plate; it was

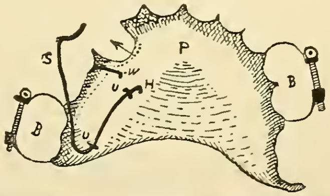

FIG. 992.—Mechanism for moving the right upper cuspid outward (A).

further supported by staples, U, U. When the mechanism was applied the spring was in the position of the dotted line, and held there by a staple, W, made sufficiently broad to permit the spring to play one-fourth of an inch toward the cuspid. This staple was necessary, also, to confine the

[1] Similar wire arms on plates are represented in B, Fig. 95, Part VI., p. 222, and in Fig. 402, Part VIII., p. 431.

spring sufficiently close to the plate to hold its bearings upon the tooth at a point close to the gum, and not slide off. These staples were of platinum wire.

Fig. 993 illustrates an early stage of an operation for making room for an outstanding left upper cuspid. It

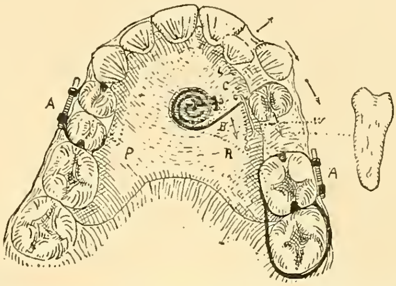

FIG. 993.—Moving a bicuspid by a concentric-coil spring, preparatory to moving an instanding incisor to line (A).

consisted in moving the first bicuspid posteriorly, after having extracted the second bicuspid.

The mechanism was a concentric spring, B, made of spectacle-bow wire, anchored to a hard-rubber plate, P, which was attached to the side teeth by two gold clamp-bands, A, A. To the left clamp-band was soldered a platinum-wire loop (represented in black), that extended around the second molar; this loop aided in holding the plate firm. The spring was fixed to the plate by one end being bent at right angles and lodged in a hole through the plate, and by two platinum-wire staples of different sizes. The shorter arm of the spring was confined close to the plate by the smaller staple, and the longer arm by the larger, which was one-fourth of an inch in breadth; the spring was also kept from slipping off the tooth by this larger staple. When the plate was first applied, and before the spring was put into use, the long arm was in the position indicated by the dotted line R.

After the spring had moved the bicuspid sufficiently, the tooth was retained in place by a wire pin set in a hole in the edge of the plate at a point near the dotted line W. After this the arm B of the spring was sprung forward so as to bear upon the cuspid. (See dotted line C.)

Later the lateral incisor was forced outward by a straight wire projected diagonally through the wide staple, and held in place by the posterior extremity being bent at right angles and lodged in a hole (see L) in the plate.

FIG. 994.—A similar spring (A).

Fig. 994 represents a concentric spring similar to the one used in this case.

To lessen the inconvenience of the mechanism to the minimum, the coil of the spring was sunk into a circular depression in the plate. This depression was then filled flush with beeswax. Either beeswax or paraffine is superior to harder wax, because these do not materially interfere with the action of the spring.[1]

[1] This concentric coil was stationary. For rotating concentric coils by ratchet actions, refer to Ratchet in the Index.

CHAPTER C.

MOVING UPPER CUSPIDS BY CURVED SPRINGS AND BY SCREWS, WITHOUT PLATES.

OPERATION BY A HOOK-SPRING IN COMBINATION WITH A CLAMP-BAND.—TWO SPRINGS ANCHORED BY A CLAMP-BAND.—OPERATION BY A SCREW-JACK ANCHORED BY FERULES.—BY TWO CURVED SPRINGS ANCHORED TO A TRANSPALATINE SCREW-JACK FASTENED TO THE SIDE TEETH BY CLAMP-BANDS.—ABOUT PITS IN TEETH.

SKELETON mechanisms having wire springs for moving cuspids are similar to those for moving incisors; but the springs, as well as the anchors holding them, are sometimes required to be stronger, because of the length of the cuspid-roots. Though these operations (by springs) may be slow and somewhat tedious, persistent effort will generally be followed by success.

Springs for moving teeth that have crowns as tapering as the cuspids should be of the form of, and so connected with anchors that they will bear steadily upon the teeth, and not slip off. There are two ways of accomplishing this end: one is by resting the end of the spring in a small pit made in the cuspid; the other is by resting it in a pit in a broad ferule cemented on the tooth. When the crown of a cuspid is not sufficiently erupted to firmly retain a ferule, a pit in a tooth may be the only alternative. If a ferule be made broad on the labial side and narrow on the lingual, covering entirely the exposed part of the tooth, it will generally hold sufficiently for such purposes.

Fig. 995 illustrates an early stage of an operation for moving posteriorly a right upper cuspid that had pointed diagonally forward through the gum, over the lateral incisor. The first step in the process was to make room for the cuspid by extracting the first bicuspid.

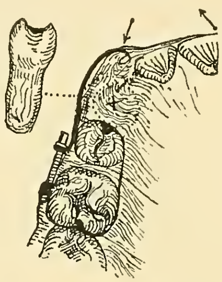

FIG. 995.—Moving a cuspid by a hook-spring in combination with a clamp-band (A).

The mechanism used consisted of a stiff gold-wire spring of hook shape, soldered to the anterior part of a gold clamp-band on the second bicuspid and first molar for anchorage. After this band had been fixed upon the teeth the sharp-pointed extremity of the hook was brought forward and caught in a pit made in the prominent part of the anterior side of the crown of the cuspid. As the tooth had only pointed through the gum, it was necessary to first slightly dissect the gum to make way for the entrance of the drill. In such cases it is important that both the pit and the spring should be so formed that the latter cannot slip from the tooth and injure the gums.[1]

To maintain sufficient force on the tooth, after the spring had moved it a short distance the mechanism was removed once every week, and the spring rebent, so as to make it

[1] The pit was filled with gold after the tooth had been corrected.

shorter. As the space made by the extraction of the bicuspid was wider than was necessary for the cuspid, the second bicuspid and first molar were moved forward a short distance. This was accomplished at the same time and by the same mechanism that was used for moving the cuspid.

Fig. 996 represents an edge view of one of a set (two) of spring-acting mechanisms for drawing stubborn cuspids posteriorly. It consists of two wire springs, S, S, soldered

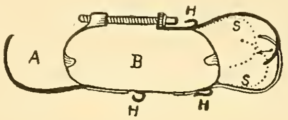

FIG. 996.—Mechanism with duplicate springs for moving a cuspid (A).

to the anterior part of a clamp-band, B. It also has soldered to its posterior end a stiff clasp-hook, A, to aid the anchorage. This mechanism (which is for the left upper side of the arch) is applied to the teeth by a clamp-band embracing the second bicuspid and first molar. The clasp A hooks around the second molar. This hook is only necessary, however, when the posterior molar is too short to be embraced by the clamp-band.

The figure illustrates the appearance of the springs when drawn forward from their places of rest (here indicated by dotted lines). The small hooks H, H, soldered to the band, are for attachment of elastic-rubber rings, whenever they are necessary for turning the cuspid, or for drawing upon the incisors in the later stages of the operation.

Fig. 997 illustrates the first stage of an operation for drawing the first bicuspid into the place of an extracted second bicuspid, to make space for moving an outstanding left upper cuspid to line. The mechanism used consisted of a clamp-band and two round-wire springs made of hard gold. The latter were made of spectacle-bow wire.

The operation was in two stages. The bicuspid was drawn back by the clamp-band before the springs were

FIG. 997.—Moving an outstanding cuspid to line by clamp-band springs (A).[1]

soldered to it. The movement of the cuspid (second stage) was caused by the labial spring bearing upon it, and, at the same time, the lingual one drawing upon it; this inner spring was tied to a staple on the cuspid ferule.

It is sometimes practicable to move the cuspid and first bicuspid at the same time by a complicated mechanism. I seldom attempt it, however, because it is safer to work in stages, first drawing into place the teeth that are within the clamp-band, and afterward moving the cuspid to the bicuspid. The construction of the mechanism is shown so plainly in the figure that it is unnecessary to say more than that to prevent loss of the elasticity in the springs by overheating, they were connected with the band by soft solder.

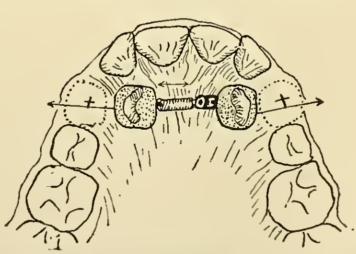

FIG. 998.—Moving outward instanding upper cuspids by a screw.

Fig. 998 illustrates a part of a larger operation, showing the plan of one of the simplest operations for moving two

[1] Engraved February 5, 1887.

instanding upper cuspids to line by a screw. The laterals were drawn back to line by an elastic-rubber ring caught around the cuspid-ferules.

Fig. 999 represents the mechanism; it consisted of a swivel screw-jack and two ferules.

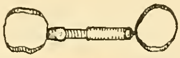

Fig. 999.—The Mechanism (A).

The first step in the operation was the extraction of the first bicuspids; the next was to cement (with phosphate of zinc while in a sticky condition) a broad gold ferule upon each cuspid; the third and last step was to connect these ferules by the screw-jack, by hooking its ends into rings soldered to the lingual surface of the ferule as shown.

This mechanism is practicable only when the crowns of the cuspids are sufficiently erupted to retain the ferules so firmly that they will not loosen when the force of the jack is applied. It, however, requires only two-thirds exposure of the crown to be sufficient; if the ferules are made as broad in all their parts as are the exposed parts of the crowns, and are filled flush with cement, they will not only be sufficiently firm, but in some cases they will constitute all the gag necessary to prevent the antagonizing teeth from interfering with the outward progress of the cupsids.

Fig. 1000 illustrates an operation for moving two instanding upper cuspids outward to line by two steel-wire springs, one end of each of which was anchored to a transpalatine screw-jack fastened with clamp-bands to the bicuspids; the other ends of the springs were placed in pits made in the teeth to be moved.

The springs were attached to the jack by having one end of each flattened, drilled, and then riveted between two gold ears soldered to the jack as shown in the figure. Before applying the springs to the teeth they were so bent that when sprung into the pits (in the cuspids) they forced the

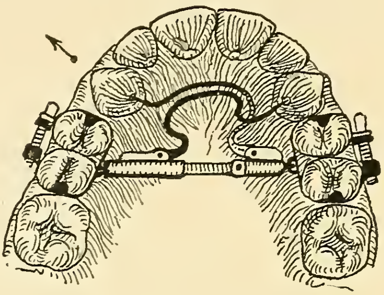

FIG. 1000.—Moving two upper cuspids outward by wire springs anchored to a transpalatine screw-jack (A).

teeth in the direction desired. To prevent the tongue from dislodging these springs, they were bent upward so as to somewhat conform to the palatine arch.

Pits.—Although artificial cavities were used in this case, I think they should never be made, unless other means of attaching mechanisms are impracticable. When cuspids are sufficiently long to retain cemented ferules, these should be used instead of pits. In fact, pits are rarely necessary.

CHAPTER CI.

MOVING UPPER CUSPIDS BY SCREWS IN COMBINATION WITH PLATES.

GENERAL REMARKS. — SCREW-JACKS IN COMBINATION WITH PLATES.—ESTHETIC OPERATION.—OPERATION BY A HOOK-SCREW IN COMBINATION WITH ROOF-PLATE.—BY TAIL SCREW-JACK WITH PLATE.—BY HOOK-SCREWS WITH A PLAIN PLATE. —BY HOOK-SCREWS WITH A BOX-PLATE.

FORMERLY the use of plates for anchors was nearly universal; even now they are in common use by many dentists. As the advantage of less inconvenient anchors becomes better understood, however, they gain favor. Still, large plates sometimes have their advantages, and in some cases are indispensable. Especially is this so where nearly the entire dental arch is necessary for anchorage.

Of all mechanisms for moving cuspids posteriorly, for patients of twelve years of age or older, there are none superior, if equal, to those that act by screws. Some of these mechanisms are somewhat complicated, but the majority of them are simple and easily managed. The principal object in preparing for operations for moving cuspids should be to obtain sufficiently firm anchorage. This generally is to be found in the teeth on the same side of the jaw in which the cuspid to be moved is situated. Occasionally, however, it is necessary to embrace teeth on the opposite side of the dental arch. When the teeth of one side (of the arch) are sufficient for anchorage, clamp-bands or ferules are generally all that is necessary. When they are not sufficient then it may become necessary to resort to plates that extend across the palate and bear upon or embrace (by auxiliaries) some of the teeth on the opposite side of the dental arch. We shall in this chapter consider only those cases in which the plates are used.

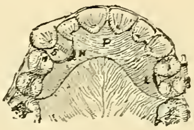

FIG. 1001.—Drawing an outstanding cuspid to line by a screw in combination with a roof-plate (A).

Fig. 1001 illustrates the beginning of an operation for drawing an outstanding upper right cuspid to its proper place by a screw anchored to a roof-plate.[1]

As the patient was a professional singer, it was important that the regulating mechanism should not disfigure the patient, nor alter the articulation or voice. This required something worn inside the dental arch that would not interfere with the tongue. The mechanism (made of gold) was thin and light, consisting of the following parts: a thin roof-plate, P, a detachable clamp-band, B, and a screw, S, having on one end a movable nut, W, and having soldered to the other end a narrow band or ferule to embrace the outstanding tooth.

This screw and ferule held in place the right side of the plate, while the left side was held by the detachable clamp-band. One end of the screw was fastened to the ferule on the cuspid; the other end projected through a hole in

[1] Devised in 1876.

the upright piece of plate soldered to the roof-plate, and was secured by a nut. To prevent the band or ferule from slipping off the cuspid, a pin-point soldered on its inner surface projected into a small pit made midway in the labial surface of the crown.[1]

To apply the mechanism the plate was first inserted; then the clamp-band was placed on the bicuspids, and, being pressed snugly against the plate, it was screwed tightly upon the teeth. The ferule (on the screw) was then placed on the outstanding cuspid, with the end of the screw passing through the hole in the upright piece or ridge on the plate, and then tightened in place by the nut.

To cleanse the mechanism, it was removed daily. In doing this, however, the clamp-band was not removed; such bands do not need to be removed often. After slight practice the patient (woman) was able to sing apparently as clearly as when without it.

This mechanism is somewhat expensive if made entirely of gold, but if it is properly and accurately fitted it is very quickly applied. It is more easily managed than if made of rubber.

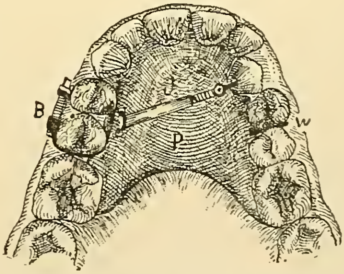

FIG. 1002.—Moving an instanding cuspid to line by a screw-jack in combination with a plate (A).

Fig. 1002 illustrates an operation for moving outward to line a left upper cuspid that had erupted in the posterior

[1] Such a pin-point is not necessary in all cases.

position. The mechanism consisted of a spindle-pointed tail screw-jack, J, in combination with a hard-rubber plate, P, having on one side an anchor-band, B, to embrace the right bicuspids, and on the other a platinum-wire anchor-pin, W, which projected through the V-shape space between the left bicuspids. The screw-jack was attached to the plate by the two extremities of a piece of platinum wire, soldered to the barrel, projected through holes in the plate, and then twisted together on the opposite side.[1]

The operation of this mechanism consisted in lengthening the screw-jack by turning the screw by a lever placed in a hole in the bulb.

This mechanism is extremely practicable, and the attachment of the screw-jack to the plate is easy. Another of its merits lies in the ease with which one jack can be exchanged for another if desired.

Hook-screws in Combination with Plates.—Under this head will be explained two operations by hook-screws in combination with plate-anchors, and in the following chapter will be explained mechanisms, acting uponsimilar principles of mechanics, without plates, but with small skeleton anchors.

Fig. 1003 illustrates an operation for correcting outstanding upper cuspids. The first step in the process was the extraction of the first right and second left bicuspids x, x. The second step (which is the one here illustrated) was the drawing back of the left first bicuspid into the space left by the one extracted for that purpose. The correction of the right cuspid was left to nature. The reason for taking the first bicuspid from one side of the arch and the second bicuspid from the other was because the spaces between the first bicuspids and the laterals differed.

[1] See rules for construction of tail-jacks in Part VIII., pp. 310–312.

The mechanism consisted of a hard-rubber roof-plate, having clamp-bands (to anchor it), and a hook-screw. The hook was made of stiff gold wire, and was drawn upon by a screw. The holes in the posterior nut N (on the left clamp-

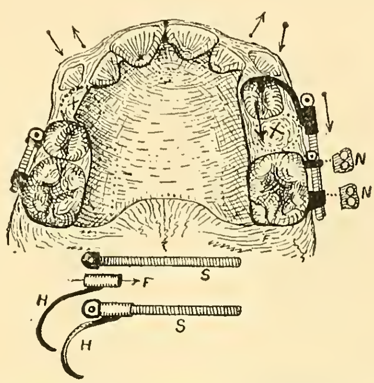

FIG. 1003.—Drawing back a bicuspid to make space for a cuspid (A).

band) were also screw-cut, but those in the anterior nut N were smooth. As the molar alone was not sufficiently firm anchorage, it was aided by the hard-rubber roof-plate, which covered the roof of the mouth and fitted several other teeth. The plate was held to the teeth by clamp-bands, one of which embraced one molar, the other the right second bicuspid and the molar.[1]

The construction of the hook H, and its relation to the draught-screw, is shown by H, S in the lower part of the figure. The hook is connected with the screw by a short piece of metallic tubing, F.

When applied to the teeth the screw is passed through the smooth-bore nut soldered to the anterior part of the molar clamp-band; thence into the screw-cut nut on the posterior part of it. The instanding laterals were advan-

[1] See a mechanism similar in principle represented in Part VI., Figs. 275 and 276, p. 324.

tageously moved forward a short distance by the roof-plate pressing against them, which pressure was caused by the action of the hook-screw S. The direction in which the several teeth were influenced to move, naturally and artificially, is indicated by arrows.

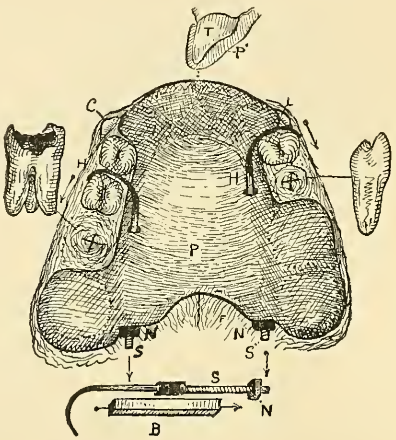

FIG. 1004.—Making room for outstanding cuspids by screw-hooks anchored to a box-plate (Wilson).

Fig. 1004 illustrates an operation by Dr. G. A. Wilson for the correction of outstanding upper cuspids. The figure represents the mechanism[1] when it was applied for moving back the upper first bicuspid and the right second bicuspid, after having first extracted the left second bicuspid and the right first molar (decayed), that room might be made for the outstanding cuspids C, L.

The mechanism consisted of a hard-rubber roof "box-plate," P, and two steel hooks, H, H, each having a nut and a square tube to slide in. The hooks, nuts, and tubes are represented separately in the lower part of the figure.

These hooks, H, H, were partly buried in the boxes, B, B,

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[1] Dr. Wilson devised this modification in June, 1888. (See Part VI., p. 324.)

the latter being imbedded in the substance of the hard-rubber plate; the hooks were operated by the loose nuts N, N playing on their screw-cut extremities. To prevent the hooks from turning when tightened, a part of each shaft was made rectangular and fitted to tubes B, of similar form.

In applying the mechanism the roof-plate was first forced upon the teeth (see sectional view of the anterior part, in the upper part of the figure), and then the hooks were adjusted to the teeth (bicuspids) to be moved, and the nuts tightened. When Dr. Wilson devised this mechanism he had no knowledge of the one last described. The novelty claimed, therefore, does not lie in the box-plate, nor in the hook as a hook, but in the form of the body of the hook S in combination with the square tubes B, the loose nut N, and the box-plate.

CHAPTER CII.

MOVING UPPER CUSPIDS WITH SCREWS AND DRAUGHT-CORDS, WITHOUT PLATES.

GENERAL REMARKS ON DRAUGHT-CORDS IN COMBINATION WITH SKELETON-ANCHORS.—DRAUGHT-RIBBONS AND DRAG-WIRES WITH CLAMP-BANDS AS ANCHORS, OPERATED BY SCREWS.—OPERATIONS BY CLAMP-BANDS ONLY.—BY A DRAG-SCREW AND DRAUGHT-RIBBON.—BY A DRAG-SCREW AND DRAUGHT-WIRE.—BY A SCREW AND TRANSPALATINE-WIRE.—BY A SCREW AND RIBBON, INSIDE DRAUGHT.—BY A SCREW AND RIBBON, OUTSIDE DRAUGHT.—BY A TRANSFERABLE SCREW AND DRAUGHT-WIRE.—BY A SCREW AND TWO HOOKS.—BY IMPROVISED AIDS TO A DISABLED MECHANISM.

IN some cases a cuspid can be moved posteriorly by a screw connecting it by a ferule with some molar tooth having also a ferule; but for the majority of cases there is, as yet, no mechanism more practicable, or equal to, the simple clamp-band; this is because of its direct power. Notwithstanding a clamp-band, embracing the tooth to be moved and the anchor teeth (as represented in Fig. 1005),

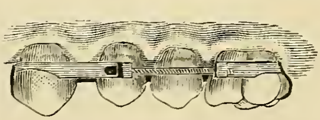

FIG. 1005.—Moving a cuspid by a clamp-band.

is best for a large majority of cases, there are others, requiring movement in a diagonal direction, that can be better corrected by additional aids, such as draught-wires or ribbons, and extra screws. There are several modifications of such aids, some superior to others, but all developed from very simple prototypes, intended for diagonal movements, inward or outward. When an outstanding cuspid requires to be moved inwardly as well as posteriorly, the draught is anchored to the lingual side of the dental arch, and when the tooth to be moved is instanding and requires to be moved outward as well as posteriorly, the draught is anchored to the buccal side of the arch.

The degree of force necessary to move a cuspid posteriorly depends somewhat upon the age of the patient, but more upon whether the tooth is required to plough its path all the way through alveolar tissue, or only through a septum between its socket and the socket of a bicuspid, soon after its occupant tooth has been extracted to make space for the cuspid. Sometimes such socket-openings in the path not only affect the relative position of the cuspid *en route* by turning it, but make it possible to move the tooth diagonally by force applied in a slightly different direction from the line of its course.

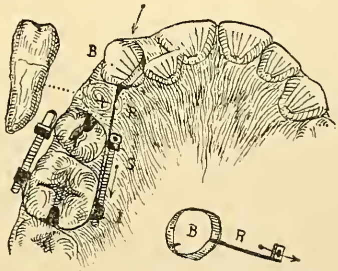

FIG. 1006.—Drawing an outstanding cuspid to line by a mechanism causing an inside draught (A).

Fig. 1006 illustrates an instance of this, in an operation for moving posteriorly an outstanding right upper cuspid to make room for an instanding lateral, for a patient fifteen years of age. The mechanism applied after having extracted the first bicuspid consisted of a gold cuspid-ferule, B, gold draught-ribbon, R, drag-screw, S, and an anchor clamp-band.

To prevent the cuspid-ferule from slipping off or upward and injuring the gum, a short, pointed piece of small gold wire (shown in detail in the lower part of the main figure) was soldered to the inside of the ferule B, to enter a small pit drilled in the labial side of the cuspid.[1]

In applying the mechanism the clamp-band was first fastened upon the upper right first bicuspid and first molar, after which the ferule was first so applied to the cuspid that the pin entered the pit in the tooth, and then the ferule was moved upward over and upon the crown, and pushed firmly upon its neck.[2] The screw S was then placed in the smooth-bore nut on the end of the ribbon R, and screwed into the nut soldered to the lingual side of the clamp-band as shown. The cuspid was moved into the place of the extracted tooth by tightening upon it twice a day throughout the operation by turning this

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[1] Sometimes such cuspids are sufficiently exposed to view to retain firmly a broad ferule by cement; or, if there should be a cavity caused by decay in the tooth to be moved (which is rarely found at this age), and it is favorably located, advantage may be taken of it for lodgment of the pin-point, instead of a new pit. Before using this cavity, however, it is well to first fill it with gutta-percha, to prevent advance of decay. If a new pit must be drilled in a tooth, let it be done carefully, yet boldly. It is unnecessary to fill such a pit with gold immediately after completion of the operation for correction of the outstanding tooth. It should, however, be filled temporarily with gutta-percha or cement. After the sensitiveness of the socket—caused by the regulating operation—has subsided it may be filled with gold.

[2] Whenever cuspids are only partly erupted, a cuspid-ring made of round platinum wire (without any pin being soldered inside) may be practicable; this wire will work up under the gum a short distance, and hold to the neck of the tooth. The ring should not, however, be permitted to plough beneath the union of gums and root-tissues. This can be prevented by a platinum loop soldered to the ring, to ride across the lingual plane of the cuspid.

screw. Such a mechanism is somewhat inconvenient to the tongue, but if it is smooth in all its parts the operation will be easy and success assured, with little annoyance.

Fig. 1007 illustrates an operation, though not by the best plan, for moving an outstanding left upper cuspid to line. The draught-cord was a transpalatine wire (plati-

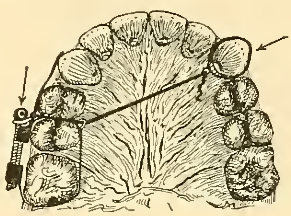

FIG. 1007.—Moving an outstanding cuspid by a drag-screw and platinum wire (A).

num). One end was attached to the cuspid by a narrow gold ferule, the other to a drag-screw, connected with the buccal side of a clamp-band on the teeth of the opposite side of the arch. To increase the anchorage a strip of thick gold plate about three-fourths of an inch in length was soldered to the buccal side of the clamp-band, so as to project forward and rest upon the right cuspid. Having placed the ferule upon the outstanding (left) cuspid, one extremity of the wire was tied into a staple on its lingual side, then carried diagonally across the dental arch, through a ring on the anterior part of the lingual side of the clamp-band, thence into a swivel (on the buccal side) that played on the neck of the drag-screw connecting it (the wire) with the posterior (double) nut of the anchor-band. This swivel consisted simply of a short piece of gold plate, bent at right angles, and having a hole in each extremity—one for attachment of the wire, the other for the screw.

This mechanism was successful, but there was the objection of inconvenience to the patient from wire across the mouth. The discomfort from a wire is far greater than from a smoothly made, transpalatine, cylindrical screw-jack, which, being of much larger size, is less irritating to the tongue.

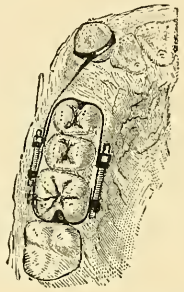

FIG. 1008.—Moving an outstanding cuspid by a mechanism causing an outside draught (A).

Fig. 1008 illustrates the beginning of an operation for drawing into the place of an extracted deciduous cuspid an outstanding right upper cuspid by a gold ribbon attached to the cuspid by a ferule, and drawn upon by a screw playing in a nut on the buccal side of a clamp-band that had its tightening-bolt on the lingual side of the dental arch. The object of having this binding-bolt on this side was to give the drag-screw and ribbon an unobstructed path in which to play.[1]

In this case, as in nearly all such operations, the patient was instructed to tighten the drag-screw at home as much as possible, short of causing actual pain, about 9 A.M. and 5 P.M. daily.

[1] In 1879 this form of clamp-band was published by the author in the "Dental Cosmos." About nine years later (1888) Dr. Patrick, not knowing the fact, brought out exactly the same kind of band, supposing it to have been first originated by himself.

Fig. 1009 illustrates the beginning of an operation for moving posteriorly, and then diagonally inward to line, an outstanding right upper cuspid. The first movement was by an outside draught, the second by an inside draught.

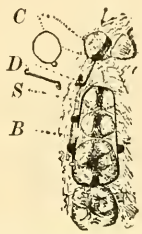

FIG. 1009.—Drawing an outstanding cuspid into line by round wire and a shifting-screw in combination with a clamp-band (A).

The mechanism (a modification of the one represented in the preceding figure) consisted of a clamp-band, B, wire ring, C, screw, S, and round platinum wire, D. In the first part of the operation one end of this wire was hooked into a staple soldered to the ring C on the cuspid; this was connected with the anchor B by the screw S, on the buccal side. After the cuspid had been drawn directly back, half-way to its proper place, the drag-screw S was transferred from the nut on the buccal side of the anchor-band to a nut on the lingual side, to change the direction of draught, so that the tooth would move diagonally and directly into its proper place in the line of the arch. The direction in which the cuspid was first moved was necessary to prevent it from interfering with the lateral incisor; the cheek on the medial side of the tooth was sufficiently prominent to prevent the ring from slipping off.

Operations by Improvised Mechanisms.—Sometimes mechanisms break down during the process of operations, and require immediate alteration, in order that the ground gained may not be lost. When the dentist has on hand "reserve forces" in the line of duplicate parts, there is no difficulty in mending a disabled machine; but when duplicates are not at hand, resort must be had to improvising something, even if it be only for temporary use. The two following cases are given more as a lesson in such emergencies than to show any special mechanical excellence.

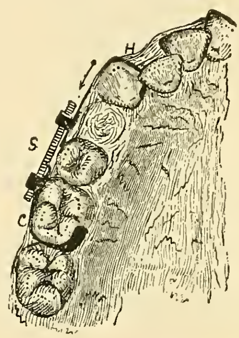

FIG. 1010.—Moving a cuspid by an improvised mechanism consisting of two hooks and a screw (A).

Fig. 1010 illustrates an operation performed by a mechanism improvised in 1872 for moving a right upper cuspid to make room for jumbled incisors. I do not regard this mechanism (made from scraps) as equal to some that I have since improvised to meet emergencies, but it served at this time to help overcome a set-back caused by breakage of a mechanism. This substitute consisted of two silver hooks, C, H, connected by a screw, S. The anchor (posterior) hook C, formed to clasp around the posterior part of the first molar, had soldered near its anterior buccal end a threaded nut for the screw that connected this anchor with the draught-hook H, caught on the cuspid. To operate the screw it was turned by a watch-key.[1]

[1] About fifteen years after this mechanism was invented, Dr. Patrick, not knowing of its previous existence, devised a similar one. This mechanism,

Fig. 1011 illustrates an early step in another operation for moving an outstanding upper cuspid into the place of a first bicuspid, extracted to make space for it and for an instanding lateral. This case is presented to show how a mechanism was altered from the broken original to meet the emergency.

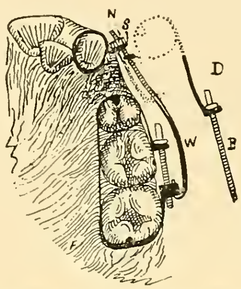

FIG. 1011.—Moving an upper cuspid by an improvised hook-screw mechanism (A).

The original mechanism consisted of a clamp-band, and a cuspid-ferule connected by a draught-wire and a screw. (See D, B, at the right of the main figure.) The accident took place in the screw, which drew out, leaving the clamp-band on the second bicuspid and two anterior molars.

The mechanism was disabled by the "ripping" of the threads of the screw, and those in the posterior nut of the clamp-band. The screw B was cast aside, and the parts of the ribbon and the cuspid-ferule represented by dotted lines were retained. A long hook, W, was then made from a piece of screw-cut wire, and caught into the posterior end of the disabled nut on the clamp-band, the other end being projected through a staple soldered to the cuspid-ferule, and then tightened upon by a loose nut, N (taken from the scrap-drawer).

devised in 1872, and several hundreds of others (mostly of gold) devised earlier and later, and described in this work, are still in the possession of the author.

To hold the ferule on the cuspid (quick-setting cement being then unknown in dentistry) a piece of platinum wire about the size of a small pin (soldered to the gum-margin of it, not shown in the figure) was twisted tightly around the neck of the tooth.

To prevent this side-draught from turning the cuspid, a part of the ribbon D was bent around the wire W as shown. (See dotted line.)[1]

Instead of the staple S for attachment of the wire W, a piece of tubing soldered to the ferule—after the plan by Dr. Talbot, and later used by Drs. Angle and Case—would have been more effective.[2]

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[1] A modification of this improvised mechanism, devised on the same principle, was published by the author in the "Dental Cosmos" in 1878.

[2] Probably Drs. Angle and Case did not know that Dr. Talbot had previously devised this combination of the tube and ferule when Dr. Angle laid claim to the originality of it. (See Part VII., p. 371.)

CHAPTER CIII.

MOVING UPPER CUSPIDS BY CLAMP-BANDS WITH SPLICES, SOMETIMES AIDED BY ELASTIC RUBBER.

OPERATION FOR CORRECTION OF A RIGHT CUSPID BY AN ANCHOR-BAND HAVING A VERY SHORT SCREW-JACK, AIDED BY A GOLD-RIBBON SPLICE, AND LATTERLY BY AN ELASTIC-RUBBER RING.—OPERATION BY A METALLIC RIBBON IN COMBINATION WITH A SWIVEL-SCREW AND CLAMP-BAND.—BY A SIDE-DRAUGHT RIBBON IN COMBINATION WITH A BAR CLAMP-BAND.—DRAUGHT-RIBBON VS. DRAUGHT-WIRE.

IN the preceding chapter operations by drag-screws and direct draught-ribbons, and wires anchored by clamp-bands were explained. In the present chapter operations by indirect draught-ribbons anchored by clamp-bands will be explained. The difference between these two classes of draught-cords is considerable: in the former they are nearly direct, straight from the tooth to be moved to the drag-screw; while in the latter the draught-cords are bent U-shape, both arms drawing upon the tooth, one arm being connected with one side of the clamp-band, the other by a screw with the other side—a sliding draught-cord.

Fig. 1012 represents the second stage of an operation, and the mechanism used, for moving a right upper cuspid to make room for an overlapping lateral, and moving the latter to line. As the casts of this case (performed many years ago) are lost, and only brief notes and sketches remain, little more than a description of the mechanism used, and its appearance at the second stage of the operation, will be attempted.

The right upper first bicuspid was missing, the cuspid continuing to bear against the lateral, and standing in the

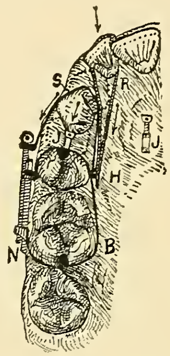

FIG. 1012.—Moving a cuspid to make room for and correct an overlapping lateral by a clamp-band, splice, and rubber ring (A).

position indicated by the dotted line. The plan of the operation was to draw the cuspid posteriorly sufficiently to make ample space for the overlapping lateral, and then to hold it there while the lateral was being drawn into its proper place.

The mechanism consisted of a gold clamp-band, B, having a very short screw-jack, J, soldered to the anterior part; a gold-ribbon splice, S, and one elastic-rubber ring, R. The plan of the operation was to apply the clamp-band so as to embrace the second bicuspid and first molar, and then draw, posteriorly, the cuspid by the splice and then leave them on these teeth to serve as an anchor to the rubber. To apply the remainder of the mechanism, one end of the splice S was caught upon a hook, H, on the lingual side of the anchor-band, and the other end, by a screw, N, upon the buccal side, leaving the loop on the tooth to be moved. When the cuspid had been drawn sufficiently away to make a space slightly wider than was required for the lateral, it was prevented from moving farther back by the interposition of the little screw-jack J, soldered to the anterior part of the anchor-band before the splice S was added. The cuspid being held in its proper place, the lateral was now drawn into line by the rubber ring R, caught upon the lingual hook H on the anchor-band, and stretched forward and caught upon the tooth (lateral) as represented in the figure.

Fig. 1013 illustrates an operation for moving a cuspid to make space for an outstanding right upper lateral

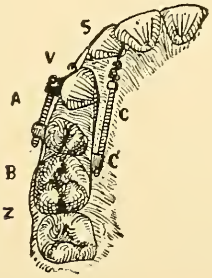

FIG. 1013.—Moving a cuspid and lateral by a clamp-band and splice-ribbon.[1]

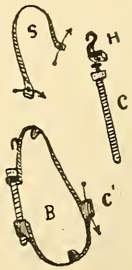

FIG. 1014.—The different parts of the mechanism (A).

(subsequently corrected). The mechanism, Fig. 1014, consisted of a clamp-band, B, gold ribbon, S, and a swivel-screw, C. The cuspid was drawn posteriorly by the clamp-band B, that embraced it and the second bicuspid and first molar. At the close of this step the ribbon was caught upon the hook on the labial side of the clamp-band, and then, being drawn over the lateral, it was connected with the lingual side of the band by a swivel-screw, C. The

[1] Published in the "Dental Cosmos," March, 1878.

clamp-band and splice were, subsequently, temporarily left on the teeth as a retainer, after which they were substituted by another, made as shown in Fig. 1015.

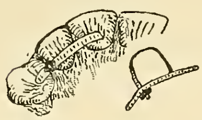

FIG. 1015.—The Second Retainer (A).

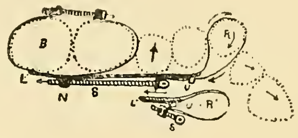

FIG. 1016.—Plan of drawing an outstanding cuspid and an instanding bicuspid to line by a gold screw, lever, and a ribbon (A).

Fig. 1016 represents a mechanism for simultaneously moving to line an outstanding right upper cuspid and an instanding right second bicuspid, in a case having an interdental space between the centrals. The mechanism consisted of a gold clamp-band, B, having an arm, L, a gold ribbon, R, and a gold screw, S. The ribbon R, with a smooth-bore nut on one end, and a part of the screw S and arm L, are duplicated in the lower part of the figure.

To the lingual side of the band was loosely riveted one end of the arm L, which consisted of a narrow strip of stiff plate. To the other end of the arm was soldered one end of the gold ribbon R, which was of sufficient length to extend around the outstanding cuspid, thence through the staple U (on the lingual side of the arm), and connect with the screw in the smooth-bore nut soldered at right angles to the ribbon. This screw connected with the anchor-band by another nut, N (threaded), soldered to its lingual side.

To operate the mechanism, the screw S is advanced through the nut N, thus drawing upon the ribbon R (the latter sliding through the staple U), causing the cuspid to move in between the lateral and first bicuspid. By this draught upon the cuspid, is guided lingually the strip of plate L which bears upon the instanding second bicuspid, causing it at the same time to gradually move outward.

When a cuspid is so short that a gold ribbon will not hold upon it, resort may be had to the use of platinum wire in place of the ribbon.[1] Wire will work up above the cheek of the crown and rest securely upon the neck of the tooth.[2] If the wire is smooth the tissue will generally tolerate it without causing much, if any, irritation; but of course the wire should never be allowed to plough deeper under the gum than the natural trough caused by the lip or the margins around the tooth.[3] Should the wire irritate the gum sufficiently to cause pain, a gum-guard ring placed upon the cuspid will prevent it.[4]

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[1] Size, 2½ gold-plate gauge.
[2] See Fig. 118, Part VI., p. 237.
[3] See Part VI., p. 243, and Part VIII., p. 431.
[4] See Fig. 403, Part VIII., p. 431.

CHAPTER CIV.

MOVING UPPER CUSPIDS BY SCREWS IN COMBINATION WITH BRIDGE-PIECES.

BRIDGE MECHANISMS ANCHORED BY WIRES.—BRIDGE MECHANISMS ANCHORED BY FERULES.—MOVING A CUSPID AND TURNING A BICUSPID AT THE SAME TIME BY A BRIDGE MECHANISM.—MOVING INSTANDING CUSPIDS BY BRIDGES ANCHORED BY CLAMP-BANDS.—THE TRANSVERSE SCREW CLAMP-BAND ANCHOR VS. THE LONGITUDINAL SCREW CLAMP-BAND ANCHOR.

IN the two preceding chapters operations upon cuspids by the use of draught-cords acted upon by screws were explained. In the present chapter operations upon cuspids by screws acting from span-bridges will be considered. In Chapter CI. is represented and explained a mechanism for moving to line an outstanding upper cuspid by a screw one end of which was fastened to the tooth to be moved by a narrow ferule, the other end being connected with a roof-plate serving as an anchor. The plans for correction of similar cases by screw-acting bridge mechanisms make no use of roof-plates. The bridge used in these operations consists of a strip of plate or round wire bent to conform (nearly) with the curve of the dental arch, and spanning the space in the line made by the offstanding tooth. In some cases the bridge is anchored to the teeth by platinum wire or strings; in others by ferules or by clamp-bands, which are far superior to either wire or string, which I have now entirely abandoned in such operations.

Fig. 1017 represents one of my older and simple mechanisms for drawing an instanding upper cuspid to line, and at the same time forcing the adjacent teeth farther apart. The instanding tooth is caused to act like a wedge between the others by a screw and nut.

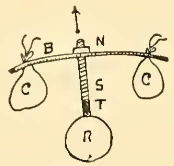


FIG. 1017.—A simple form of bridge mechanism for moving a cuspid (A).

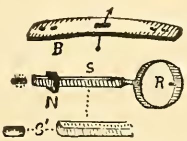
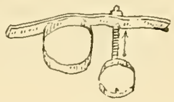


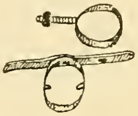
FIG. 1018.—The parts separated. Enlarged scale (A).

Fig. 1018 represents the heavier parts as they appear separated. These consist of a bridge, B (a short, narrow strip of thick plate), a screw, S, with a nut, N, a ferule, R, and two pieces of platinum wire, C, C. Through the bridge is a rectangular hole for the screw S, that has two of its sides filed flat, S, to prevent the screw from turning when the nut N is operated; the object of the ferule R is to fasten the tooth (instanding cuspid) to the screw. To permit the screw on the ferule a slight play, it is connected by interposing between the two a thin piece of gold ribbon, cut from rolled wire (as shown in Fig. 1018).[1] The ends of the bridge are confined to the teeth adjacent to the instanding tooth by the platinum wires; the only weakness about this mechanism is these wires. Instead of wire I now use a broad ferule, soldered to one end of the bridge-piece; this ferule is cemented to one of the

[1] The principle of this combination of the screw and ring was published by the author in two numbers of the "Dental Cosmos" in 1878.

anchorage teeth (generally a bicuspid), leaving the other end of the bridge to rest freely on the tooth or teeth on the other side of the space. (See next figure.)





FIGS. 1019, 1020.—Two similar bridge mechanisms anchored by ferules (A).

Figs. 1019 and 1020 represent two mechanisms, similar but superior to the one last described. These differ only in the bridge-piece, which is anchored by broad ferules (gold) instead of wire. These modifications are superior because ferules, when cemented on the anchorage teeth, furnish firmer anchorage.

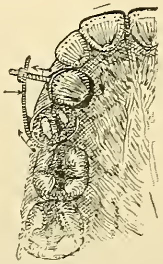


FIG. 1021.—Moving an instanding cuspid and turning a bicuspid at the same time by one screw (A).

Fig. 1021 illustrates the beginning of an operation for moving outward an instanding right upper cuspid, and at the same time turning the first bicuspid, by one and the same screw. This double operation, however, is practicable only in rare combination of circumstances. When everything is not favorable, the process has no advantage over that of moving each tooth independently; the case is given simply to show what has been done. The mechanism (similar in principle to the one last described) consists of two parts: a gold screw, having a narrow ferule soldered to one end to embrace the cuspid: and an arm projecting from a band having a deep notch in the upper border, into which the screw is lodged; a nut plays on the screw.[1]

When all is ready to apply, the broad band is first cemented upon the lone bicuspid, with the arm projecting forward and outward, so that when drawn upon by the screw and nut it will act as a lever. The cuspid-ferule is then placed on the cuspid and pushed well up to the gum, the screw at the same time being dropped into the notch in the arm. To prevent the narrow ferule from slipping off the tooth (cuspid), a pin-point is soldered to the inside of it, to rest in a shallow pit made in the lingual side of that tooth. To prevent the end of the screw from irritating the lips, a globular nut is screwed upon it. The mechanism is operated by turning the nut against the lever sufficiently to spring it slightly toward the cuspid, thereby causing force upon both teeth; the tightening of the nut is repeated daily until the cuspid is drawn into line.

As the bicuspid had not fully turned when the cuspid had reached its place, the screw and the cuspid-ferule were taken away, leaving only the broad bicuspid-band and the lever; the operation was carried on by other aids. A roof-plate, having anchor clamp-bands to fasten it to the side teeth, was applied now, to serve as an anchor to an elastic-rubber ring stretched double from a hook on it to the notch in the lever. The rubber was renewed on alternate days and the bicuspid turned into its proper position.

Fig. 1022 illustrates an operation for moving outward an

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[1] The two ferules were made of No. 34 plate (pure gold).

instanding right upper cuspid, and at the same time moving inward an outstanding lateral.

This mechanism—the first of its kind, and devised in 1876—consists of a clamp-band, a bridge-piece, and a drag-screw. This bridge, which is made of a strip of thick gold

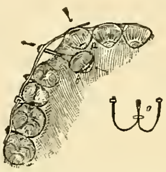

FIG. 1022.—Moving an instanding cuspid to line by a bridge mechanism (A).[1]

plate, is anchored at one end to the side teeth by a transverse screw clamp-band, the bridge-strip projecting forward over the space between the bicuspid and lateral; thus supported, it constitutes a span, or a subanchor for holding one end of the screw that draws upon the cuspid. One end of this screw is connected with a narrow ferule that embraces this instanding tooth; the other end of the screw projects through a hole in the bridge, and is held there by a nut, upon its labial side. To enable the screw to have some latitude of action, it is not soldered directly to the cuspid-ferule, but is connected by a thin piece of gold ribbon (the parts are soldered together). In applying the mechanism the bridge is first fastened on the right second bicuspid and first molar, after which the cuspid screw-ferule is caught on the tooth (cuspid), and then, having sprung outward the bridge-strip, the end of the screw is made to enter the hole in it. The nut is then placed on the screw and tightened upon the bridge.

The mechanism is operated by simply turning this nut

[1] Published by the author in the "Dental Cosmos" in 1878.

with a key; this draws the screw through the bridge, and therefore draws upon the cuspid. At the same time the free extremity of the bridge is forced against the outstanding lateral, and moves it in a direction opposite to that of the cuspid.

Although the lateral did not receive so great a degree of force as the cuspid did, it moved more easily, and reached its proper place in the arch before the cuspid had reached its place. When the lateral had been moved sufficiently, further pressure upon it was prevented by the anterior extremity of the bridge-strip resting on the right central.

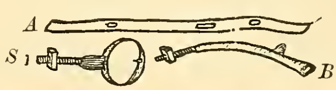

FIG. 1023.—Modification of the mechanism last described (A).

Fig. 1023 represents the different parts of a modification of the mechanism last described. A shows the form of the bridge-piece, with its three oval holes—two at the right for the clamp-ribbon B, and the other for the cuspid-ferule and screw S. For union of all parts ready to apply, see Fig. 289, Part VI., p. 334.

To prevent the cuspid-ferule from slipping off the cuspid, a pin-point is soldered to the inside of it, to rest in a small pit made in the tooth as mentioned in previous pages. To prevent the screw from turning in the hole in

FIG. 1024.—Cuspid-screw and ferule.

the bridge while being tightened upon by its nut, it (the screw) is filed on two opposite sides, to make it correspond with the smaller oval hole. (Fig. 1018.) To permit deviation of the screw to meet the needs incident to the changes in the inclination of the cuspid while moving it, the ferule-end of the screw is hammered thin, as shown in Fig. 1024.

The only defect in this mechanism is the anchor; although it was practicable in the case for which this was made—the V-shape places between the necks of the teeth being sufficiently large to permit the transverse screw to enter—such an anchor-band would not be practicable in the majority of cases. Instead of using transverse screw clamp-bands for anchors, I now *always* prefer the longitudinal screw clamp-band anchor, made as represented by the following figure.

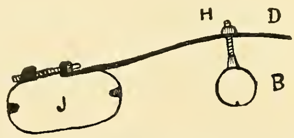

FIG. 1025.—Superior modification of the mechanism represented by Fig. 1023 (A).

Fig. 1025 represents this superior mechanism, which was used for moving an instanding right upper cuspid outward. This modification consists of a bridge-piece, D, cuspid-ring and screw, B, nut, H, and a longitudinal screw clamp-band, J, for anchor. (Compare this figure with Fig. 289, Part VI., p. 334.)

CHAPTER CV.

MOVING UPPER CUSPIDS BY SCREWS AIDED BY ELASTIC RUBBER.

OPERATION FOR MOVING TWO INSTANDING CUSPIDS TO LINE BY A SCREW-JACK IN COMBINATION WITH CLAMP-BANDS HAVING ARMS AND AIDED BY ELASTIC-RUBBER RINGS.

SOMETIMES the correction of difficult cases of irregularity of the teeth can be best accomplished by resorting to more than one kind of engine of force—such, for illustration, as screws, metallic springs, or elastic rubber; one part of the operation being performed by the screw, and another part by the spring or rubber, or both. Such mechanical combinations are generally made by one addition after another.

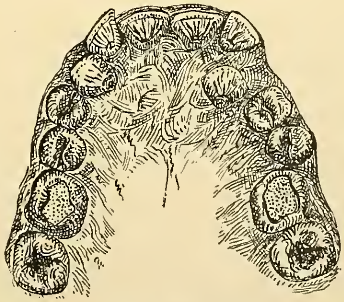

FIG. 1026.—Appearance of the case before treatment.

Fig. 1026 illustrates the case of a man thirty years of age, for whom an operation was performed by such a combination. The two upper cuspids and one bicuspid were in the posterior position, and the two laterals in the anterior. Some of the other side teeth were also slightly out of the proper line; the operation, however, was confined to the eight anterior teeth.

The first stage of the operation was short, consisting of extraction of the second bicuspids; the second stage was the application of the first part of the mechanism, and moving posteriorly the first bicuspids sufficiently to make space for the cuspids and laterals. The third stage was for turning the cuspids and moving these and the laterals into line.

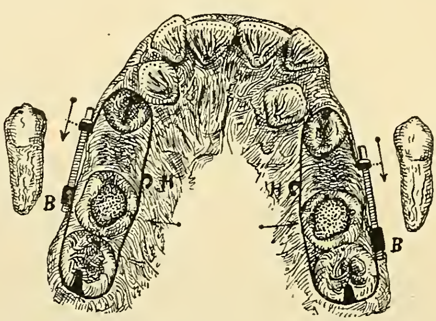

FIG. 1027.—Appearance at the beginning of the second stage (A).

Fig. 1027 illustrates the case at the time the first part of the mechanism was applied, and ready to begin the work of moving the bicuspid posteriorly. The mechanism consisted of two gold clamp-bands, B, B, each having on its lingual side a hook, H. These bands were not only regulators, but also their own anchors. The first and second molars on each side constituted the anchorage. By tightening the screws the first bicuspids were moved sufficiently in fourteen days. This completed the second stage of the operation.

The clamp-bands were taken off the teeth, and then to each was soldered two stiff gold wires as represented in Fig. 1028; one (W) to bear on the labial side of the lateral, and the other (W′) on the lingual side of the cuspid. About midway of each of these wires was soldered a small hook for the attachment of an elastic-rubber ring in a later

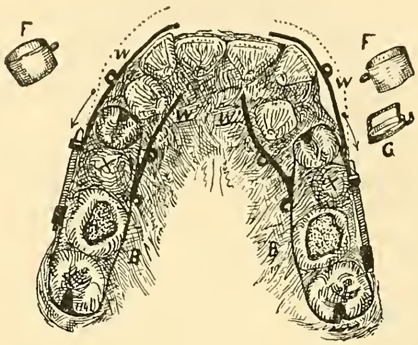

FIG. 1028.—Appearance at the beginning of the third stage (A).

part of the operation. To prevent the lingual wires from sliding off the short and conically formed cuspids, broad cylindrical gold ferules, F, F, were cemented on them with phosphate of zinc. On the lingual side of each ferule was soldered a small ring to keep the wires W′ in their proper places. The cuspid-ferules not only furnished perpendicular walls for the lingual and labial arms to bear against, but, being filled with phosphate of zinc, they served as gags to bite upon and to keep the jaws sufficiently far apart to permit the instanding cuspids to pass outward over the lower teeth.

To prevent the bicuspids from moving lingually, by the leverage action of the arms W′, through resistance of the cuspids, a swivel screw-jack was placed across the dental arch, and attached, by staples, to the lingual side of the clamp-band arms as represented in Fig. 1029. This jack served not only to keep the clamp-bands and the teeth within them in their proper places, and to aid in holding the arms against the cuspids, but served as an engine of force to aid in moving them outward.

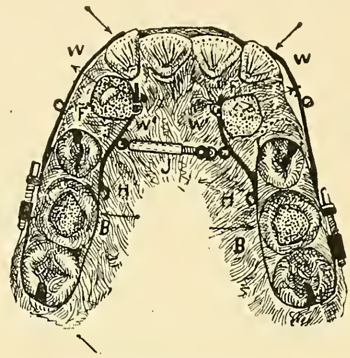

FIG. 1029.—Appearance in the middle of the third stage (A).

The jack was not intended in any way to widen the dental arch, but to keep up the proper degree of pressure against the moving cuspids. While the screw-jack and arms W′, W′ were acting on these teeth (cuspids), the labial arms W, W (extending forward from the anchor-bands) were acting on the outstanding laterals.

After a short trial of the mechanism it was found that the left anchor-band slipped upward on the bicuspid. This was arrested and prevented from further slipping by a gum-guard ring. (See G, Fig. 1028.)

In about fifteen days the right cuspid had moved into line, but it still required to be moved slightly posteriorly. The left cuspid, which required turning, had, like the right lateral, moved only half the required distance. At this point the middle part of this stage ended.

Fig. 1030 illustrates the beginning of another step. The screw-jack and the lingual arms had been taken from the mouth, leaving the remainder of the mechanism. Rubber rings, R, were now brought into use. To adjust the proper degree of force on the different laterals after the rubber additions were made, the left arm W was bent outward, so as not to bear (when free) on the left lateral; the

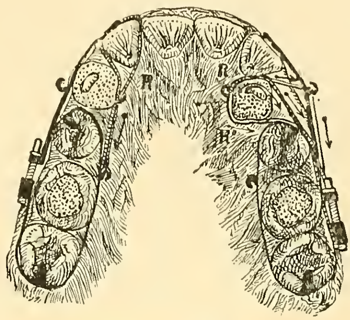

FIG. 1030.—Appearance of the case past the middle of the third stage (A).

right arm was left to continue its usual bearing on the right lateral. The rubber on the right was so applied that it drew upon the lateral and also prevented the cuspid from retracing its steps; the left one acted upon the left cuspid so as to move it posteriorly and at the same time turn it.

On the right side, one rubber ring (represented as checkered) was first caught on the hook on the lingual side of the right anchor-band, and then it was stretched and caught upon the right lateral. On the left side, one rubber ring (represented as white) was caught on a hook on the buccal side of the anchor-band, and then stretched through the hook-ring on the (left) labial arm, and caught over the cuspid. The other rubber ring (represented as checkered) was caught on the hook on the lingual side of the cuspid-ferule, and stretched and caught on the same clamp-band screw as shown.

The elastic rings were substituted by new rings thrice a week; at these times the other parts of the mechanism were also removed and cleansed.

After using the rubber rings on this left side about three weeks, and causing little, if any, change in the position of the cuspids, they were abandoned as worthless for engines of force in this case, and a screw-jack was placed between the cuspids, one end being so attached to the ferule-ring of the right cuspid that it bore evenly on the tooth, while the other end was so attached to the left cuspid-ring that it tended to turn it at the same time it moved outward. (See Fig. 998, p. 1041.)

While this jack was pushing the left cuspid outward to line, it was pushing the other cuspid in the opposite direction; but as the alveolar resistance was less on the right side, that tooth moved more rapidly, and before the left cuspid had reached the proper place this (right) one had moved beyond its proper place. This cuspid and the bicuspid next to it had also moved forward, closing all visible

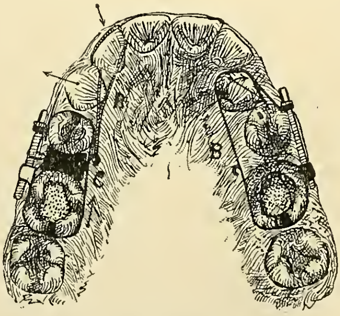

FIG. 1031.—Appearance at a later time.

spaces between the cuspid and lateral, while in conversation; but there was a wide space left between the bicuspid and first molar.

An interdental block clamp-band was now applied for an anchor to hold an elastic-rubber ring caught over the outstanding right lateral to draw it into the line of the arch. Fig. 1031 illustrates the case soon after.

To hold temporarily the left cuspid where it now was, a clamp-band was applied as shown in the same figure. As this cuspid required more space between the lateral and bicuspid, it was necessary to use some powerful mechanism to widen the space; this widening was accomplished by what the author calls one of his triplex-acting mechanisms. This will be again referred to.

The right lateral having been brought into its proper place, it was retained there by a thin gold ferule having a piece of platinum wire soldered crosswise, to rest on the lingual side of the adjacent teeth.

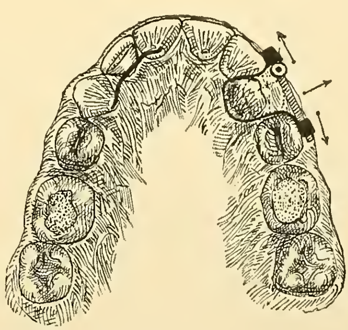

FIG. 1032.—Drawing the cuspid to line by a triple-acting mechanism (A).

Fig. 1032 illustrates the case with this retainer in place, and the "triplex" applied to the left cuspid ready to begin widening the space for it. After a few days this left cuspid was in line, but it still required turning to complete the operation. This was made with a rubber ring, caught upon a lever soldered to a ferule cemented on the tooth, the rubber being anchored to a clamp-band placed upon teeth posterior to it. This part of the operation is not illustrated; the principle, however, is shown by the checkered line in Fig. 1030.

Fig. 1033 illustrates the case completed, and the retainers applied to hold both the laterals and cuspids in place; these were worn several months.

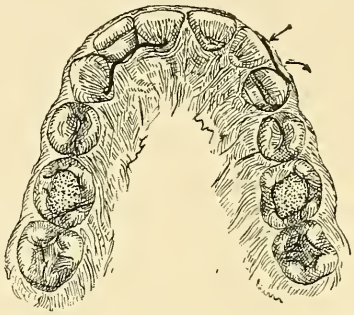

FIG. 1033.—The case at the completion of the operation.

During the operation the irregularity of the first molar teeth was partially corrected by the bearing of the lingual sides of the clamp-bands upon them.[1]

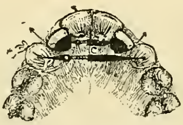

FIG. 1034.—Moving instanding upper cuspids and laterals by screw-jacks (A).[2]

Fig. 1034 illustrates a plan—not the best—for moving instanding cuspids and laterals by spindle screw-jacks. The operation is represented at a stage when the cuspids

[1] The question might arise in the reader's mind, Might not all of the wires have been soldered upon the clamp-bands in the first place, as represented in Fig. 1028, before moving the first bicuspids back? This would not only have increased the length of time of the maximum discomfort of the patient, but would have increased the difficulty of management of the mechanism. In the way the case was conducted, the patient (an active merchant) did not lose any time from business; the operation was completed within two months.

[2] "Dental Cosmos," June, 1878.

had been moved outward to line by one jack and the laterals were about to be acted upon by the other. The ends of the jack for moving the cuspids rested in pits made in the lingual surfaces of these teeth; but for moving the laterals the jack rested in holes in the lingual sides of gold ferules cemented to them. The strings represented in the figure were precautionary measures against possible harm from the jacks falling into the throat. This plan of operation is effective, but the mechanism is not as firm as screw-jacks anchored by cemented ferules or by clamp-bands. The tongue is very liable to dislodge it.

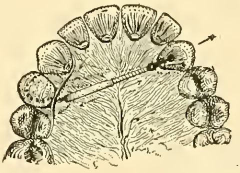

FIG. 1035.—Forcing an instanding cuspid to line by a large spindle screw-jack anchored to a broad cemented ferule (A).

Fig. 1035 illustrates an operation for moving a stubborn instanding left upper cuspid into line by a spindle-jack, one end of which was anchored to a single-tooth ferule having a bar (consisting of a strip of stiff gold plate) soldered to the lingual side to increase the anchorage; the other end rested in a pit in the cuspid. This bar, by extending each way sufficiently to rest on the adjacent teeth, not only aided in the firmness of anchorage, but it prevented the first bicuspid within the ferule from being forced out of line. The anchor-ferule was cemented with phosphate of zinc upon the first bicuspid of the right side of the dental arch.

The jack consisted simply of a screw-cut piece of tubing, and a piece of screw-cut wire of corresponding size. The screw was pointed spindle-like at one end, near which was soldered a short piece of tubing, that was afterward filed (bulb-like) and drilled for a lever-key. An open, ring-shape hook was soldered to the other end; this ring part of the jack, when applied, was caught into a closed ring soldered to the middle of the bar on the anchor-ferule. After the jack was connected in this way with the anchor, its open ring was closed by pincers. This kind of mechanism (though not equal in value to some others represented in this work), being simple, is easily improvised when the operator has ready at hand different sizes of bands and cylindrical screw-jacks. The weakness in this plan is having the loose end of the jack rest in a pit, which renders it liable to become dislodged.

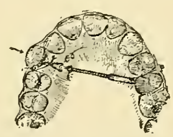

FIG. 1036.—Drawing an outstanding upper cuspid to line by a swivel screw-jack (A).

Fig. 1036 illustrates a plan of operation for drawing to line an outstanding right upper cuspid by a mechanism consisting of a swivel screw-jack attached to the teeth by two clamp-bands of my old pattern (before phosphate of zinc came into use). It interferes with the tongue, but it is firm, effective, and easily kept clean.

The screw-jack was attached to this anchor-band by a rivet projected through gold ears soldered to its lingual side. The construction of this mechanism is so plainly shown in the diagram that further description seems unnecessary.[1]

Fig. 1037 represents a superior modification of the mech-

[1] Published in the "Dental Cosmos," June, 1878.

anism last described. Instead of a transverse screw anchor-band, this (B) has a longitudinal screw; instead of a screw binding-band for the cuspid, this (R) is simply a (narrow)

FIG. 1037.—Mechanism for moving outstanding cuspids (A).

ferule. The ferule is prevented from slipping off the cuspid by a pin-point soldered to its inner surface, to rest in a pit made in the labial side of the tooth. The nut part, F, of the jack is connected with the anchor-band B (having bar-arms) by wire staples. The swivel-end J is soldered to the ferule R.

To operate this mechanism the screw N is turned by a lever placed in a hole in a bulb between it and the swivel.[1] (Concerning the making of such mechanisms, see Part VI., pp. 294, 299, and Part VIII., p. 419.)

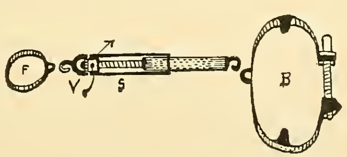

FIG. 1038.—Non-irritating mechanism for drawing upper cuspids into line. The sleeve is represented in section (A).

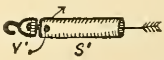

FIG. 1039.—The barrel of the jack.

Fig. 1038 represents a modification of the mechanism last described. This one (which is of the non-irritating class, and was used for drawing an outstanding right upper cuspid into line) differs from the one referred to not only in the proportions of the different parts, but

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1 The screw-jack part of this mechanism was illustrated in the "Dental Cosmos," October, 1877.

in having its screw covered by a sleeve or tube, S, to prevent it from irritating the tongue. This sleeve, which is soldered to the key-bulb on the screw, slides snugly along the outside of the barrel of the screw-jack as shown in section in this figure. In Fig. 1039 V′, S′, represent independently the outside of the sleeve and the swivel. The latter is hooked into a staple on a detachable narrow gold ferule, F, fitted to the cuspid. The jack is similarly attached to the anchor-band B.

(For rules concerning the manufacture of these mechanisms, see Part VI., pp. 279–281, and Part VIII., pp. 417–421.)

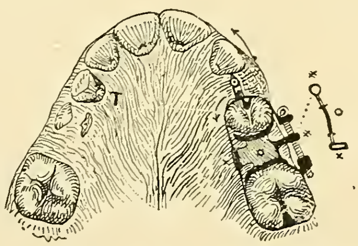

FIG. 1040.—Making space for an outstanding unerupted cuspid by an interdental block clamp-band and screw-jack.[1]

Fig. 1040 illustrates an operation for gaining space for an unerupted left upper cuspid in the case of a child ten years of age. (T represents a deciduous cuspid.)

Interdental Block Clamp-band.—The mechanism consisted of a miniature gold screw-jack, and a clamp-band in combination with an interdental block. The jack was fixed on the anterior part of the band by a spring pinch-clamp. Fig. 1041 represents (side view) the screw-jack, and the clamp-band minus the block. The clamp-band served as an anchor to the screw-jack while it (the jack) was forcing the lateral forward. The block or cross-piece was devised

[1] Devised in 1881.

to prevent the clamp-band from drawing the first bicuspid into the territory of the unerupted second bicuspid. This block was made of platinum plate one-sixteenth of an inch in thickness. To hold it in place there was soldered to

FIG. 1041.—Side view of the mechanism less the block (A).

its lingual end a short gold rectangular ferule (this ferule fitted loosely, and slid on the lingual side of the clamp-band); to the opposite end of the block was soldered a small ring, to hold it loosely upon the clamp-band screw; the screw projected through the ring. This block is represented (edge view) by o, at the right of Fig. 1040.

Jack.—The screw-jack, which was cylindrical and spindle-pointed, was less than a fourth of an inch (when closed) in length. The U-piece which connected the jack with the anterior end of the clamp-band, and which made the jack detachable, was made of clasp-plate, soldered to the end of the barrel of the jack. When this clamp was forced upon the clamp-band, it pinched it so firmly that the jack did not become dislodged while at work. A ferule held the spindle.

When the mechanism was ready to be applied, the clamp-band, with the interdental block attached to it, was placed upon the first bicuspid and first adult molar, and then tight-

FIG. 1042.—The retaining mechanism.

ened gently upon them until they were brought against the block. The jack was now lengthened by a lever-key until it pushed firmly against the neck of the lateral incisor. The turning of the screw was repeated two or three times daily, until the lateral and bicuspid were sufficiently separated to permit the unerupted cuspid to fall into line. This being accomplished, the space was maintained by a retaining mechanism formed as represented by Fig. 1042. It consisted of a broad ferule for the bicuspid, and a platinum-wire arm having a fish-tail extremity to rest against the lateral.

CHAPTER CVI.

MOVING UPPER CUSPIDS BY SLIDING NEEDLES.

OPERATION BY TWO NEEDLES WORKED BY NUTS.—VARIOUS FORMS OF NEEDLES.—PLAN OF CONSTRUCTION OF THE MECHANISM.

AMONG the curious yet practicable mechanisms for correction of teeth is a class of needle mechanisms; these may have one or two needles, and are anchored by two clamp-bands. This name was given to these mechanisms because some of the parts resemble needles; these act intermittently upon the teeth by nuts playing along a transpalatine screw connecting the clamp-bands.

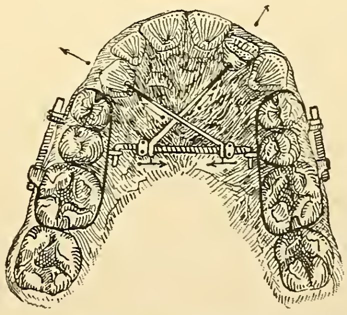

FIG. 1043.—Moving an instanding upper cuspid and lateral to line by a needle mechanism (A).

Fig. 1043 illustrates the beginning of an operation for moving outward two instanding upper teeth—a right cuspid and a left lateral—by a needle mechanism having for the base of support a transpalatine screw and two clamp-bands. The ends of the transpalatine screw are fastened to the clamp-bands by hooks fitting into staples soldered to the lingual sides of the bands. These bands embrace the bicuspids and first molars as shown. A needle consists of a piece of stiff gold wire with one end bent in the form of a ring (eye), the other being pointed. Through the ring projects the transpalatine screw, to serve as the base of action; against each of such rings force is applied by a loose nut which plays along the transpalatine screw, driving the pointed end against the tooth to be moved. The pointed end of one needle rests in a pit in the cuspid, and the point of the other in a hole in a ferule cemented upon the lateral. Twice a day these needles were forced against the teeth to be moved until they were in the line of the arch.

The defect in this mechanism is the weakness in the hold between the points of the needles and the teeth. This weakness I now overcome by using sockets soldered to ferules, or by bending the ends of the needles so as to hook into rings soldered to broad ferules. (See Fig. 127, Part VI., p. 241.)

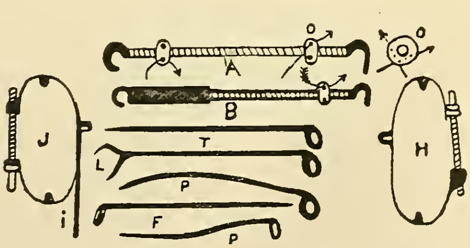

FIG. 1044.—A set of different parts of the device.

Fig. 1044 represents a set of the different elements from which such a mechanism may be constructed: J, H, two anchor clamp-bands, one (J) having a bar soldered to its lingual side to bear upon an adjacent tooth serving as anchorage; A, B, two forms of transpalatine screws; O, operating-nut; T, P, P, F, different forms of needles.

As dental arches differ in width, it is well to have several screws, varying in length, made after the form represented by A; but they may be formed after that shown by B, or the form of an ordinary cylindrical screw-jack. To prevent the screw from irritating the tongue, some of the parts exposed may be covered by pieces of tubing.

CHAPTER CVII.

CORRECTION OF FRONT UPPER TEETH IN CASES WHERE THERE ARE SPACES.—RETAINING CORRECTED TEETH IN THEIR PROPER PLACES BY PLATES SUPPORTING ARTIFICIAL TEETH TO FILL SPACES.

GENERAL REMARKS UPON SPACES CAUSED BY DRIFTING OF TEETH ALONG THE ALVEOLAR RIDGE WHEN THE TEETH ARE TOO SMALL TO FILL IT, OR BY LOSS OF TEETH.—PERFECT AND IMPERFECT OPERATIONS.—OPERATIONS BY CLAMP-BANDS.

WHERE one or more teeth are on the esthetic line, yet are not properly located on the line, and some teeth are missing, the moving of the former along the line of arch into their proper places, and holding them steadily there by a plate supporting artificial teeth that are substitutes for the missing ones, is not only practicable but also the best plan. Of course the conditions requisite for obtaining this double result in the highest degree must be favorable; consequently these cases are rare; still the number of such favorable cases is greater than is supposed by many who have not made this branch of dentistry a study.

In these cases the missing teeth causing spaces are generally the laterals or the bicuspids; sometimes an upper central or even a cuspid is missing. Spaces also often result from teeth drifting along the esthetic line from lack of lateral support, caused by missing teeth, or where the alveolar ridge is too large for the size of the teeth to fill. Drifting of teeth often occurs during the eruptive process; there are temporary spaces caused by too early extraction of deciduous teeth, and permanent spaces by extraction of wrong adult teeth to make room for others to fall into line; as, for illustration, those cases in which the first molars are extracted, or where the upper deciduous cuspids are lost before the first deciduous molars drop.

Another class of cases that need artificial teeth on retaining-plates are those where upper adult cuspids have erupted anterior or posterior to the adult laterals, and these laterals have been extracted to make room for the cuspids, permitting these large teeth (cuspids) to stand alongside of the broad centrals, that consequently cause coarseness of facial expression that can be refined only by moving the misplaced cuspids into their proper places, and filling the spaces thus made between them and the centrals by artificial laterals. Teeth in these cases, as also those in which some teeth have been lost by decay, requiring artificial teeth to complete the line of arch, can thus be easily retained indefinitely by the plates, without the patient feeling that he is encumbered by them as retainers.

To make room for substitutes where spaces are too narrow, or where there are no spaces and it is necessary to cause them to be made, the teeth may be forced apart by small blocks of wood, cork, rubber, spring-jacks, or short screw-jacks, placed between them, or they may be separated by some form of the H-separator, as suggested in Part VI., Chapter XXIII., p. 253, or Section A, p. 927, in this Part (XV.), on Widening Interdental Spaces. Clamp-bands are sometimes used in these cases, and as this instrument has not been sufficiently considered for this purpose, our present remarks will be confined to operations in which it has been used; two cases will be given, one to show a complete operation, the other an incomplete one.

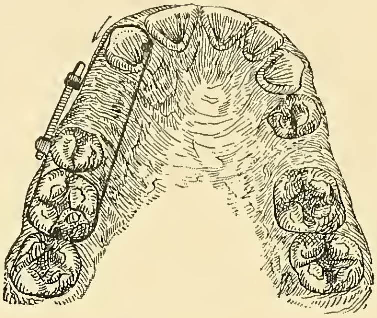

Fig. 1045.—The complete operation (A).

Fig. 1045 illustrates the beginning of an operation for moving a right upper cuspid away from a central, to make room for an artificial lateral, for a woman about twenty years of age. Originally the teeth, by being too large for the jaw, were so jumbled that it was necessary to extract one or more to make room for the remainder. At that time esthetics in this line consisted simply in doing that which would permit teeth to be arranged in a regular line, without regard to the finer aspects of facial expression; therefore the right lateral was extracted to permit an outstanding cuspid to fall into line. The patient had also lost (from decay) two bicuspids, one on each side of the arch. All this took place before I saw the case.

To refine the coarse facial expression caused by the cuspid taking a position alongside of the central was the object of moving the cuspid away from it and interposing the artificial lateral. This was accomplished by a clamp-band extending around the cuspid and the lone bicuspid and first molar as shown. This band, by being tightened twice a day by turning the screw, soon caused sufficient space for the artificial lateral; to complete the dental arch, however, two artificial bicuspids were added. These three artificial members were not held in place by a plate, but by a half-round gold wire bent to conform with the gum near the lingual walls of the dental arch. This wire was held in place by delicate clasps that embraced the cuspids, right bicuspid, and left first molar.

In nearly all cases where one or two bicuspids are missing and there are left a sufficient number of teeth for mastication, I use plate cuspids instead of bicuspids, because they look equally well, and by escaping severe antagonism in mastication of food, they are less liable to break. In this instance this rule was followed.

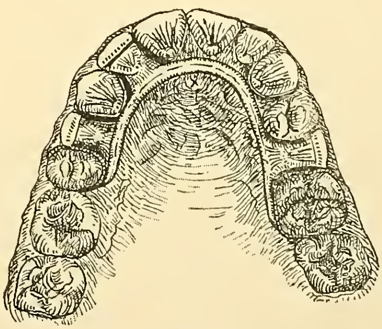

FIG. 1046.—Appearance of the case at completion of the operation.

Fig. 1046 represents the case at completion of the operation, and with this retaining dental plate applied.

In cases where it is necessary to use artificial teeth for mastication, the parts of the teeth receiving the antagonizing force may be made entirely of gold. The half-round gold wire may be thought to be too weak to be practicable, but several years' observation has proved that this does not hold true in light cases, where thin cuspids, that do no antagonizing work, are used; heavy cases require plates.

Fig. 1047 illustrates an operation upon the imperfect plan referred to. This case was that of a man twenty-five years of age, whose teeth were so large, and the upper jaw so small, that the teeth were jumbled together. In boy-

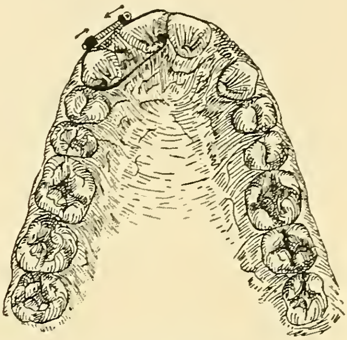

FIG. 1047.—The incomplete operation.

hood an unwise dentist had extracted the right lateral to make room for an outstanding cuspid; and to give balance of expression, the left lateral had also been extracted. At the time I first saw the case there was also slight overlapping of the right upper central upon the left one, leaving a space about one-eighth of an inch between the right central and right cuspid. Had the lap been removed, the space would have been less. On the left side of the arch the space was sufficiently wide to insert an artificial tooth.

As all the teeth posterior to the right cuspid were in line and in contact, there was no way of obtaining sufficient room for an artificial right lateral except by moving all the side teeth posteriorly, or by extracting the second bicuspid and moving back the first bicuspid and cuspid, or by widening the arch. The circumstances of the patient were such that it was impossible to perform the operation upon any of these plans; therefore the imperfect operation was the only one that was practicable.

On the right side the space was nearly closed by drawing the cuspid and central toward each other by a clamp-band placed so as to embrace the two teeth. When moved, these teeth were held in place by a retainer made of half-round gold wire, upon which was an artificial tooth, as substitute for the missing lateral. The centrals were kept a short distance apart by a piece of (round) platinum wire soldered to the half-round gold-wire base.

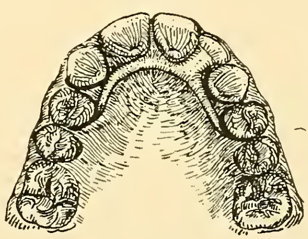

FIG. 1048.—Appearance of case at completion of operation (A).

Fig. 1048 illustrates the anterior half of the dental arch at completion of the operation, and after the retainer, supporting the artificial left lateral, had been applied. The arch was filled, and upon casual observation it appeared to satisfy the eye; but when closely scrutinized the two sides of the dental arch were seen to be unlike. This is an illustration of the unfortunate positions in which dentists sometimes find themselves, and where the question arises as to whether it is right to help the patient a little or not at all. By this procedure the antagonism being perfect, it was not disturbed by closing a space; and as the man had a mustache, it so hid the teeth that the defect was seldom noticeable.

It is only in cases where circumstances render the perfect operation impracticable that this kind of operation is permissible for women. While, under these circumstances, the closing of a space caused by a missing *lateral* is permissible, the closing of a space by moving teeth together, when the space is caused by loss of a *central*, would be highly improper.

CHAPTER CVIII.

SECTION C.................. DIVISION II.

CORRECTION OF PARTLY ERUPTED UPPER CUSPIDS BY SPUR-PLATES AND BY SCREW-ACTING MECHANISMS.

GENERAL REMARKS ON SPUR-PLATES.—OPERATION FOR CORRECTION OF AN INSTANDING UPPER CUSPID BY A SPUR-PLATE.—OPERATION BY A SCREW-ACTING HOOK ANCHORED BY INTERDENTAL BLOCK CLAMP-BANDS.—DIFFICULT CASES OF CUSPIDS ERUPTED FAR FROM THEIR PROPER PLACES, CORRECTED BY SPUR-PLATES AIDED BY SCREW-ACTING MECHANISMS, SOME OF WHICH WERE COMPLICATED.

IN this chapter the treatment of two classes of cases of partly erupted cuspids will be considered: those that have erupted obliquely to the normal position, and those that have erupted normally in this respect, but off the esthetic line. To move to line an instanding cuspid tooth that is only partially erupted, the cusp just pointing through the gum, has been regarded, until recently, as nearly impossible, because of the difficulty of attaching the engine of force to the tooth. Now, by properly constructed spur-plates or by platinum draught-wires, in combination with screws attached to hard-rubber anchor-plates or to anchor clamp-bands, the correction of such cases is comparatively easy.[1] Of all kinds of mechanisms known, probably the spur-plate and the screw would be regarded by the majority of dentists as the best.[2]

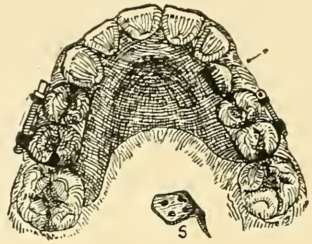

FIG. 1049.—Moving an instanding left upper cuspid by a spur-plate (A).

Fig. 1049 illustrates the beginning of an operation for moving to line an instanding left upper cuspid by a spur-plate, the spur projecting from the left margin of the plate covering the palate, and anchored to the side teeth by two clamp-bands. The roof-plate was made of hard rubber; and the spur of thick gold plate about three-fourths of an inch in length and one-eighth of an inch in width, bent at right angles upon itself, so that one extremity (the foot) was shorter than the other; the longer part was embedded into the plate. The free extremity, the spur part, projected upward a short distance, so as to lie between the gum and the tooth (not deeper, however, than the lip of the gum around the tooth); this spur bore upon the lingual side of the neck. As the tooth moved away from the plate, this spur was bent outward more and more to keep up the pressure. When the form of the spur had so far changed, by bending it, that it was no longer serviceable, it (the spur) was cut away, and substituted by one having a

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[1] Illustrations of several of these have been published by the author in the "Dental Cosmos." In this work only the best are reproduced.

[2] See Fig. 405, Part XIII., p. 433.

longer foot-piece (riveted to the plate), leaving the spur part a short distance further from the border. The plate was then reapplied, and its use persisted in until the cuspid was moved into its proper place.

If in such cases the space between the teeth (for the cuspid) is very unsightly, I sometimes insert a thin artificial tooth (upon the plate) to complete the dental arch, and keep it there until the instanding cuspid has been moved near to its proper place, and then the artificial tooth is cut away to permit the cuspid to move into line. (See Fig. 1068.)

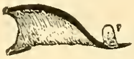

FIG. 1050.—Section view of a spur-plate for moving an instanding lateral (A).

Fig. 1050 represents in section one-half of a similar plate, having a spur, P, for moving into line an instanding upper lateral. Instead of clamp-bands for anchors, this plate is anchored by two ferules.[1]

I occasionally make spur-plates for *widening* the upper dental arch. For such plates flat spurs, similar to the one mentioned previously to the one last described, are vulcanized into the side of a roof-plate. Each of these spurs (which may be made separately or collectively) is so bent that it will bear against the lingual side of one of the teeth to be moved. The bearings are retightened by rebending the spurs twice a week, until the dental arch has been sufficiently widened. I once devised a similar plate that acted by continued force. I do not think, however, that this was equal to the kind that acts intermittently. The continuously acting spur is made by interposing a coil-spring between the spur part and the part that enters the

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[1] The character of force from these mechanisms is similar to that from a screw—intermittent.

roof-plate. These different forms will be further explained in Part XVIII. (See Widening of the Dental Arch.)

Righting Up and Moving Greatly Inclined Teeth that have Erupted at Considerable Distance from their Proper Places.—Occasionally cases are found in which teeth are so far inclined that they are nearly hidden beneath the gums; in others the teeth lie horizontally in the jaw and are entirely hidden from view, and never erupt. The "righting up" of teeth that incline only slightly is easy compared with righting up of teeth that incline forty-five degrees or more; but when the apices of the roots (as well as the crowns) are out of place, they have been regarded as impossible to correct, because they not only require to be forced sidewise through the alveolar tissue, but apex backward, which act was thought would destroy the pulp. Admitting that the pulp, under such circumstances, may possibly be destroyed, if roughly handled, I will present later a case which will prove that it is possible to safely move backward such a tooth without injury to its pulp; but this will not be given as advocating such operations for common practice.

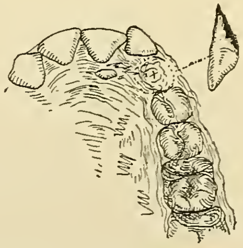

FIG. 1051.—Appearance of the case before the operation.

Fig. 1051 illustrates an operation for righting up a left upper cuspid. In this case—a robust girl about fifteen years of age—the cusp of the left upper cuspid had pointed through the gum just posterior to the left central. The lateral, which had been forced anteriorly out of its place by it, showed that the apex of the root (cuspid) was nearly in its proper place, thus making it plain that the crown, only, required to be tilted into line.

As the left deciduous cuspid still remained, the first step in the operation was to extract it. After this a spur-plate having clamp-band anchors was applied. It was so made that the spur projected upward between the cuspid and the annular lip of the gum, and pressed upon the medial side of the neck of the tooth. In one week the point of the cusp of the tooth, had by it moved one-sixteenth of an inch to the left.

Fig. 1052 illustrates the case a few days later as it appeared, with the spur-plate applied.

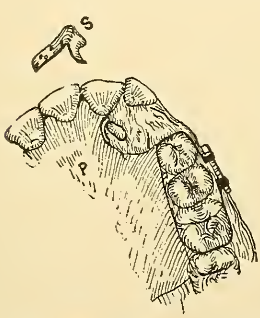

FIG. 1052.—Appearance of the case after one week (A).

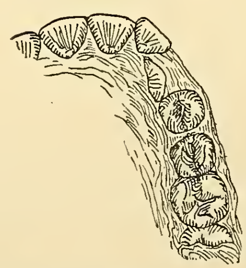

FIG. 1053.—The cuspid in contact with the bicuspid, but still standing in the posterior position.

Fig. 1053 illustrates the appearance of the case five weeks later, and six weeks from the beginning of the operation. The cuspid had been moved so that it was in contact with the bicuspid, but still stood in the posterior position; there was also left unabsorbed, between the two teeth, some protruding gum-tissue.

Measurement between the lateral and bicuspid at this time showed that the space was still too narrow for the cuspid; consequently it was necessary to widen it. As the side teeth posterior to the cuspid were not quite in contact I thought that perhaps by drawing these teeth into contact the space would be made sufficient for the cuspid. A clamp-band was now applied to embrace all the fully erupted side teeth posterior to the space (Fig. 1054),

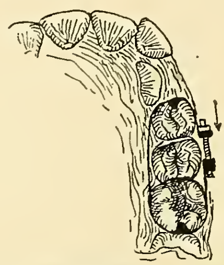

Fig. 1054.—Attempting to make room by drawing the side teeth together.

and tightened upon until these teeth were brought into contact. Upon measurement afterward, it was found that the space was still too narrow, making it necessary, after all, to extract a tooth. As the loss of the first bicuspid would cause more space than was required for the cuspid, the second bicuspid was taken, and the first bicuspid moved posteriorly until the cuspid space was sufficiently wide.

The object in extracting this bicuspid was to have the extra space (if any should be left at the close of the operation) sufficiently far back in the mouth to be unnoticeable (Fig. 1055). I thought, however, that this space could probably be wholly closed by moving the first molar forward by means of a clamp-band embracing the molar and bicuspid. When these two teeth had been drawn together there remained, of course, a wider space than was necessary for the cuspid; but this extra space was closed by the continued draught upon the molar in drawing the cuspid to its proper place by using this clamp-band as anchor, and adding to it a platinum-wire splice. This splice was con-

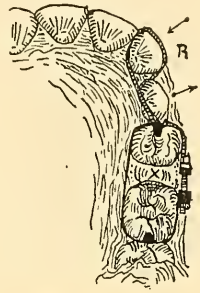

Fig. 1055.—Drawing the first bicuspid posteriorly by a clamp-band, and holding the lateral and cuspid in place by a rubber ring.

nected with the lingual side of the clamp-band by a hook, H, and with the buccal side by a screw, C (Fig. 1056).

The cuspid moved slowly yet steadily toward its proper place, and the anchor teeth also moved slightly forward

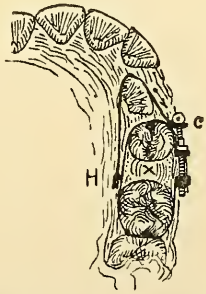

Fig. 1056.—Drawing the cuspid posteriorly by a splice.

by the same draught. There was some space around the cuspid, but this was needed, as the cuspid still required to be moved outward; the outstanding left lateral also still required to be moved inward a short distance beyond where the tooth had naturally moved. At this stage of the operation the mechanism was replaced by a new one—a clamp band with two gold-wire springs; one to move the lateral, the other to move the cuspid. By this means these teeth were soon forced into their proper places in the arch.

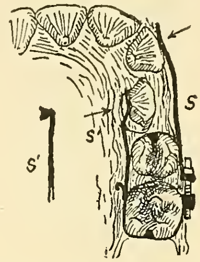

FIG. 1057.—Moving the cuspid outward and the lateral inward by compensating-springs.

Fig. 1057 represents the case at this time with this mechanism on the teeth. The outer spring, s, pressed upon the labial side of the lateral incisor, and the other, s′ (not straight), bore upon the lingual side of the cuspid. The end of the latter was bent (at right angles) to project upward to rest between the cuspid and the gum, to prevent it (the spring) from sliding off the inclined lingual surface of the crown. By these compensating-springs the teeth were easily forced into line. The extra space made by the extraction of the second bicuspid now being closed by the drawing forward of the first molar by the clamp-band and splice, the second molar followed of itself, and thus the first molar was prevented from falling back (when liberated).[1]

Fig. 1058 illustrates the retainer used when completed. It consisted of two ferules and two wires connected by solder, as shown.

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[1] Unless the second molar moves forward immediately in such cases, the first molar should be held fast by being attached to some tooth or teeth anterior to it.

Root-Apex Forward Operation.—Fig. 1059 illustrates a similar but more difficult case to correct, because the tooth required to be moved further, and the patient (a woman)

FIG. 1058.—The Retainer.

was thirty-eight years of age. The operation was for the correction of a right upper cuspid that began to erupt about three years previously, and was arrested in its progress when the cusp had barely pointed through the gum just behind the right central. This arrest in its progress appeared to have been caused by the tooth antagonizing with one of the lower teeth. The right lateral was appar-

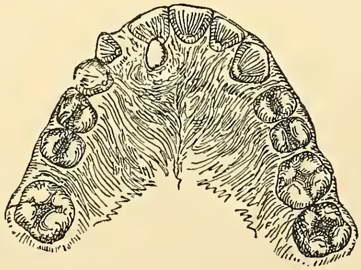

FIG. 1059.—The case before appearance of new cuspid; the change the new cuspid caused.

ently hopelessly loose, from being crowded far out of its former place in the arch; in fact, it had moved, bodily, nearly through the gum by the pressure of the root of the cuspid, which rested diagonally across its lingual side. The deciduous right upper cuspid still remained in its place, though its root was considerably wasted away, not because of its successor, but from its great age.

The patient said she had travelled from one dentist to another to see if her teeth could be saved and made useful; but all advised her to have the cuspid extracted and then save the lateral if possible. Finding that the dental arches were originally very regular and the antagonism normal, I advised saving the cuspid if possible; the lateral was already doomed and its long salvation was impossible, because loose and the socket was diseased. Fig. 1059 illustrates the case before commencing the operation. Several figures following it represent other steps in the operation.

The patient, being of a highly nervous organization, could not endure even an ordinary strain. Even the gum-tissues seemed to have the same weakness, and would rebel with inflammation from very slight cause; the patient could not bear continued force in the slightest degree, nor could she bear intermittent force unless applied lightly. I undertook this case more to learn how much the science of regulating teeth is capable of accomplishing, than for pecuniary benefit; indeed, I told the patient I would perform the operation gratuitously for the privilege of proving how far nature would tolerate the pushing of a tooth root (apex) backward, through alveolar tissue. This operation is not presented here, however, to stimulate others to make such tedious efforts in common practice.

I felt that the cuspid could be successfully moved into its proper place, unless the root be crooked, or other roots were crooked. As the lateral had been forced bodily so far outward, and as its socket was in a diseased condition, I did not believe it could be made firm. Again, the color of the tooth showed that if the pulp was alive it was feeble and not at all healthy. The outline of its entire root could be plainly felt just beneath the gum under the lip, and the lingual side of the root was exposed from waste of the gum-tissue and extensive severing of the connection between the root and the socket by loculosis alveolaris.

Examination showed that the irregular adult cuspid was lying diagonally to its proper position, and the root was in contact with the extremity of the root of the loose right lateral. The right approximal surface of the crown of the cuspid was facing toward the throat, the opposite surface being in contact with the lingual side of the neck of the right central. In probing between the delinquent tooth and socket, it was found that its root was not only resting against the mesial side of the root of the lateral, but it (cuspid) was about to slide in between its (lateral) root and the root of the central.

To move this delinquent cuspid into its proper place required pushing of its root-apex backward about one-fourth of an inch, and then righting up the tooth, and swinging its crown around past the lateral incisor, a distance of more than half an inch before the crown would be in line of the dental arch. I had little doubt as to the success of the operation upon the cuspid; but the doubts I had about the loose lateral incisor were confirmed later, when it was found that the tooth was too loose and too low in vitality to be naturally retained when forced back within the alveolus.

The first step in the operation upon the cuspid was the making of a path by extraction of the deciduous cuspid, one-third of the root of which had wasted away (Fig. 1065); the second step was the moving of the crown of the (adult) cuspid away from the crown of the central; the third was unlocking the roots of the cuspid and lateral; the fourth, pushing the cuspid into its proper place.

The second step required the force to be so applied to the cuspid that it would not tilt upon the easily yielding root of the lateral, and force the latter through the gum. To move the cuspid away from the central, the force was applied so as to move the tooth bodily (crown and root) toward the throat. This was accomplished by applying the force from outside the arch, directly against the middle part of the tooth (just above its neck), and not against the crown. The force that was necessary required something that would operate by a screw, acting from a firm anchorage embracing all the upper teeth excepting this cuspid. To save time I devised a mechanism without regard to expense.

Fig. 1060 represents this elaborate gold mechanism, devised mainly for moving the cuspid a short distance away

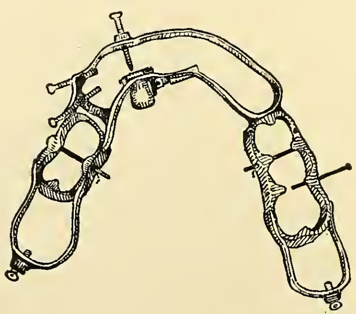

FIG. 1060.—The first mechanism used (A).

from the central and lateral, and not for any other part of the operation. It consisted of anchors, a hinged wing-piece, three screws, three pins, and a small screw-jack. The anchors consisted of two ferules and two thumb-screws. To the anterior parts of the anchors were soldered two rigid bows, a lingual and a labial.

To the posterior parts of the ferules were soldered two rigid wire loops. These extended posteriorly and embraced the molars. The thumb-screws were for tightening the rear parts of the loops upon these molars. The two screws on the patient's right were for moving the lateral toward the right central.

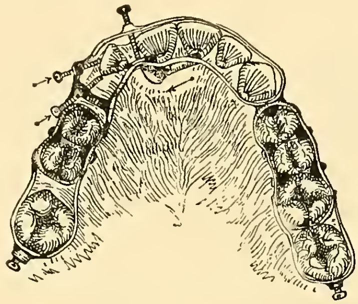

FIG. 1061.—The mechanism as applied to the teeth (A).

Fig. 1061 illustrates the case with the mechanism as it appeared when first applied to the teeth. The ferules were filled with phosphate-of-zinc cement.

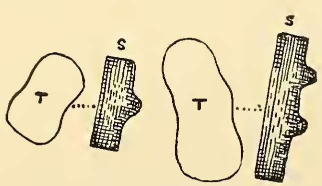

FIG. 1062.—The Ferules.

Fig. 1062 represents a side view (S, S) and an edge view (T, T) of the ferules before they were soldered to the other parts of the mechanism. These ferules had ears to prevent them from sliding upward and injuring the gums.

The anterior parts for moving the crown of the cuspid away from the central, although difficult to plainly express in picture, will, I think, be understood by reference to the following figures.

Figs. 1063 and 1064 represent a front and an edge view of these parts, consisting of the wing-piece T and the flat brace C, connecting the outer and the inner bows L, I; the wing T was attached to the bow I by a hinge, H; S represents the screw for forcing the wing against the cuspid.

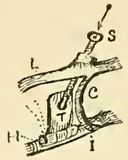

FIG. 1063.—Front view of the wing-piece (A).

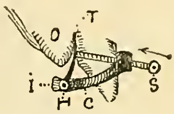

FIG. 1064.—Cross view of the wing-piece (A).

When the mechanism was applied, this wing projected upward between the central and the delinquent cuspid; the screw S played in a screw-cut hole in the outer bow L, and projected between the right central and lateral, and pressed against the wing, moving it in the direction indicated by dotted lines.

In order to make this screw bear sufficiently high upon the wing and under the lip of the gum, it was necessary to project it (the screw) through a place in the gum (made by a lance) between the central and lateral. To prevent the screw from irritating this gum-tissue, the threads on the wing extremity of it were filed away, leaving it smooth for about one-eighth of an inch from the end.

When the mechanism was first applied, the screw S was lightly turned against the wing T, and then left until after the screws at the right of it were gently operated for a few days against the neck of the right lateral. These screws bore on the lateral so as to force it bodily (root and crown) toward its former place near the central. The object of this act was to carry the root of the lateral past the interfering root of the cuspid, to prevent the apex of the latter (cuspid) root, when borne upon by the wing, from falling into the space between the roots of the lateral and central.

To prevent the lower teeth from antagonizing with the delinquent cuspid during this stage of the process was one of the offices of the anchor-ferules; these, when filled with cement, served as gags for the lower side teeth to bite upon.

In eight days, by careful management, the lateral had moved toward the central as far as practicable and still leave space for the screw s, which was now made to begin to bear against the wing. The cuspid, though stubbornly resisting the screw, moved steadily away from the central for seven days, when an accident occurred by crumbling of the cement in the anchor-ferules, which so loosened the entire mechanism that the wing could not be managed properly; besides this, the gum all along the alveolar ridge began to swell, making it necessary to remove the mechanism. The operation was now suspended for four days, for the swelling to subside; during this time, however, the delinquent cuspid was held by a clamp-band embracing the two centrals and the wayward lateral, and lying between the cuspid and central.

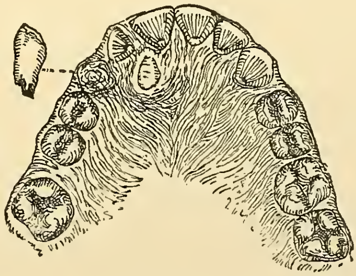

FIG. 1065.—Appearance of the case after the cuspid had been moved a short distance from the central.

An examination of one side of the root of the cuspid, by probing in the space made by its separation from the central, confirmed my first opinion, that it (the cuspid) originally rested against the root of the lateral; these two roots had separated a short distance, but the crowns of the cuspid and central had separated further.

Fig. 1065 illustrates the case at this time without the mechanism.

After the inflammation of the gum had subsided, the mechanism was reapplied and the process of moving the cuspid continued; before the mechanism was replaced, however, the original wing T was replaced by a new and longer one, that projected further into the space between the central and cuspid, so as to bear higher upon the root of the latter, to insure the forcing of the apex of the root of the cuspid further away from the root of the lateral, thus preventing their entanglement.

Having the mechanism firmly fixed upon the teeth, the two screws (at the patient's right) were lightly reset against the lateral, to hold it steady. The screw S was reset against the wing, causing it to again bear upon the cuspid; this tooth was retightened upon two or three times a day for two weeks, causing it to move bodily inward.

When the tooth had moved sufficiently far to prevent the possibility of its root interfering with the root of the lateral (which had for several days followed on behind the root of the cuspid), further action on the wing was suspended, and the short screw-jack, soldered to the lingual bow I, and having a concave tack-head shaped extremity (made at the time the other parts of the gold mechanism were made), was put into action against the point of the cusp of the delinquent cuspid, to push it (root backward) to the patient's right, so that the end of the root would be carried far beyond the root of the lateral, toward its (cuspid) proper place in the dental arch. This screw-jack also served to partially "right up" the cuspid. (See Fig. 1060.)

A slight pressure was thus maintained upon the crown of the cuspid for eleven weeks, slowly moving it back on the line of its long axis. At this time the cement in the ferules again crumbled, and the anchor loosened, causing the screws on the lateral and cuspid to again relax, thus permitting the teeth to fall back a short distance.

This expensive mechanism had, however, now accomplished its object (the most difficult part of the entire operation)—the freeing of the roots of the lateral and cuspid from interference with each other, and the separation of the crowns of the cuspid and central. As summer vacation-time had now arrived, the operation was rested until autumn. The mechanism was taken from the mouth, and a clamp-band applied to temporarily hold the teeth in place until a better retainer could be made; one that would hold the teeth safely during summer. This one consisted of a hard-rubber plate, having on it a small screw-jack, and for the benefit of personal appearance two small artificial teeth, one filling the space between the lateral and central, the other between the lateral and first bicuspid.

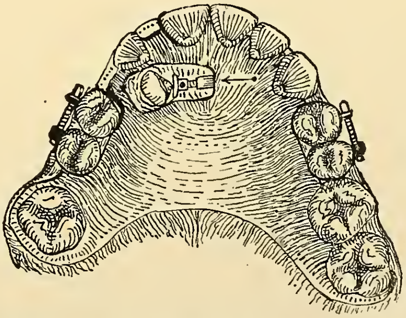

FIG. 1066.—The retainer worn during the summer vacation (A).

Fig. 1066 illustrates the case with the retaining mechanism and artificial teeth applied. To insure against loss of ground gained by the cuspid was the office of the tack-head screw-jack; this jack was arranged transversely to the dental arch, and held steady by one end of it being vulcanized into the plate as shown in the figure. The plate (which was anchored to the bicuspids by two gold clamp-bands) was of a form that prevented the cuspid and lateral from approaching each other, and the artificial teeth held in place the teeth that were already on the esthetic line. This was removed and cleansed daily.

When the patient returned, after her vacation, I found that the teeth had not lost ground. Although the case appeared to be in excellent condition for resuming work, it was further postponed, as the patient was obliged to leave the city again for an indefinite period. The retainer having the two artificial teeth upon it, however, was now removed, and temporarily substituted by the hook clamp-band used twice before. Fig. 1067 illustrates the

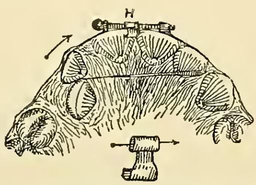

FIG. 1067.—Clamp-band temporarily used.

case with this band used for drawing the lateral nearer to the central. In the lower part of the figure, H represents the hook that hung from the screw and caught over the centrals to prevent the band from slipping upward. While this band was being worn a modification of the former retainer, with the addition of a spur, was being made.

Fig. 1068 represents this new retaining-plate, P; the spur is represented by X, the artificial tooth by T, and the anchor-bands by B. Fig. 1070 illustrates the same applied.

Fig. 1069 illustrates, by sectional view, the philosophy of action of the spur upon the cuspid, moving it in the direction indicated by the arrow. This spur acted properly, but slowly, for several weeks, and then one of the bands broke and loosened the plate; this retainer was now

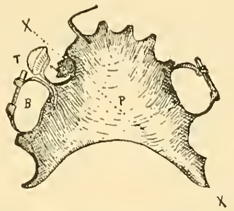

FIG. 1068.—The second retaining-plate (A).

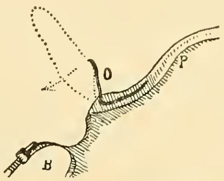

FIG. 1069.—Section view of a part of the plate, showing the application of the spur upon the cuspid.

thrown aside and replaced by another, formed as represented in Fig. 1071. This substitute, however, was not applied for about two days; meanwhile the case lost ground. Therefore one object sought by this new one was the regaining of the ground lost. This being easily accomplished,

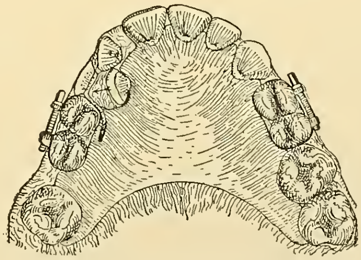

FIG. 1070.—Illustrating the case with the new mechanism (A).

the tooth now advanced apex foremost, the crown at the same time rightening up more and more by the pressure of the jack. To aid in holding the tack-head screw upon the cuspid, one end of a piece of gold wire flattened by a hammer was interposed between them, the other end being anchored into the plate. The effect of this wire (which extended forward, curving upward so as to lie between the tack-head of the screw and the cuspid) was the furnishing, in effect, of a flat surface to the tooth for the jack to bear against to prevent it from slipping.

While the cuspid was thus being moved, the lateral incisor was forced to regain its lost ground by another screw

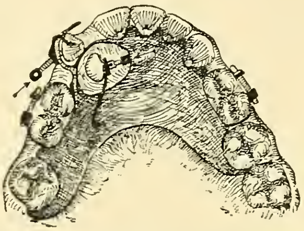

FIG. 1071.—The spur mechanism, applied to the teeth.

projecting through an arm extending from the (patient's) right side of the plate. To prevent the lateral from starting from its socket, and also to guide it toward the central, this arm had two guard-wires soldered to it, one of which rested on the cutting end, the other across the labial surface of the tooth.

Soon after the screw-jack was applied and the cuspid began to "right up," the gum-tissue over the root began to bulge, and continued to do so until the tumor pressed against the plate, causing itself pain. This necessitated frequent cutting or "hollowing out" of the palatine side of the roof-plate, to relieve the tumor of pressure. The case now progressed favorably for several weeks, the lateral moving up against the central, the cuspid moving around the lateral toward its proper place. The progress of the cuspid, however, was slow, because it could move only by absorption of a large quantity of alveolar tissue.

The vocation of the patient obliging her to be frequently from home also hindered the progress; more trouble, however, arose from the occasional breaking of the mechanism, from one cause or another, while the patient was away, thus permitting the teeth to repeatedly lose ground.

As the mechanism illustrated in Fig. 1071 had now finally finished its share of the work, it was removed and replaced by still another spur-plate, having an artificial tooth (similar to the one illustrated in Fig. 1068). To aid the anchorage there was in addition a clasp, to rest against the right side of the right central. This clasp caused the tooth (central) to move a short distance too far to the (patient's) left; but the cuspid was, by this additional anchorage, enabled to move nearly to its proper place in the arch. From this place it was extremely difficult to move it; persistent effort, however, placed it on the esthetic line; but the tooth still required to be slightly turned on its long axis before it could be regarded as correct. Great effort was made to accomplish this end; and while the tooth turned part way, it was impossible to turn it fully to its proper place, although the greatest force that screws (in the mouth) could exert was brought into use.

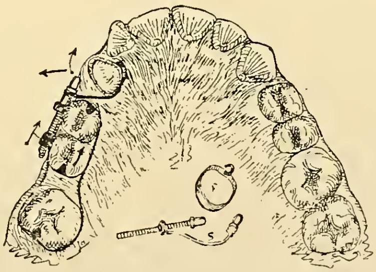

FIG. 1072.—Attempting to turn the cuspid upon its long axis (A).

Fig. 1072 illustrates one of the attempts at turning the cuspid. The mechanism consisted of an anchor clamp-band having a gold-wire loop (extending posteriorly to include the lone molar) and a platinum-wire splice (the size of a small pin) caught upon the anterior part of the lingual side of a ferule, and tightened upon by a screw entering the (double) nut on the buccal side of the clamp-band. The tooth moved outward slightly, and turned more. There appeared to be some unyielding resistance to its moving farther. To try again to overcome this resistance the splice was now taken from the mechanism, and a different draught-wire applied, not only to move the tooth farther outward, but also to turn it more still.

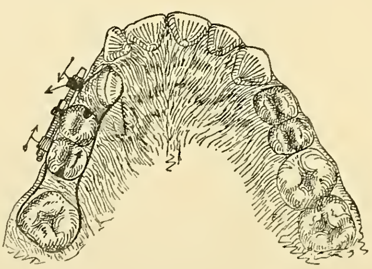

FIG. 1073.—Drawing upon the cuspid by a screw-and-splice mechanism (A).

The parts, represented in the lower part of Fig. 1072, consisted of a thin platinum ferule, F (having on one side a gold-wire hook), and a platinum draught-wire, S. The screw was the same as that used on the buccal side of the last mechanism. The ferule F was first cemented firmly upon the cuspid with phosphate of zinc, after which the splice-wire S was attached to the hook, and then connected with the buccal nut of the anchor-band by the screw as shown.

For several weeks a persistent effort was kept up with this mechanism and another represented by Fig. 1073 (shown as it appeared upon the teeth), but the effort resulted only in slight improvement. The cause of this stubbornness had not become apparent at this time; crookedness of the root of the cuspid, or of one or both of the adjacent teeth, seemed later to be the cause. This was evident by the lateral incisor moving slightly whenever the cuspid was moved.

The centrals, which were now crowded together, were, by the patient's request, forced slightly apart, so that they might appear as they did when she was a girl. Although the lateral had been moved into its proper place, the gum was so wasted away (before I saw the case)—the root being exposed for nearly one-fourth of an inch, and the socket being afflicted with loculosis alveolaris, the tooth also being darker than the other teeth—that the substitution of an artificial tooth mounted upon a light gold base, serving also as a retainer for the cuspid, was now advised for completion of the case.[1]

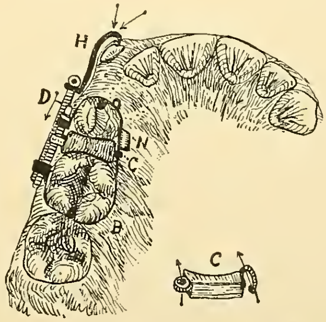

FIG. 1074.—Moving an arrested cuspid by a hook operated by a screw from a block clamp-band. First step (A).

Figs. 1074 and 1075 illustrate the first and second steps in an operation for moving posteriorly an arrested right

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[1] *What did the Operation Prove?*—It proved that it is possible to move a tooth, apex foremost, about one-fourth of an inch, without injury to its pulp, provided it be moved *very* slowly and is held there firmly.

That which has proved true in this kind of an operation would also be true of operations for depression of lower front teeth, if they could be held firmly until they could become fixed in their places; but as they cannot be so firmly upper cuspid. (A third step will be explained later on.) The peculiarity of this case was that the tooth was lying diagonally to its proper position, pointing forward, and beginning to show itself through the gum just above the lateral incisor.

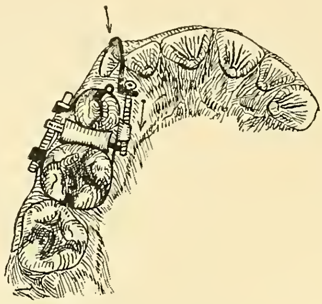

FIG. 1075.—Second step in the operation (A).

The elements of the mechanism used in both of these steps consisted of a hook, H, drag-screw, D, and a clamp-band, B, having an interdental block, C. This block was used to prevent the second bicuspid and first molar from being drawn toward each other by tightening of the clamp-band upon the anchorage teeth.[1]

When the case was first seen the deciduous cuspid was missing, and the right first and second bicuspids had erupted so far anterior to their proper places that there was no room left for the outstanding adult cuspid. There

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fixed, and play up and down continually, they are liable to lose their pulps from congestion of the sockets. This danger is not so great, however, with teeth the roots of which are only partly developed, as those that are fully developed; nor is it as difficult to depress partially developed teeth as it is to depress those that are perfected, because the open (tubular) roots of the former can harmlessly "telescope," so to speak, their pulps—an act that is not so liable to jugulate the nutrient tracks as is the forcing of the hard apex of a fully developed root against its nutrient tracks. The danger of irritating the great nerve also holds true.

[1] For fuller explanation concerning the construction of this class of mechanisms, see, through the Index, Interdental Block and Sash Clamp-bands.

was, however, a space between the second bicuspid and the first molar; this space was where it should be, however, if there must be one. By measurement it was found that extraction of the second bicuspid would not be more advantageous to the case than would be the extraction of the first bicuspid; the space that would be made by extraction of the first bicuspid would be sufficiently wide for the (adult) cuspid, without leaving extra space. The first act, therefore, was the extraction of the first bicuspid (see dotted line); the crown of the cuspid was then drawn from above the lateral, by the mechanism represented in Fig. 1074, to a point as near as possible to the place left by the first bicuspid. To catch the hook upon the cuspid it was necessary to expose more of its crown. This was accomplished by lancing the gum; and then a small undercut pit was drilled into the anterior part of the labial side of the tooth, at the place where the surface curves to constitute the anterior approximal side. Having everything now in readiness, the first stage of the mechanical part of the operation was commenced; the anchor-band was first screwed firmly upon the bicuspid and molar, after which the hook H (made of stiff 18 k. gold wire) was caught into the pit in the cuspid, and then connected with the buccal side of the anchor-band by the screw D. The patient was then given a bench-key (such as is represented by Fig. 308, Part VI., p. 347), with the instruction to gently turn the screw two or three times daily, but not sufficiently to cause pain. The cuspid moved posteriorly, but after several weeks of persistent effort it (the cuspid) still stood in the anterior position, and needed to be drawn inward before it would be in its proper relation to the other teeth; at this point the first stage ended.

Fig. 1075 illustrates the beginning of the second stage;

the screw was changed from the buccal nut of the clamp-band to one on its lingual side. The patient resuming the tightening process by turning this screw for several days, the cuspid was successfully placed on the line of arch; thus ended the second stage.

The cuspid now required to be turned; but to turn a cuspid that had only pointed through the gum has always been regarded as impossible, yet it was accomplished in this case.

This third and last stage was performed by two screw-jacks placed across the dental arch, one used for pulling upon, and the other for pushing the cuspid. These jacks were anchored by a clamp-band on four teeth—the cuspid, bicuspids, and first molar of the opposite side of the dental arch. (For details, see Part XVI., Turning, p. 1369.)

The cuspid was temporarily retained in its new place by two ferules and a piece of wire, one ferule being cemented on the cuspid, which was now sufficiently erupted to hold it; the other on the molar. The wire (lying along the dental arch) connected the two ferules.[1]

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[1] This operation should be read in connection with an operation on Elevation of Teeth in Part XVI., Chapter CXXXIV. (Fig. 1324.)

LOWER CUSPIDS.

SECTION D................DIVISION I.

Moving Lower Cuspids by Elastic Rubber.
" " " Corrugated Bands.
" " " Screws.

CHAPTER CIX.

SECTION D................DIVISION I.

MOVING LOWER CUSPIDS BY DIFFERENT KINDS OF MECHANISMS.

GENERAL AND SPECIAL REMARKS ON ANCHORAGE AND DIFFERENT KINDS OF ANCHORS FOR ATTACHING ENGINES OF FORCE. —OPERATIONS BY ELASTIC-RUBBER RINGS WITH SINGLE AND UNION FERULES.—OPERATIONS BY A RUBBER RING AND CLAMP-BANDS.—BY CORRUGATION OF A METALLIC BAND.—THE LONGITUDINAL SCREW CLAMP-BAND OPERATED BY ITS SCREW FOR SIMILAR CASES.

Anchors vs. Tipping of Anchorage Teeth.—Sometimes we read in the reports of discussions at meetings of dentists that the experience of some of them has proven to their satisfaction that the posterior teeth are not sufficient anchorage for moving lower cuspids posteriorly. So far as I have traced out the cases to which these dentists refer, I have generally found that simple single-tooth ferules were used as anchors, and not two or three ferules rigidly connected, nor clamp-bands of a size to embrace more than one tooth. So long as the philosophy of anchors in the mouth is not understood, and so long as the simplest laws of mutual resistance between the anchorage and the teeth to be moved are not comprehended by operators, they will meet with undesirable results. There is liability of moving forward anchorage teeth by any kind of draught, but tipping them forward to an injurious inclination seldom results from skilful hands. The side teeth are generally sufficient for anchorage, if made to support one another; the anchorage should never be less than the resistance in any case; some require more than others.

Reaction of Anchorage Teeth.—When it is desirable to make space by moving side (anchorage) teeth posteriorly, calculations should be made to guard against their return to their former positions, if the space anterior to them is needed for other teeth; reversely is this true when the side teeth are to be so drawn upon that they will move anteriorly. To disregard these points is to fail to have the desired results remain permanent; many are such failures.[1]

Lower cuspids are more easily moved by screw-acting mechanisms, when practicable to apply them, than by any other engine of force. When screw mechanisms are not practicable, resort may be had to other things, such as metallic springs, wedges, or elastic-rubber rings. The construction of mechanisms for lower teeth is similar in principle to that of those for correction of upper teeth, the main difference being in the form. The mechanism should not interfere with the tongue more than is necessary.

As little or no anchorage resistance can be obtained from the soft tissues (much less than can be secured from the roof of the mouth), the anchorage must be mainly, if not wholly, obtained from the teeth; but generally it is important that as many teeth be used in the anchorage as are necessary to move the irregular teeth without materially disturbing the anchorage teeth.

Different Anchors for Moving Lower Cuspids.—For the lower jaw, box-plates, clamp-bands, and ferules (single or

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[1] See Anchorage, Proper and Improper, Part XV., Chap. LXXI., p. 771.

multiple) have their advocates. The box-plate may be U-shape, embracing more or less of the crowns of the teeth on both sides of the dental arch, or it may cover the teeth of only one side. The plain U-plate, made to fit the lingual sides of the teeth, but not covering their antagonizing ends, is sometimes practicable.

If a wire spring is used, one extremity is vulcanized into the plate; but if rubber rings are used, they are attached to knobs, or to wire staples or hooks fastened into the plate.

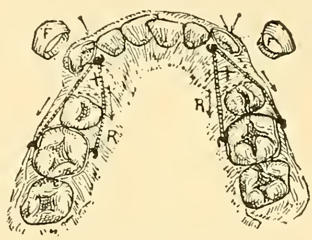

FIG. 1076.—Moving lower cuspids by elastic rubber and ferules.

Rubber and Bands.—Fig. 1076 illustrates a plan of moving lower cuspids. This plan (a modification of one by Dr. Chapin A. Harris) consists in placing a hook-ferule upon a cuspid, and another upon a molar, and connecting them by an elastic rubber. Having extracted the first bicuspids, the ferules F, F, made broader on the lingual sides, are first cemented upon the cuspids, and then the others are cemented upon the first molars. A rubber ring, R, is caught upon the lingual hook of each molar-ferule, and stretched forward over the hooks on the cuspid-ferules, thence posteriorly, and lodged upon the buccal hooks of the molar-ferules. Small anchors are useful for moving anchorage teeth anteriorly, as well as for moving the cuspids posteriorly, to entirely close too wide spaces caused by the extraction of bicuspids.

Fig. 1077 represents an operation for moving a right lower cuspid into the place of an extracted first bicuspid, by two elastic-rubber rings, R, anchored by two ferules, F, F, connected on the buccal side by a piece of platinum wire,

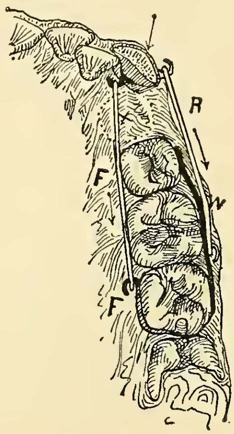

FIG. 1077.—Moving posteriorly a right lower cuspid (A).

W. The rubber rings were confined to the cuspid by two hooks upon a band. The action of this mechanism upon the cuspid is the same as that shown in the operation represented in the preceding figure; the anchor, however, is larger, in order to prevent moving the anchorage teeth.

FIG. 1078.—The Anchor.

FIG. 1078A.—Similar Anchor.

Fig. 1078 represents separately the anchor used in this case. Fig. 1078A is a similar anchor, the difference being in the number of the wires connecting the ferules. These anchors are among the best, and in some cases are superior to clamp-bands, because they do not cramp the teeth together; the wires are crooked to adjust the ferules.

Fig. 1079 illustrates the beginning of an operation for moving posteriorly two lower cuspids. One object sought in this operation was ample room for the evening of irregular lower incisors; another object was the shortening of the

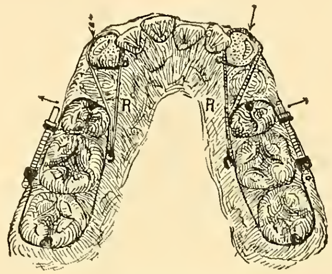

FIG. 1079.—Drawing posteriorly the lower cuspids by elastic rubber (A).

dental arch. As shortening was necessary in this case, the usual plan of evening the incisors by the extraction of one of them was not followed. The first bicuspids were extracted to make the necessary room by moving the cuspids posteriorly.

The mechanism used consisted of two gold clamp-bands, two platinum ferules, and two rubber rings. Each clamp-band, serving for an anchor, embraced two molars and one bicuspid; these teeth made ample anchorage to move posteriorly the cuspids, and subsequently to move and even the incisors. Each of these anchor-bands was connected with a cuspid by a rubber ring, R; a plain ferule, having a little hook, was previously cemented to each cuspid, to hold the rubber rings upon them. These rubber rings were renewed three times a week, until the cuspids had been drawn in contact with the molars; the teeth were retained there by larger clamp-bands in place of those used for anchoring the rubber rings.

Fig. 1080 represents a gold band used in an operation by

Dr. B. S. Byrnes. The lower cuspids occluded in front of the upper ones, and the third molars had begun to erupt behind—an already crowded arch. This tended, by antagonism, to push the lower teeth anterior to them farther for-

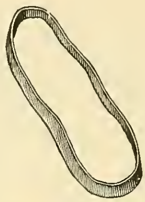

FIG. 1080.—The Gold Band.

ward. The first bicuspid on the left side was extracted to make space for the cuspid, after which this band, made sufficiently large to embrace the cuspid, second bicuspid, and first molar, was applied. During this stage of treatment the band was made to draw continuously by being corrugated. The jaws were kept a short distance apart by

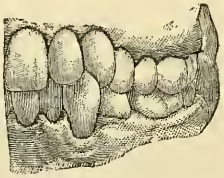

FIG. 1081.—Appearance of the case before the operation.

gags, consisting of molar thimble-caps (after the Desirabode plan). To keep up the pressure upon the teeth the gold band was occasionally made smaller by cutting out a small piece and resoldering the ends together. After ten weeks' treatment the tooth reached its proper place. Dr. Byrnes uses this principle frequently.[1]

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[1] "Dental Cosmos," 1886.

Screws.—Fig. 1082 illustrates one of the best plans for moving back an outstanding lower cuspid. The mechanism consists of a longitudinal screw clamp-band, made to embrace the cuspid, and two molars constituting the anchorage. In this case the first bicuspid was extracted

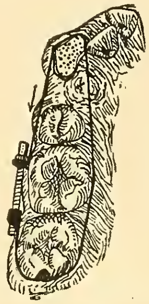

FIG. 1082.—Moving a left lower cuspid posteriorly by a clamp-band (A).

to make space for the cuspid. The clamp-band, being retightened every morning and evening, moved the tooth into its proper place in one week, less than the usual time necessary to accomplish such a result. This shortness of time was due to thinness of the septum between the cuspid and the socket of the extracted tooth.

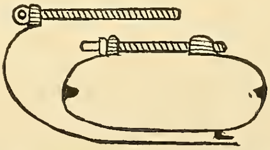

FIG. 1083.—Mechanism for moving an outstanding lower cuspid (A).

Fig. 1083 illustrates a mechanism for a similar operation. After the first bicuspid is drawn into the place of an extracted second bicuspid to make space for a cuspid by a clamp-band, the cuspid is drawn back by addition of a splice-piece.

UPPER BICUSPIDS.

Section E..............Division I.

Chap. CX. Moving Upper Bicuspids by { Peg-plates (various kinds). Spur-plates. Plates having Wire Springs. Plates with Scallop Wires.

" CXI. Moving Instanding Upper Bicuspids by Wire Springs without Plates.

" CXII. Moving Upper Bicuspids by Spiral Spring-jacks.

" CXIII. " " " Screw-acting Mechanisms.

ANTERIOR UPPER TEETH IN GROUPS.

Section E..............Division II.

Chap. CXIV. Correction of Irregular Upper Incisors by / Correction of Cuspids and Bicuspids by } { Simple and Complicated Mechanisms acting by Screws.

CHAPTER CX.

SECTION E.................DIVISION I.

UPPER BICUSPIDS CORRECTED BY SPUR-PLATES, AND BY WIRE SPRINGS ANCHORED TO PLATES.

GENERAL REMARKS UPON PLAIN PLATES, PEG-PLATES, PLATES WITH ELASTIC RUBBER IN GROOVES AND IN HOLES.—SPUR-PLATES.—OPERATIONS BY SPUR-PLATES.—OPERATIONS BY WIRE SPRINGS IN COMBINATION WITH PLATES.

IRREGULARITIES of the upper bicuspids generally result from lack of sufficient space between the adult cuspids and the first adult molars. This lack of space is caused by irregularity in the order of the eruption of the cuspids and bicuspids, a condition sometimes aggravated by the moving forward of the first molars. These irregular (upper) bicuspids are generally found to have encroached upon the space belonging to the tongue. Such oppositely instanding bicuspids may be moved outward by roof-plates, so formed that they will press upon these teeth and upon no others; or they may be moved outward by springs or by screw-jacks, provided ample space be made for the teeth.

Plain Roof-plates.—Fifty years ago roof-plates were made of silver, but now they are generally made of hard rubber. Formerly these plates were used only a short time, and then they were replaced by new ones. This renewal of plates was thought to be necessary in order to keep up the pressure upon the teeth acted upon, because the influence of any one plate was soon destroyed by the moving of the teeth away from the plate. The making of a series of plates now belongs only to the followers of old customs. The improved mechanisms vary in merit greatly, but all are constructed upon the plan of making the plate adjustable to meet the changes in the position of the teeth.

Peg-plates.—One of the oldest of these modern kinds is a plate having holes in the dental borders, in which wooden crutch-headed pegs are inserted to bear upon the teeth. These pegs are substituted by longer ones whenever the older ones become too short for proper pressure. Instead of wooden pegs I sometimes use steel or gold fish-tail headed screws, which are easily adjusted by turning them. By these, any degree of pressure can be kept up, provided the teeth do not flare outward. See Chapter XLIV; see also Screws, Part VI., Chapter XL., p. 434; also Part XVIII., Widening Dental Arches.

Plates with Elastic Rubber in Grooves and in Holes in and near the Borders.—Instead of using wooden pegs or screws in plates, some dentists use elastic rubber, sewed into a groove made longitudinally into the border of the plate, as suggested by Dr. J. B. Littig. The teeth are moved by the elastic rubber pressing upon them. Another dentist (whose name has escaped my memory) suggests a different plan of using rubber: he bores holes transversely through the plate, at points about one-eighth of an inch from the border, so as to intersect other holes bored into the border (as in an ordinary peg-plate). In the latter holes are then placed loose wooden pegs, after having drawn a piece of round rubber string into each of the first-mentioned holes. These strings, which are then cut off flush with the two surfaces of the plate, serve as springs to bear against the ends of the loose wooden pegs, which are thereby made to maintain the pressure upon the teeth. When the plate is forced into its proper place in the dental arch, the pegs slide into their holes and condense the rubber behind them, which, reacting (it is claimed), holds the mechanism upon the teeth, and keeps up its work.

Spur-plates.—Very practicable mechanisms for moving outward instanding teeth are found in a class that I denominate spur-plates.[1] These plates are of various forms.

FIG. 1084.—Sectional view of a spur-plate for moving bicuspid teeth (A).

Fig. 1084 illustrates in section one of the mechanisms (devised in 1873[1]). This plate is made of hard rubber, and the spurs of gold cut from thick 18 k. plate and bent U-shape. One arm of each spur is riveted to the border of the plate with platinum pins taken from porcelain teeth; the other is filed at the end to a fish-tail form, to fit the lingual wall of the tooth to be moved. All that is necessary to continue the usefulness of the mechanism, after the teeth have moved so that the spurs cease to press suffi-

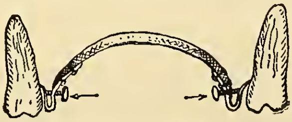

FIG. 1085.—Sectional view of screw-acting spur-plate (A).

ciently upon them, is to bend the free arms of the spurs farther outward from the plate.

Fig. 1085 represents a sectional view of another of these

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[1] Devised by the author.

spur-plates, devised in the same year (1873). It was used for moving two instanding upper bicuspids outward, each spur being operated by a little screw.

Instead of riveting the spurs to the plate, as shown in this figure, I now generally vulcanize them into the border of the plate. For further particulars about the making of these plates, refer to Spur-plates, in the Index.

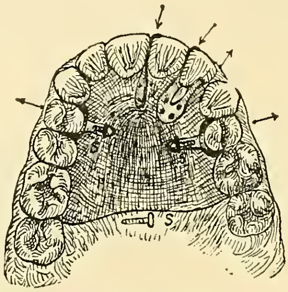

FIG. 1086.—Appearance of a case with the spur-plate being used as a retaining-plate.[1]

Fig. 1086 illustrates a stage of a larger operation, at a time when the case was nearly completed. The irregular incisors had been corrected in the earlier stages, and are now being retained by hooks on the same plate, supporting spurs, acting upon an instanding right first bicuspid and the left second bicuspid.

Like the plate last described, the spurs on this one were made of strips of gold plate, bent as represented, and riveted to the hard-rubber plate by platinum pins taken from porcelain teeth. To maintain the force against the moving teeth, the arms of the spurs were occasionally opened by turning short thumb-screws, s.[2]

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[1] Invented in 1873 (A).

[2] To make room for the various irregular teeth, I extracted the left first bicuspid in the first stage of the operation. This operation (one of my early efforts) was at a time when my experience in the regulation of teeth by spurs was limited.

When all the teeth were corrected the patient used a roof-plate as a retainer for more than a year; then she laid it aside for a year, as all appeared to be perfectly stationary. Afterward, however, an irregularity took place in the teeth, which, though only slight, was sufficient to prove that in this case there were too many teeth, and that it would have been better to have also extracted another tooth—the bicuspid on the opposite side of the arch.

Moving Upper Bicuspids by Metallic Springs.—Among the mechanisms in vogue for moving bicuspids is the well-known kind consisting of springs anchored to plates. These mechanisms are similar to those used for moving incisors and cuspids, and have already been described in the chapters upon moving cuspids.

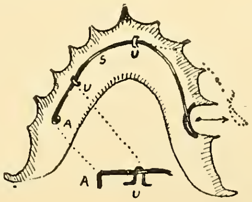

FIG. 1087.—Spring mechanism for moving an instanding left upper bicuspid (A).

Fig. 1087 illustrates a modification of this class of mechanisms. This one, designed for moving outward an instanding left upper second bicuspid, consisted of a hard-rubber U-plate and a wire spring, combined as follows: the spring S, made of steel piano-wire the size of a pin, bent into the form shown in the figure, was anchored to the part of the plate opposite to the tooth to be moved. One extremity of the wire was bent at a right angle to project through a hole, A, in the plate, the other parts were confined to the plate by two platinum-wire staples, U, U. The form of these staples, and the right-angle extremity of the spring, are shown in the lower part of the figure.

The spring is represented as sprung into the form that it would take if applied to the tooth, when moving it in the direction indicated by the arrow.[1]

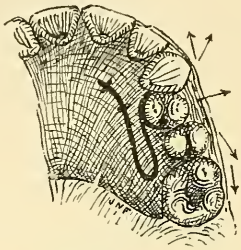

FIG. 1088.—Spring mechanism for moving an instanding bicuspid.

Fig. 1088 illustrates an operation upon an instanding left upper bicuspid, by a plate having a spring. The drawback of this mechanism is its weak anchorage and the spring being anchored on the wrong side of the plate. Plain plates should be anchored to the teeth by clamp-bands vulcanized into their sides, similarly as represented in Part VI., Fig. 89, p. 219. This mechanism, as well as the one represented by the preceding figure, must be regarded as merely modifications of those devised by Taft, and later by Coffin.

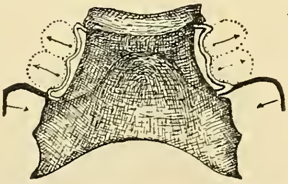

FIG. 1089.—Scallop-wire plate for regulating instanding upper bicuspids (A).

Fig. 1089 represents a wire-acting mechanism of the class in which a plate constitutes the anchor. The object

[1] To prevent springing of all plates, the spring should be anchored to the side of the plate opposite to the tooth to be moved, unless the plate be made very thick and strong.

for which this mechanism was devised was the moving outward of four instanding upper bicuspids. The moving part was made of delicate wire, the ends of which were vulcanized into the borders of the hard-rubber plate. In use the corrugated wires were occasionally rebent farther outward from the plate, to keep up the pressure on the moving teeth. The projections (in black) represent two clasps. The anterior part of the plate was made sufficiently thick to prevent it from being warped when the mechanism was forced upon the teeth. This mechanism is one of the best for widening the bicuspid section of the dental arch. If the instanding teeth incline wrongly for retaining the plate, the latter should be supplied with clamp-bands to bind them to some of the other teeth; but in such emergencies a transpalatine screw-jack, anchored to the teeth to be moved, by ferules, or clamp-bands, is far more reliable. (See Part VI., Chapter XXVIII., p. 305, Figs. 239, 241.)

CHAPTER CXI.

MOVING OFFSTANDING UPPER BICUSPIDS BY WIRE SPRINGS WITHOUT PLATES.

GENERAL REMARKS.—OPERATION BY A WIRE SPRING ANCHORED BY A FERULE.—OPERATION FOR MOVING FOUR BICUSPIDS OUTWARD BY A DETACHABLE WIRE BOW-SPRING ANCHORED BY FERULES.—OPERATION UPON INSTANDING BICUSPIDS BY A BOW-SPRING ANCHORED BY CLASPS.—BY COMPENSATING-SPRINGS ANCHORED BY A CLAMP-BAND.—BY A SPRING-LOOP.—BY AN ELLIPTICAL SPRING.—BY A BAR-FERULE.—OPERATION BY AN ELLIPTIC AND SEMI-ELLIPTIC SPRING MECHANISM.

UNDER some circumstances the moving of bicuspids by metallic springs is very easy, and the rate of motion satisfactory; but under other circumstances it is difficult and slow. There are two common kinds of mechanisms in which wire springs are used. In one the springs are anchored to plates; in the other plates do not constitute a part of the mechanism. The main difference in value of the two kinds is in the degree of inconvenience in the making and the wearing of them. Generally upper bicuspids can be corrected as easily by small mechanisms as by larger ones. There are cases, however, where the larger ones are more effective and better in every respect; cases in which it is necessary to use the larger are few. Having previously explained the operations by springs anchored by plates, there now remain for consideration those in which springs are anchored by other means than by plates. This class of mechanisms, small in size, are somewhat numerous. Some of these will be represented as mounted upon the teeth, while others will be represented independently.

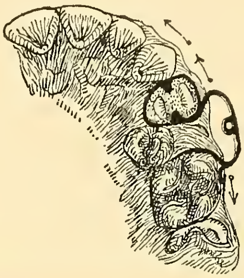

FIG. 1090.—First step in an operation for moving outward an instanding bicuspid by a wire spring aided by rubber (A).

Fig. 1090 illustrates the first step in an operation for moving to line an instanding left upper second bicuspid. The first step was the widening of the space between the first bicuspid and the first molar by the wire spring; the next step was the drawing of the instanding bicuspid into the space by elastic rubber anchored to a ring in the middle part of this spring.

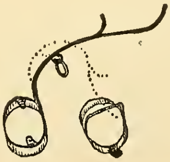

FIG. 1091.—The Mechanism (A).

Fig. 1091 represents the entire mechanism, consisting of a gold anchor-ferule, wire spring, gum-guard ring, and a rubber ring. The spring and its anchor were constructed as follows: to a broad platinum ferule, made to fit around the first bicuspid (to serve as an anchorage), was soldered one end of a piece of gold spring-wire (cut from a broken spectacle-bow); to the middle third of this wire was soft-soldered a small ring.[1]

When ready to apply, the ferule was first cemented (with phosphate of zinc) upon the first bicuspid, after which the spring (the free extremity of which was flattened) was sprung between the bicuspid and molar, so as to bear upon both as shown. After these teeth had been sufficiently separated the second stage of the operation was begun.

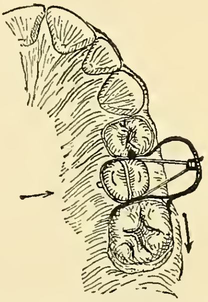

FIG. 1092.—Second stage of the operation.

Fig. 1092 illustrates this stage. The rubber ring was first caught upon the bicuspid, then drawn through the gold ring on the wire spring, and again around the bicuspid, then through the ring, and caught over the tooth again. To prevent the rubber from slipping upward and injuring the gum a thin (platinum) gum-guard ring was previously placed upon the bicuspid. In about three weeks this tooth was drawn to line.

The peculiar advantages of this mechanism over one in which the spring is attached to a roof-plate are freedom from interference by the tongue and the slight inconvenience to the patient.[2]

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[1] The object of using soft solder was to prevent, as far as practicable, the loss of elasticity in the wire by too great a degree of heat.

[2] Instead of a ring in the middle of the spring, a coil can be used. This is

Fig. 1093 illustrates the latter part of an operation for correction of four instanding upper bicuspids, the crowns of which were very short and conical. The mechanism was a modification of an old and well-known one called a U-plate, formerly made of silver or gold, but now generally made of hard rubber. The mechanism illustrated consists of a long piece of gold spring-wire (bent in the form

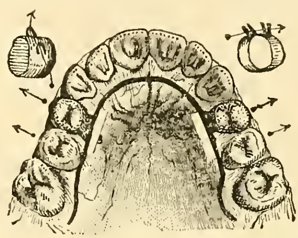

FIG. 1093.—Moving outward oppositely instanding bicuspids by a detachable trans-palatine wire spring (A).

of a bow), and two thin platinum (independent) ferules, each one fitting a first bicuspid tooth. Two platinum-wire staples were soldered to the lingual surface of one of these ferules, and to the other, two bifurcated lugs (represented in the upper part of the main figure). To apply the mechanism the ferules were first cemented upon the teeth to be moved; then one extremity of the bow-spring was passed through the staples on the ferule on the right side, while the other extremity was sprung between the bifurcated lugs on the left ferule. To aid in holding the spring in its proper place, a small ball was soldered on each extremity, one ball resting against the anterior staple (on the right), the other between the lugs (on the left). The middle third of the spring may rest upon the lingual surface of the

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made in the same wire that constitutes the spring. Sometimes a mechanism having a second broad ferule to fit around the molar, to give a firmer anchorage to the spring, is superior to this one. Various modifications of this mechanism have been devised by other dentists as well as by myself.

front teeth, the arms riding clear of all teeth excepting those that were to be moved.

The chief drawback in an adjustable mechanism of this kind is the tendency of the bow to play up and down by the action of the tongue. To overcome this was one of the objects of the two staples and lugs on the ferule. Accuracy of fit between the spring and staples is important. To aid in preventing this play, the arms projected posteriorly from the ferules and rested lightly on the gums beyond.[1]

The object of having this wire detachable, instead of being soldered to the ferules, as is the usual custom, was to enable me to increase the power of the spring (by opening it wider) without removing the ferules that were cemented to the teeth, which were too short and conical to hold the ferules without the aid of cement.

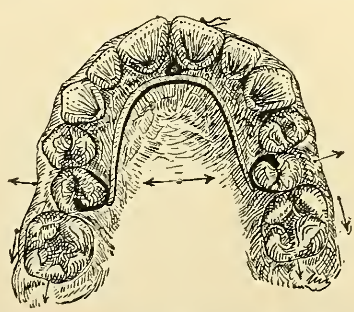

FIG. 1094.—Moving upper second bicuspids by a bow-spring with two clasps.[2]

Fig. 1094 illustrates an operation for moving outward to line two instanding second upper bicuspids by force from elasticity of metal. The mechanism consisted of three parts, viz., a long piece of elastic gold spectacle-bow wire,

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[1] This combination of the spring and ferules is not new. It has its prototype in the long-band and ferules of Desirabode's time (1823). (See Part VI., p. 337.) A tube is superior to staples for holding the spring.

[2] For other modifications of this mechanism, see Fig. 422, p. 440.

and two gold clasps having gum-guard ears to rest in the sulci of the crowns of the instanding teeth. Fig. 1095 represents this mechanism as it appeared before the tie-ring was applied or the ears were soldered to the clasps. Generally,

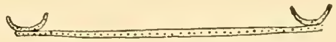

FIG. 1095.—Mechanism before ears were applied.

this mechanism is practicable only in cases where there are no second molars (as in the case preceding this), and where the instanding bicuspids require very slight additional space to accommodate them.

The plan of the operation consisted in moving the first molars backward, by forcing, wedge-like, the instanding teeth between them and the first bicuspids. This wedging of a tooth between others tends to move the first bicuspids outward, as well as to move the molars posteriorly, consequently to move such teeth in cases that require considerable separation of the adjacent teeth would be unsuccessful.[1]

FIG. 1096.—Moving bicuspids by compensating springs (A).

Fig. 1096 illustrates an operation, before full eruption of the second molar, for correction of a case in which the two left upper bicuspids were crowded slightly out of line, the

[1] For several modifications of spring mechanisms, see Part XIX. The principle of this one, and that of all similar to it, in which a long piece of flat or round wire is used for moving opposite side teeth outward, whether the

first bicuspid standing in the posterior, the second in the anterior position.

The mechanism used consisted of two pieces of gold spring-wire (cut from a very stiff round-wire spectacle-bow) soldered to a single-tooth clamp-band fitting the first molar. This mechanism was worn continually until the teeth were corrected. To keep up the pressure it was occasionally removed and the springs rebent inward.[1]

In this case the irregularity admitted of the application of springs, so that the influence of one of them upon the anchorage tooth was counterbalanced by that of the other, while the bicuspids were being forced into their proper places. The two springs acted not only upon the bicuspids, but by forcing them, wedge-like, into line, they caused the anchorage molar to move slightly posteriorly.

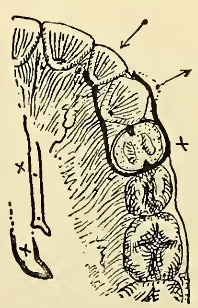

FIG. 1097.—A similar mechanism (A).

Fig. 1097 illustrates the results of a similar operation, upon a cuspid and lateral, by a similar mechanism, the main difference being in the anchor. In this case the springs

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spring be applied across the arch, and approximately corresponding with the curve of the palate, or along (near) the lingual surface of the dental arch, is only a modification of the Westcott mechanism, published in the "Dental Cosmos," 1859, and of another shown by Magitot in his "Dental Anomalies," 1867; and these in turn are but modifications of Bourdet's crude mechanisms, published in 1757–86. (See Figs. 164–166, pp. 263, 264, and figures on p. 337.)

[1] German-silver or steel wire might have been used instead of gold, but the

(one wire) were longer and were anchored by a ferule. The arrows indicate the direction opposite to the movements of the cuspid and lateral. (See Part VII., p. 373.)

Fig. 1098 illustrates one of the best operations for moving an instanding bicuspid outward. In this case (a man about thirty years of age) the second bicuspid had previously been extracted to make room for several jumbled teeth. This simple mechanism consisted of a gold ferule

FIG. 1098.—Correction of a bicuspid by a bar-ferule.[1]

with a piece of gold spring-wire soldered to its buccal side. The ferule applied left the wire riding hard upon the buccal sides of the adjacent teeth, as represented. The tooth was moved into line in twelve days. During the process the mechanism was removed three times and the wire rebent, so as to keep up a strong drawing force upon the instanding tooth. The same mechanism (cemented in place) served as the retainer, as did that in the preceding case.

Concerning the value of this little mechanism for moving a single instanding tooth into line, where there is already nearly sufficient space for it, too much cannot be said in praise. It is cheap and easy to make, easy to apply, easy to manage, and easy to remove for altering the form of the wire.

Fig. 1099 represents a mechanism devised by Dr. C. P.

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latter was preferred because it would not blacken by use. To rigidly couple the wires upon the band there should be more solder used at the posterior junction of the wires and the bands than is represented in these figures. For more on compensating mechanisms, see Part VI., p. 268, Fig. 172.

[1] Concerning the history of the arm-bands, see Part VII., pp. 369–371.

Wilson for moving an instanding bicuspid to line. This is in some respects similar, but superior, to the mechanism represented by Fig. 1102; instead of a screw, with a ribbon extending around the tooth, the loop is of smooth platinum

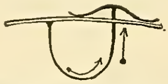


FIG. 1099.—Semi-elliptic spring and a loop for moving a bicuspid (Wilson).

wire, one end being soldered to the bar, the other projected through a hole in it and connected by solder with a spring that rested loosely upon the buccal side of the bar, as represented in the figure. (See Part VI., p. 369, Fig. 324.)

When ready to be applied, the spring is forced down upon the bar until it is nearly straight; the loop is then forced upon the tooth, and the spring liberated, thus causing a steady draught upon the tooth.

In cases requiring but slight additional space this mechanism is as effective as it is simple; not only is it practicable for moving a tooth, but if allowed to remain it serves well for retaining the tooth in its proper place after being corrected.

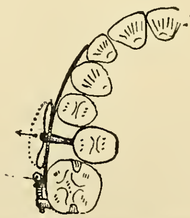


FIG. 1100.—Elliptic-spring mechanism for moving a bicuspid (A).

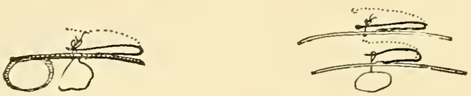
Fig. 1100 illustrates a plan of operation for drawing an instanding second bicuspid to line by power of an elliptic spring made of *delicate elastic wire* (soft-)soldered to a strip of platinum and gold plate, one end of which is soldered to a clamp-band used for anchoring the strip to the first molar. Independent of these different but united parts is a thin, narrow (18 k.) gold ferule, having on one side a small platinum-wire staple. This ferule, when applied to the instanding tooth, serves as a convenient means of connecting the instanding tooth with the spring. As will be seen, this spring is but a slight modification of Dr. C. P. Wilson's spring. (See Fig. 1099.)

To apply the mechanism the anchor-band is so arranged and fastened to the first molar that the strip projects forward and rests upon the first bicuspid and cuspid. The ferule is forced snugly over the instanding tooth and connected with the elliptic spring by a linen string drawn so tight that the shape of the spring is changed from that represented by the dotted line to that shown in figure. There being no second molar, and the instanding tooth requiring but little additional space, the power derived from this spring forced the first molar away and drew the instanding bicuspid to line.

FIGS. 1101, 1102.—Two modifications of the elliptic-spring mechanism (A).

Figs. 1101 and 1102 represent the working parts of two elliptic-spring mechanisms that are similar to the one last described. They differ only in that in each mechanism the ferule is connected (by solder) with the spring by a short piece of small platinum wire, which projects through a hole in the bridge-piece; this bridge is anchored at one end to a neighboring tooth by a clamp-band or a ferule.

Figs. 1103 and 1104 represent less valuable modifications of the Wilson mechanisms. The bridge-pieces are anchored by ferules. The instanding tooth is connected with the spring by platinum wire (Fig. 1104), or, better, by a ferule and detachable wire united by solder (Fig. 1105).



FIGS. 1103, 1104.—Other Modifications (A).

Yoke Clamp-band or Screw-acting Loops.—Fig. 1105 represents one of a class of small mechanisms for moving instanding bicuspids outward. The principle of construction is the same as that in my transverse screw clamp-band, used for anchoring mechanisms to the teeth, and published several years ago.[1]

The mechanism here represented consists of a narrow strip of plate, B, of sufficient length to span the space made

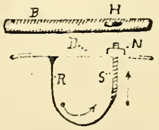


FIG. 1105.—Yoke clamp-band for drawing an instanding bicuspid to line (A).

by the instanding tooth, and to rest upon the buccal surfaces of the adjacent teeth. To this strip (at a point about one-fourth distant from one end) is soldered one end of a gold ribbon, R. To the other extremity of this ribbon is soldered a small screw, S, which projects through an oval hole, H, in the strip B. The screw is held in place and drawn upon by a nut, N.

To apply this mechanism the screw is first projected

[1] Published in the "Dental Cosmos," October, 1877; shown also in Part VI., Fig. 265, and Part VII., Fig. 378.

through the V-shape space (near the gum) between the instanding tooth and one of the teeth adjacent to it, and thence through the oval hole in the strip, after having previously pushed the ribbon between the tooth to be moved and the nearest (opposite) adjacent tooth.

The hole in the bar is made oval to permit play of the screw, so as to adjust the loop to the tooth. To prevent slipping, an ear (not shown in the figure) is soldered to the middle of the ribbon, to rest upon the grinding surface of the instanding tooth. To operate the mechanism the nut is turned two or three times daily. This act tightens the ribbon upon the instanding bicuspid, and draws it out between the adjacent teeth.

Instead of making the mechanism adjustable by an oval hole in the strip, I prefer to make it adjustable by soldering a rectangular wire loop to the other end of the ribbon. This slides back and forth upon the strip, instead of being

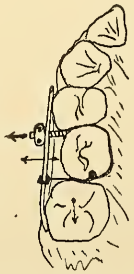


FIG. 1106.—Moving an instanding bicuspid to line by a yoke mechanism (A).

stationary and immovable upon the strip as shown by Fig. 1105. This plan is illustrated in Part VII., Fig. 325, p. 369. See also Part VIII., Fig. 379, p. 418.[1]

Fig. 1106 represents another of my oldest plans of mov-

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1 Published in the "Dental Cosmos," February, 1879.

ing an instanding right upper second bicuspid to line by a loop mechanism consisting of a bridge-piece and a gold ribbon operated by a screw and nut. The loop is made adjustable by one end of the ribbon being attached to the bridge-piece by a rectangular ferule; the screw projects through a round hole in the bridge.

CHAPTER CXII.

SPIRAL SPRING-JACKS FOR MOVING UPPER BICUSPIDS.

ADJUSTABLE AND NON-ADJUSTABLE SPRING-JACKS.

IN Part VI., pp. 263–270, several varieties of spring-jacks and their application for moving teeth, are illustrated and explained; these jacks are practicable for moving bicuspid as well as other forms of teeth. Some of the wires constituting the spring are straight, others corrugated, some having only one curve, others more; but not one of them is of spiral form; this class was reserved for this chapter. Dr. W. G. A. Bonwill says that he "devised a spiral spring-jack in 1861 or 1862."[1] Since that time several similar mechanisms have been brought out by other dentists, but only a few are of value.

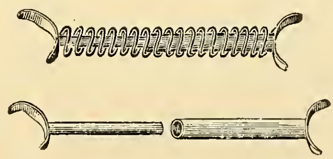


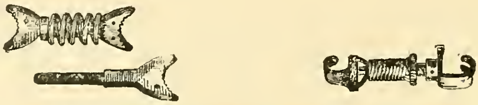
FIG. 1107.—Spring-jack (Bonwill).

Fig. 1107 represents Dr. Bonwill's spring-jack. This jack consists of two crutch-pieces, the shaft of one being cylindrical and solid, and that of the other, cylindrical and

[1] Dr. Bonwill made this claim at a meeting of the First District Dental Society of the State of New York in 1888, but said that the jack had not then been published.

tubular, the latter serving as a sleeve to the former. These hold each other in line. The mechanism is operated by a spiral spring embracing the outside of the sleeve and bearing against the crutch-head extremities as represented in the figure.

Several years after this time, T. S. Holmes devised two modifications of spiral spring-jacks that are quite similar to that of Dr. Bonwill.



FIGS. 1108, 1109.—Adjustable Spring-jacks (Holmes).

Figs. 1108 and 1109 represent these jacks.[1] In addition to the elements in the Bonwill jack there is in these an adjustable screw-cut nut that plays on the outside of the tube. By turning the nut the force can be increased or diminished at will. This mechanism differs also in that, instead of the spiral spring being of single wire, it is made of two wires, one being parallel to the other (*i. e.*, the two wires, placed side by side, are both coiled at the same time).

All of these spring-jacks are somewhat clumsy and uncleanly when used, but by proper care they are practicable.

FIG. 1110.—Non-adjustable wire spring-jack (A).

The former can hardly be regarded as differing sufficiently from Dr. Bonwill's instrument to be called novel, but the latter is superior in that it is made adjustable by the addition of the nut.

[1] Dr. Holmes patented his improvements.

Fig. 1110 represents a simple spiral spring-jack that is occasionally useful. It consists simply of a piece of stiff steel wire having a spiral midway and a crutch-piece at each end.

All of these spring-jacks may be applied in the same way that screw-jacks are used, whether independently or in combination with plates, ferules, or clamp-bands as anchors. In whatever way they are used, however, they should be so applied that they cannot easily be dislodged. (For several other forms and kinds of mechanisms for similar uses, see Part VI., pp. 263–283.)

CHAPTER CXIII.

MOVING UPPER BICUSPIDS BY SCREW-ACTING MECHANISMS.

GENERAL REMARKS.—OPERATIONS UPON INSTANDING BICUSPIDS BY DIRECT FORCE.—BY INDIRECT FORCE.—BY A SCREW-JACK IN COMBINATION WITH A STAY-CORD.—OPERATIONS BY BRIDGE MECHANISMS.—BY VARIOUS RIBBON MECHANISMS.—BY TRIPLEX-ACTING EVENERS.—SEVERAL MODIFICATIONS.—BY RIGID EVENERS.

MECHANISMS for moving bicuspid teeth differ in construction. One of the simplest operates by a spring, several forms of which are illustrated in the two preceding chapters. But some of the most effective mechanisms for moving these teeth are operated by screws, the anchorage of which is on the side of the dental arch opposite the tooth to be moved, or on both sides if more than one tooth, oppositely situated, is to be moved. Among these mechanisms are jacks that are used for pulling upon teeth, and others for pushing them. The use of those made especially for pushing is confined to cases of instanding teeth, while those made for pulling are used for outstanding teeth. As the latter kind of jack has a swivel, it is equally practicable for teeth standing in either position; this kind being superior to the other, our cases will be illustrated with it.[1]

[1] For the other kind of screw-jacks, see Part VI., p. 282, Figs. 202, 203.

Besides screw-jacks, there is a class of bridge mechanisms, operated by screws, that are practicable in some cases. To illustrate operations where several of these various mechanisms were used is the object of this chapter. The first to claim our attention is the screw-jack class, and its uses in moving teeth in a direct and in an indirect line, over equal or over unequal distances, as the cases may require. These various actions by a single screw-jack are not only interesting, but instructive, as lessons in the use of first-class mechanisms.

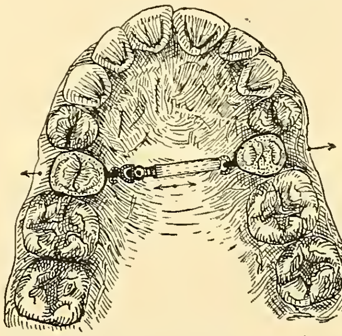


FIG. 1111.—Moving upper instanding bicuspids to line by a screw-jack (A).

Direct Force.—Operation by a Screw-jack Mechanism.—Fig. 1111 illustrates an operation for moving outward by (nearly) direct force two instanding upper second bicuspids by a swivel screw-jack anchored by two ferules cemented to the teeth to be moved. The principle of the operation is so clearly shown in the figure that further explanation is unnecessary. These teeth were moved by the patient lengthening the screw-jack every morning and evening by a right-angle lever, the main part of the operation being performed at home.

The construction of this mechanism is explained in Part VI., pp. 282, 294, 305, and in Part VIII., p. 438.

Indirect Force.—Operation by a Screw-jack Mechanism.— Fig. 1112 illustrates an operation for correcting irregular bicuspids that require to be moved different distances; the force used being from a screw-jack applied diagonally across the dental arch.

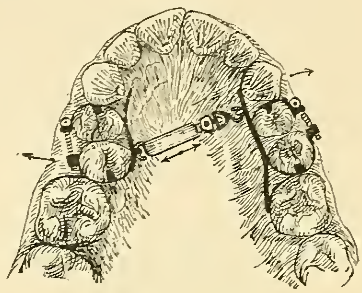


FIG. 1112.—Moving several bicuspid teeth over unequal distances at the same time, by force of one screw-jack applied diagonally across the arch (A).

The special object in presenting this and the two following cases is to show how several irregular teeth not oppositely situated can be moved different distances at the same time by one line of force; in other words, to show how irregular movements of the teeth can easily be made by very simple machines.

The mechanism used in this case consisted of a simple swivel screw-jack and two clamp-band anchors, each of which had a ring soldered to its lingual side to connect the jack with it. The object of applying the force diagonally was to cause the greatest pressure against the teeth which needed to be moved the longest distance, and less force against those teeth that needed to be moved a shorter distance. To secure sufficiently firm anchorage for this case a stiff bar was soldered to the lingual side of each clamp-band, to bear upon the lingual sides of the bands, as shown in the figure. These bands were first tried upon the bicuspids, and the jack approximately fitted in between them;

all were then removed, and the extremities of the jack hooked into the rings on the bars of the clamp-bands. After the hooks on the ends of the jack were closed tightly (by pincers) to hold all parts together, the mechanism was applied to the teeth as shown. The main part of the operation was carried on by the patient at his home, by lengthening the jack with a right-angle key.

The effect of the force moved the left cuspid and right first and second bicuspids in the directions indicated by arrows, while the left second bicuspid remained comparatively stationary. The anterior extremity of the right clamp-band bar was so bent that it did not rest upon the right cuspid until the first bicuspid had moved its proper distance to be on line of the dental arch. This tooth was arrested in its progress by this bar coming in contact with the cuspid, permitting only the (right) second bicuspid to move on; this oblique action is one of the special virtues of this plan of operation.

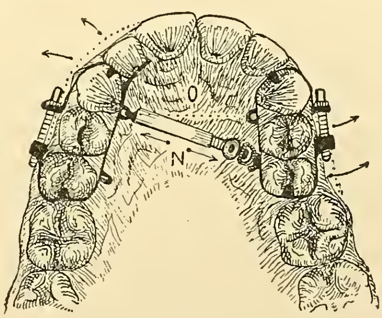


FIG. 1113.—Moving the left upper bicuspids by force applied diagonally (A).

Fig. 1113 illustrates an operation for moving the instanding left upper bicuspids and the right cuspid and lateral to line by a mechanism similar to the one represented in Fig. 1112, but applied so that the force was directed somewhat differently, and in such a way that the four teeth moved in the direction indicated by arrows. The mechanism consisted of two clamp-bands and one swivel screw-jack, connected as shown in the figures.

Instead of applying the jack N directly across the dental arch (on the dotted line O), which, if so applied, would have forced the left cuspid out of its proper place, and have done nothing toward the correction of the left bicuspids, it was applied diagonally across it, so that by one act all the teeth were corrected at the same time. The dotted lines show the position of the teeth after they were corrected. For similar cases there is no mechanism known that is equal to this and the one represented by Fig. 1112. To construct the mechanism requires some skill, but it is simple in action, and operates perfectly, with the greatest ease.

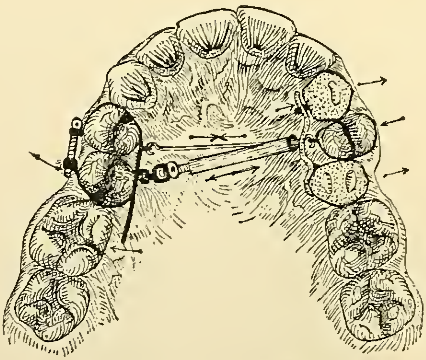


FIG. 1114.—Moving outward instanding upper bicuspids by a peculiar mechanism (A).

Fig. 1114 illustrates a very interesting operation for moving outward two instanding second upper bicuspids and the left cuspid by a screw-jack diagonally applied. The peculiarity of the operation is the mechanism by which the teeth were corrected without disturbing the two first bicuspids, already in their proper places.

The entire mechanism consisted of the screw-jack, a clamp-band having a stiff bar soldered to its lingual side, three thin gold ferules, and a transpalatine binding-cord made of wire. The bar on the clamp-band (on patient's right side) was used for a double purpose: first, to prevent the second bicuspid from moving too far when the force was applied, and, second, to increase the anchorage. The arrest of movement of the bicuspid was caused by the molar when the bar came in contact with it, thus transferring the anchorage from the bicuspid to a firmer one in the molar, and permitting continuation of the movement of the (left) cuspid and second bicuspid without changing the position of the screw-jack.

To prevent the left first bicuspid from being pushed out of line by the cuspid and second bicuspid rubbing against it while moving outward, a wire cord was so applied across the arch as to connect this tooth (left first bicuspid) with the clamp-band bar at a point off against the right first bicuspid.

The ferules cemented on the left cuspid and second bicuspid served to hold a stiff anchor-bar upon which the jack pressed, and to move the teeth in the two outside ferules. The middle ferule was not cemented upon the first bicuspid, nor in any way was it connected with the bar or the jack. This ferule had a ring soldered to it, into which was caught a hook on one end of the wire cord, the other end being previously hooked into another ring on the lingual side of the clamp-band. This cord served to prevent the two first bicuspids from being forced outward (they being already in their proper places) when the screw-jack was being operated against the other teeth.

To the ferule on the left second bicuspid was soldered one end of the stiff anchor-bar, while the other end simply rested on the ferule of the left cuspid; the bar being held in place on this ferule by a lug soldered to it, which projected through an oval adjusting hole in the bar.

As a means to an end, this mechanism must rank among the best that is known; it is not only exceedingly simple and effective, but is easily operated by the patient.

Bridge Mechanisms.—Fig. 1115 illustrates an operation for correction of a left upper bicuspid standing in the anterior

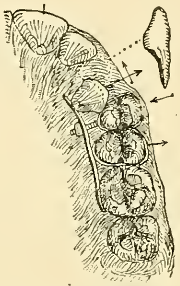


FIG. 1115.—Moving an outstanding bicuspid to line by a bridge mechanism (A).[1]

position, and a cuspid in the posterior position. The deciduous cuspid (see dotted line), that had been allowed to remain in the jaw too long, was extracted to make space. The mechanism consisted of a screw, a bridge-piece, and two ferules; one ferule was soldered midway of the bridge, to anchor it to the second bicuspid; the other ferule was for the first bicuspid, after being soldered to one end of the draught-screw.

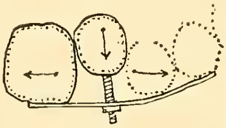
One of the extremities of the bridge rested upon the instanding cuspid to move it outward, the other upon the first molar to aid the anchorage. The end of the draught-screw opposite that fixed upon the first bicuspid by its ferule projected through a hole in the anterior extremity of the bridge, and was tightened upon by a nut.

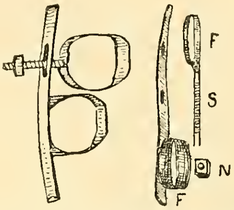
The process of moving the teeth was carried on by re-

[1] Published in the "Dental Cosmos," March, 1886.

peating the tightening of the nut twice a day, thus drawing powerfully upon the first bicuspid, causing it to wedge its way in between the cuspid and second bicuspid, and at the same time move the former forward. The different directions taken by the teeth acted upon are indicated by arrows.[1]

Fig. 1116 represents a mechanism that is practicable for moving instanding bicuspids (and cuspids) to line. The different parts of this mechanism are substantially repre-





FIGS. 1116, 1117.—Bridge mechanisms for moving instanding bicuspids (A).

sented by Fig. 1117. These consist of a bridge-piece, cut from stiff gold plate, and a broad gold ferule soldered to the strip of plate to serve as anchor; through an oval hole in the bridge projects a screw, having on the other end a narrow ferule for encircling the instanding tooth.

To apply this mechanism the ferule is placed upon the bicuspid, leaving the screw to project toward the cheek; the bridge is then placed so that it not only spans the space between the adjacent teeth, but leaving the anchor-ferule upon one of them permits the screw at the same time to enter the hole in the bridge. The instanding tooth is drawn upon by turning a nut upon this screw until it tightens upon the buccal side of the bridge.

Gold-ribbon Mechanisms.—Fig. 1118 illustrates the beginning of an operation for moving into line an outstand-

[1] I sometimes make a hinge in the bridge-bar to make it flexible, but this is seldom necessary.

ing left upper cuspid and an instanding (left) first bicuspid by a duplex-acting ribbon mechanism. In this case the teeth were irregular from overcrowding. As the arch was sufficiently large for proper outline of the lips, its en-

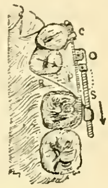


FIG. 1118.—Moving an instanding bicuspid and an outstanding cuspid by a gold ribbon tightened upon them by a screw (A).[1]

largement would have been improper. The only proper way to even the line was to make space, by extraction of the second bicuspid, before applying the mechanism.

Fig. 1119 represents the parts of this old mechanism. They consist of a single-tooth clamp-band, C; ribbon, R; screw, S; gum-guard ring, F; and a bridge-piece, B (having

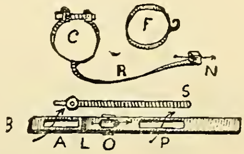


FIG. 1119.—The parts represented independently (A).

two rectangular slots, A, P; two ears, O; and a spur, L.) On a rivet between the ears O on the bridge plays a smooth-bore tilting-nut for the spindle extremity of the screw S to turn in. The spur L is simply a piece of plate soldered at right angles to the under side of the bridge-piece (near the anterior end), to project upward, and rest against the posterior side of the cuspid, to aid in holding the entire mech-

[1] Published in principle in the "Dental Cosmos," 1886.

anism in its proper place. On the other end of the bridge is another spur, bent to fit on the molar. This also is to aid in holding the bridge steady. To apply the mechanism all the parts are first put together, and then the band C is screwed tightly upon the cuspid; the bridge-piece is so laid upon the labial side of the band C that the bolt of the ferule projects through the anterior slot A. The ribbon R, passed through the posterior slot P and held by the screw S working in its threaded nut, the ribbon being caught over the instanding bicuspid and drawn taut upon it by this screw, forces the posterior nut along the bridge-piece and moves the bicuspid. This force is not confined to the bicuspid, however, but draws also upon the cuspid.[1]

Fig. 1120 illustrates an operation for moving to line an instanding left upper bicuspid, T, after the second bicuspid, which stood in the anterior position, had been extracted to

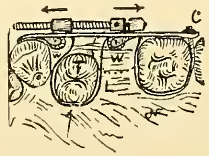


FIG. 1120.—Moving the first bicuspid by a gold ribbon playing over a roller-bridge (A).[2]

make room. This old mechanism is complicated, but it is similar to the simpler one last described. In this one the bridge-piece had only one rectangular slot. This was near the middle of the bridge. At each end of the slot was a

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[1] Like several other mechanisms described in this treatise, this one is slightly difficult to construct; but delicately yet strongly made and properly applied, it operates easily. There is one defect in it, however, *i. e.*, lack of firmness. Instead of a clamp-band, C, I now use a ferule; this is soldered to the bridge-piece, and cemented upon one of the teeth. In such a case as this it would be placed upon the first molar.

[2] This is one of my old-style mechanisms, and was published in principle in the "Dental Cosmos" in 1886.

small roller, W, which revolved on a rivet between ear-pieces soldered to the (under) side of the bridge.

One end of this bridge was anchored to the first molar by a transverse screw loop; the other end simply rested upon the cuspid. The posterior end of the transverse screw loop was soldered to the (lower) side of the bridge, anterior to the molar, while the other end, terminating in the screw, projected through a hole in the bridge, and was tightened by the nut C.

On each end of the drawing-ribbon L was a nut, between which played the operating screw. After having first passed the ribbon, bent double, through the slot in the bridge, it was caught over the instanding bicuspid T, and drawn taut by the screw forcing the ribbon nuts farther apart. As both nuts were free to move, the extremities slid, in opposite directions, over the rollers W, W, along the bridge.

The slot in the bridge was but slightly longer than the diameter of the instanding bicuspid, the object being to prevent the ribbon from bearing upon and moving the cuspid and molar farther apart.[1]

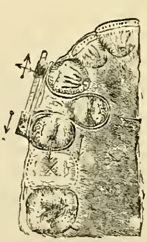

FIG. 1121.—Moving an instanding bicuspid by a triplex-acting mechanism (A).

Fig. 1121 illustrates an operation for drawing an instanding right upper first bicuspid to line. The deform-

[1] Although rollers were used in this mechanism, they are seldom necessary, because the ribbon will generally slide equally easy upon the plate at the ends of the slot.

ity was the result of the right upper second bicuspid having erupted before the first, leaving insufficient space for the latter to erupt in its proper place. The first step in the process of correction was extraction of the first molar, which was extensively decayed; the next step was the application of a triplex-acting mechanism, causing space for the instanding tooth, and moving it (the tooth) at the same time.

The mechanism consisted of a gold ribbon, a bridge-piece, a ferule, and a screw. To one end of the ribbon, which was of sufficient length to extend about the instanding tooth and over the buccal sides of the cuspid and the second bicuspid, was soldered a screw-cut nut to rest on the cuspid; the other end of the ribbon was soldered to the bridge-piece. Near this place of attachment of the gold ribbon to the bridge or strip of plate was also soldered the ferule, to embrace the second bicuspid, which served as the anchorage. Between two ear-pieces soldered to the buccal side of the anchorage extremity of the bridge played (on a rivet) a tilting smooth-bore nut. In this nut revolved one extremity (spindle form) of the screw, which, projecting forward, entered the other nut (threaded). When the mechanism was applied to the teeth the anchor-ferule was cemented upon the second bicuspid.

The mechanism was operated by the patient turning the screw with a right-angle lever placed in a hole in a bulb on it. This turning of the screw forced this anterior movable nut farther away from the stationary one, thus drawing the ribbon tightly upon the instanding tooth, causing it to move up between the cuspid and second bicuspid, and at the same time forcing it to move posteriorly. The cuspid moved slightly forward by the same act, but not sufficiently to permanently displace it.

For particulars in regard to making triplex-acting mechanisms, see Part VI., pp. 256–258.

Fig. 1122 represents the plan of drawing into line an instanding bicuspid by a clamp-band in combination with a two-ended fork—a simpler mechanism than the one last

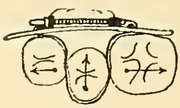

FIG. 1122.—Drawing an instanding bicuspid to line by a fork and clamp-band mechanism (A).

described. It consists of a very thin gold clamp-band, drawn over and between bifurcated extremities of a strip of thick gold plate nearly one-eighth of an inch in width.

Fig. 1123 represents (edgewise) the mechanism, and Fig. 1124 a view of a similar one. The fork-piece may be of plate or it may be made entirely of wire, the body being

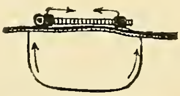

FIG. 1123.—The double-fork band, edgewise (A).

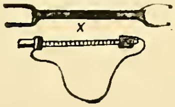

FIG. 1124.—The two parts of a similar mechanism (A).

of stiff half-round wire, and the forks of round wire (smaller size) bent into the shape of the letter U. The latter are arranged and soldered to the ends of the former as represented. To one fork may be soldered an anchor-ferule.[1]

After the different parts are put together, the forked bridge-piece is made to span across the space made by the instanding tooth, and then the gold ribbon is caught over the instanding tooth and drawn taut by the screw. The mechanism is operated by drawing the nuts on the ends of the ribbon toward each other by turning the screw that

[1] See several similar mechanisms in Part VI., p. 258, Fig. 162.

connects them; this turning is done by a watch-key. The mechanism not only draws upon the bicuspid, but also increases the space by forcing the adjacent teeth farther apart.

Fig. 1125 is an edge view of a modification of one of my old mechanisms for increasing space and at the same time drawing an instanding bicuspid to line. The mechanism

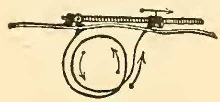

FIG. 1125.—Bridge mechanism having a detachable ribbon for increasing space, and drawing an instanding tooth to line (A).

consists of a bridge, a gold ribbon, and a screw. The bridge is nearly one-eighth of an inch in width, and has a rectangular hole in it, through which plays the ribbon; upon one end of this is soldered a threaded nut; the other end of the ribbon is held in place on the bridge by a wire soldered transversely to the end of it (the ribbon); after this is passed through the slot it catches crosswise upon the outside of the bridge. In the nut on the ribbon plays one extremity of a triplex-acting screw, the other end (spindle form) resting in a smooth-bore nut soldered to the other (left) extremity of the bridge. This mechanism is practicable only in skilful hands.[1]

Moving Bicuspids by Screws.—Fig. 1126 illustrates a process of evening the left upper bicuspids by placing on each side of them a narrow strip of thick plate, and

FIGS. A, B, and C.—Loop mechanisms (A).

[1] Figs. A, B, and C represent different modifications of this mechanism, which in my earlier practice were found to be occasionally useful for slight

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connecting them by two screws, A, A, and then drawing them toward each other. One end of each of these screws is connected (by solder) with the lingual strip by a piece of gold ribbon, the screws being projected through holes in

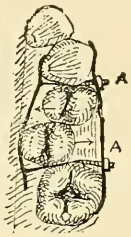

FIG. 1126.—Plan of regulating bicuspids by an evener (A).[1]

the buccal strip, and tightened upon by nuts. To prevent the mechanism from slipping upward on the teeth and injuring the gum, the strips are connected by two pieces of pliable platinum wire about the size of a large pin (not shown in the figure), one end of each wire being soldered to the buccal strip, the other to the lingual; the body of these wires bows over the teeth, resting along their approximal valleys.

If this mechanism is made delicately yet strong it is effec-

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movement of instanding bicuspids and long incisors; but I do not regard them as equal to some of the others described.

In each of these mechanisms is a bridge (cut from thick plate) having a slot midway. Soldered to this is one end of a thin ribbon of rolled-gold wire of sufficient length to encircle the tooth to be turned. This is tightened upon the bridge-strip by a nut on a screw projected through a slot, as represented in Figs. B and C.

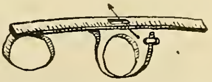

FIG. D.—Mechanism having a ferule-anchor (A).

When in use the bridge is tied to the adjacent teeth by platinum wires or by strings. Later mechanisms of this class were anchored by ferules, as represented by Fig. D. Two anchor-ferules are sometimes practicable when the space is already sufficiently wide for the instanding tooth.

[1] "Dental Cosmos," March, 1878.

tive and causes but slight inconvenience to the patient. The objection to this (one of my earlier inventions) is the transverse screw, which renders it impracticable in cases where the teeth have large necks, leaving no V-shape space between them to admit the screws.

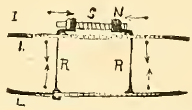

FIG. 1127.—Modification of the evener (A).

Fig. 1127 illustrates an improvement upon this mechanism; this modification has no screw between the teeth, therefore it is suitable for teeth with large necks; there is but one screw, and this lies alongside of the teeth. The mechanism consists of a half-round wire lingual bar, L, a double-forked buccal bar (strip), I, one screw, S, and two pieces of gold ribbon, R, R. On the buccal end of one of the ribbons is soldered a screw-cut nut, N, and on the corresponding end of the other (ribbon) is a smooth-bore nut. The opposite end of one of the ribbons is soldered to the lingual bar L, while the corresponding end of the other is connected with it by a sliding ring. The mechanism is operated by drawing the nuts on the buccal ends of the ribbons toward each other by turning the screw with a bench-key. This mechanism is prevented from sliding upward on the teeth and injuring the gums by four gold ears (not shown) soldered at right angles to the extremities of the bars, and then bent so that they ride in the sulci of the teeth. If the form of the crowns of the teeth is such as would prevent these two mechanisms from resting steadily upon them, an anchor-ferule is soldered to the posterior end of the lingual bar. The ferule is cemented upon the first molar.

CHAPTER CXIV.

SECTION E........DIVISION II.

CORRECTION OF JUMBLED AND SCATTERED TEETH.

CORRECTION OF IRREGULAR UPPER INCISORS, CUSPIDS, AND BICUSPIDS MORE OR LESS ASSOCIATED.

PRELIMINARY REMARKS UPON JUMBLED TEETH.—IMPORTANCE OF BEING GUIDED BY THE MEDIAL LINE IN ARRANGING THE TEETH.—OPERATIONS BY SIMPLE AND COMPLICATED MECHANISMS, ACTING MAINLY BY SCREWS.—REMARKS UPON SCATTERED TEETH THAT DO NOT REQUIRE SWAYING OF SEVERAL.—OPERATION BY WEDGES FOR SWAYING OF THE TEETH LATERALLY TO PLACE THEM EVENLY UPON EACH SIDE OF THE MEDIAL LINE.

IN several of the preceding chapters many kinds of operations for the correction of individual teeth were considered. Beginning with incisors, those for cuspids followed, and then those for bicuspids. Some of the minor operations, though complete in themselves, were only parts of difficult major operations. This division and classification was made to enable students to easily find any kind of operation desired. It should not be inferred from these remarks, however, that all major operations presented in this treatise are divided;[1] there are many to be found in

[1] See Introductory Chapter to Vol. II.

full. Beginning with jumbled teeth, some of these cases will now be presented. This class embraces irregularities of any one or of all varieties of teeth collectively, the operations becoming more and more difficult as we proceed.

Although such cases are numerous, and the variations in the conditions of the abnormalities are not less so, yet the treatment necessary for their correction is not so diverse in character as a tyro might suppose; many operations, though apparently complex, are made up of simple ones, more or less associated. Among them are those that embrace the different processes of swaying teeth that are at one side of the medial line. Generally only one or two teeth require to be swayed, but occasionally half the teeth in the arch require it, in order to close several spaces, or to place the front teeth evenly on both sides of the medial line.

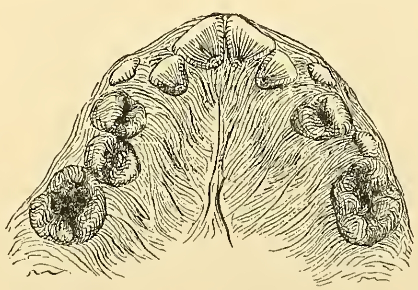

FIG. 1128.—A jumbled case that was corrected by extraction and by mechanisms.

Teeth already evenly Located on Each Side of the Medial Line.—Fig. 1128 illustrates a somewhat interesting case, a nervous young woman eighteen years of age. Besides defective speech, the upper centrals were too long and the laterals too short, causing altogether a repulsive expression. Before I saw this patient she had been under the care of a dentist who had made an effort to liberate the crowded teeth on the right side by extracting the first molar, which led to some beneficial changes in the position of the teeth, but this did not fully satisfy the demands of the case.

Fig. 1129 illustrates the arrangement of the teeth two years after the extraction. Loss of the molar relieved in a measure the crowded condition of the remaining teeth on the right side, but premature eruption of the second molar upon its territory blocked further progress. The dotted lines on the patient's right show changes in the positions of the teeth on this side, but these were not all brought about by the extraction of the molar. Like the

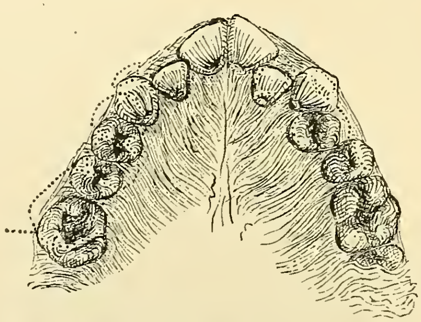

FIG. 1129.—The case two years after extraction of right first molar.

changes indicated by dotted and plain lines on the left side, a part of those on the right were simply the result of pushing upon one another. The patient's face being full and round, and the centrals being evenly located on each side of the medial line, they were left so, but the second bicuspid on each side of the arch was extracted, and then the first bicuspids were forced posteriorly to make space for liberating the crowded laterals and cuspids. These bicuspids were moved by clamp-bands anchored around the nearest molars as represented in Fig. 1130. Besides moving these bicuspids posteriorly, it was necessary to move the molars anteriorly, hence the object of the draught upon the molars, singly; the object being to partially close the too wide spaces that would otherwise be left between these teeth.

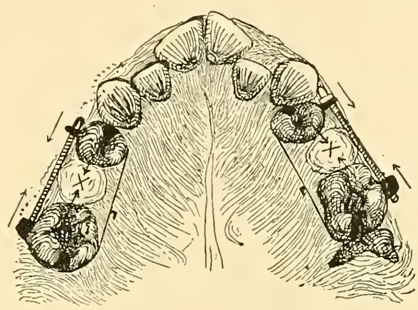

FIG. 1130.—First stage of operation (A).

Fig. 1130 illustrates the beginning of this, the first stage of the operation. After the two first bicuspids had been drawn posteriorly sufficient to make the necessary space for the teeth anterior to them, gold-ribbon splices were added to the clamp-bands (now anchors) to move back the

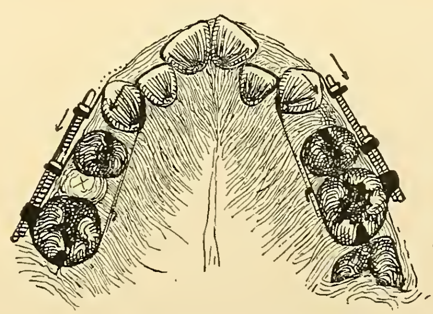

FIG. 1131.—Second stage of operation (A).

cuspids. The free ends of these splices were caught upon hooks soldered to the lingual sides of these bands; then they were extended forward over the cuspids, and connected with the band by screws entering triple nuts soldered to their buccal sides, as shown.

After the cuspids had been drawn posteriorly against the first bicuspids by repeatedly tightening these splices, a stiff long-band was added, each end of which was attached to the anchor-bands by screws entering other holes in the buccal nuts. To this long-band were tied, by strings, the centrals and instanding laterals, to draw them outward to line. The former were tied so as to turn them also, but the laterals were drawn only directly forward.

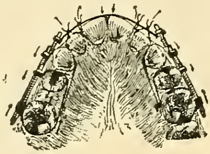

FIG. 1132.—Third and final stage (A).

Fig. 1132 illustrates the third and closing stage of the operation, and at a time when all the teeth were nearly in line. In this figure all the parts of the mechanism that were used are represented.

The distance that the right second molar had moved forward was not so great as that made by the left first molar. On this left side the second molar (which was in the erupting process during the operation) closely followed the first molar in its forward movement.

When all the teeth had been arranged in line, the centrals required shortening before the case could be pronounced correctly (esthetically) completed. The grinding shorter these centrals (they were one-eighth of an inch longer than the laterals) was deferred for several months, and until the sockets had recovered from their sensitiveness. As these teeth could not be ground sufficiently at one time without becoming too sensitive, this part was divided into three operations, extending over a period of three years, the grinding taking place once a year.

The retaining mechanism used for holding the teeth in place was a simple hard-rubber roof-plate fitting the lingual walls of the entire dental arch.[1] The shortening of these teeth caused a marked improvement in the expression of

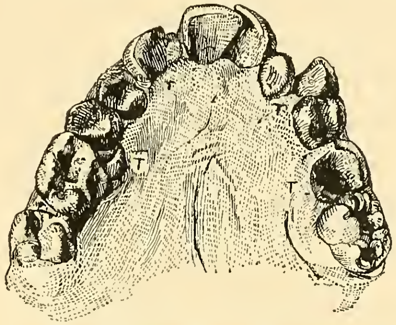

FIG. 1133.—The case before the operation.[2]

the face. The imperfection of speech that existed before the operation had also been entirely overcome.

Fig. 1133 illustrates the original appearance of the upper teeth of a girl ten years of age, and Fig. 1134 the same case

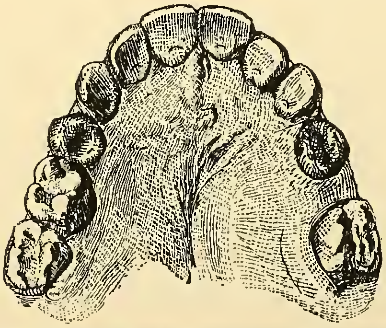

FIG. 1134.—Appearance at completion of the operation.

after it was completed. The four teeth marked T, T, T, T, represent the deciduous, and the others the adult, teeth.

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[1] An attempt was made in drawing Fig. 1132 to mark by dotted lines the distance that the bicuspids and molars had moved, but in the unintentional reduction by the photo-electrotype process they do not clearly appear.

[2] Although this drawing is accurate, the deformity does not appear as great as it really was.

The operation was commenced by extracting these deciduous teeth. The dental arch, however, was still so crowded that it became necessary to extract the right first and the left second bicuspid. The remaining teeth, one at a time, were brought into line by a mechanism.

Fig. 1135 represents the different parts of this mechanism. On each side of the dental arch one of the anchor-bands B, B, was so placed that it embraced the first molar and the nearest tooth anterior to the space made by extraction

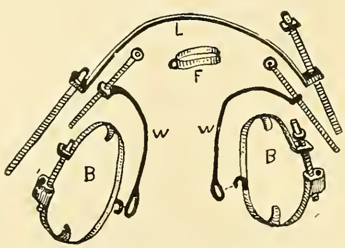


FIG. 1135.—The mechanism used (A).

of the bicuspids. These bands were tightened every twelve hours, until the anterior teeth, in the bands, were drawn firmly against the anchorage teeth (molars); there were now spaces anterior to them. The next teeth (cuspids) forward of these spaces were now connected with the anchorages by platinum-wire splices, W, W, added to the clamp-bands, in the usual way.[1] When these teeth were moved sufficiently to make room for the instanding laterals, they in turn were drawn outward to line by being tightly tied to a gold long-band, L, anchored to the side teeth by screws entering nuts on the buccal sides of the bands B, B. The left central was turned by the string that connected it with the long-band. To aid in the latter act, a Harris ferule, F, was cemented upon the tooth.

[1] See the preceding figures. For construction, see Part VI., pp. 236–277.

During the process of correction of this case there were suspensions of the operation for several months at a time, to give some of the partially erupted teeth time to move down, so as to increase the firmness of anchorage and make better the fastening of the mechanism.

After the operation was completed there remained a space between the left bicuspid and first molar, but no attempt was made by art to close it. In the course of four

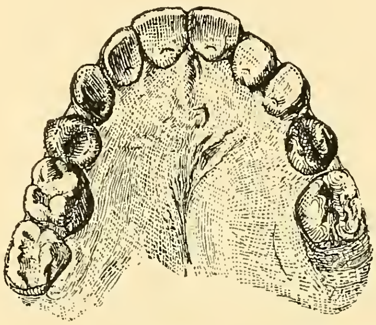


FIG. 1136.—The case as it appeared four years after the operation (A).

years, however, I found that nature had so nearly closed it, by moving the molar forward, that it was not noticeable. Fig. 1136 illustrates the appearance at this time.

Swaying Teeth to the Medial Line.—Fig. 1137 illustrates the case of a girl, thirteen years of age, whose upper central incisors were located one-sidedly. In planning the operation the question involved was " extraction by pairs." Whether to extract a tooth on only one side of the dental arch, or a tooth on each side, in order to even the irregular teeth, depends upon one of two points: first, the contour of the lips; second, the extent of the one-sidedness of the centrals. If the contour of the lips is not sufficiently prominent, all the teeth should (generally) be retained; but if the contour of the lips is proper and all the teeth are not necessary, and the position of the line between the centrals corresponds nearly with the medial line of the face, then a tooth may generally be taken from each side of the arch. If, however, the line between the centrals is off at considerable distance from the medial line, the case generally calls for extraction of only one tooth, and this one should be taken from the side opposite to the direction that the centrals have swayed. The position or the form of the nose, however, has as much to do with deciding this question as the medial line of the face; indeed,

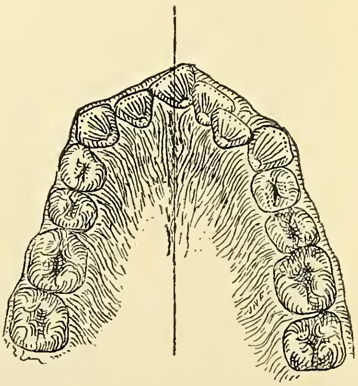


FIG. 1137.—Appearance before the operation.

the septum of the nose is the best single guide in determining the proper position of central incisors. When the nose is greatly bent to one side this may seemingly be an incorrect guide; still it may be regarded, as a rule, that the septum of the nose should influence the judgment as well as the whole face, a mean between the two lines, perhaps, being proper. Swaying the centrals so that they will be exactly on the medial line sometimes implies the swaying of several other teeth in order to make way for them. The moving of a greater number to accommodate a lesser number makes the operation more difficult than at first it might appear necessary to the patient; therefore it is always well to clearly point out the fact, before beginning the operation, and not surprise him in the end by bills that do the dentist more harm than good.

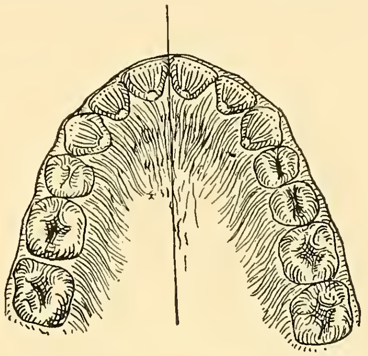


FIG. 1138.—Appearance after the operation.

The case illustrated by Fig. 1137 is one of this class. Several years ago (1872–73) I changed this condition to that represented by Fig. 1138. The five following figures illustrate the different stages of the process that brought about this change.

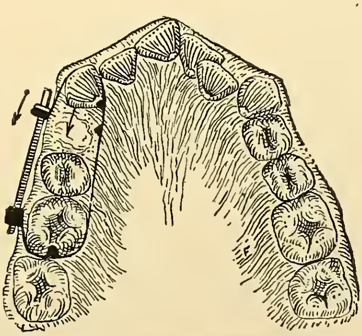


FIG. 1139.—Beginning of the first stage of the process (A).

Fig. 1139 illustrates the beginning of the first stage, the object being to make space for the jumbled anterior teeth. The line between the centrals was about one-eighth of an inch to the left of the medial line (see Fig. 1137), and the left side of the dental arch was longer than the right side.

I extracted the right first bicuspid, and applied a gold clamp-band to move the cuspid into its place. Having in

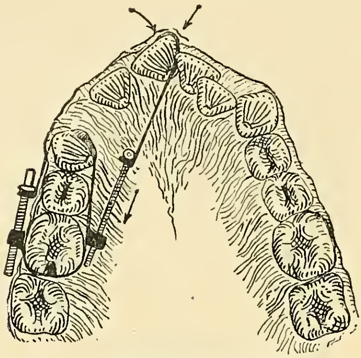


FIG. 1140.—Beginning of the second stage.

the first stage drawn the cuspid in contact with the second bicuspid, the clamp-band that did the work was then made to serve the double purpose of a retaining mechanism and an anchor for a drag-hook, applied to sway the right central and lateral to the patient's right.

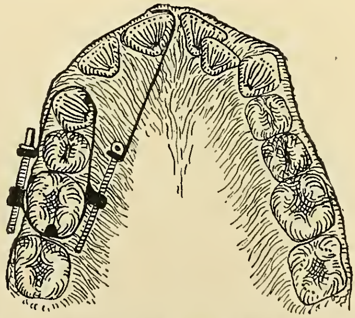


FIG. 1141.—Nearing the close of the second stage.

Fig. 1140 illustrates the case at the beginning of this (second) stage. The drag-hook already referred to was made of stiff plate, and connected with the anchor by a screw that played in a nut soldered to its lingual side, as shown. This screw was turned by a right-angle lever caught into a hole through its globular head.

Fig. 1141 illustrates the case at the close of this stage, and when the mechanism had accomplished all the benefit that was in its power.

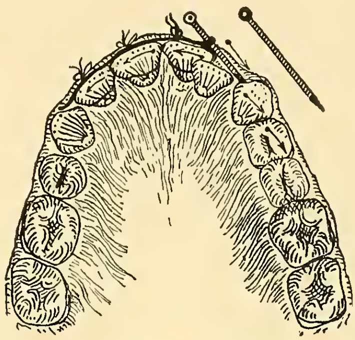


FIG. 1142.—Third stage: making room for the lateral (A).

Fig. 1142 illustrates the beginning of the third stage, by a different mechanism, consisting of a strip of gold plate bent in the form of a hook, bound to the front teeth, to serve as anchor to a pointed screw playing through a nut soldered near one end of the strip. The screw, by pressing into a small cavity in the left cuspid, caused the hook to press against the left central, which widened the space for the lateral, and at the same time moved the right central farther to the right, and beyond the medial line.[1]

Fig. 1143 illustrates the closing act of the fourth stage of the process, by a mechanism consisting of the same anchor-band that was used in the second stage, but to which was now added (by solder) one end of a long-band, the other end being anchored to the opposite side teeth by a screw T-

[1] Although this separating mechanism was effective in this case, it is not as well adapted to the purpose as one of my later inventions, the triplex-acting mechanism, described in Part VI., pp. 256–258.

piece. The instanding lateral was drawn outward to line by two little screws soldered to the ends of a piece of gold ribbon which encircled the tooth. These screws projected through holes in the long-band, and then were tightened upon by nuts.

After the case was regulated the teeth were retained in place by an old-style hard-rubber roof-plate having delicate

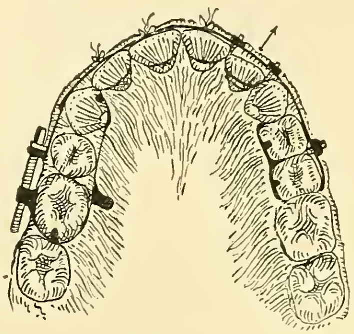


FIG. 1143.—Fourth and closing stage (A).

gold fingers projecting between the teeth, and so bent that they hooked upon, and held them as desired; the plate was worn about one year. I saw this case many years subsequently, and the teeth were nearly as regular as when the case was discharged.

Scattered Teeth.—When several teeth stand a little distance apart, they are called scattered teeth. The cause of such separations is not always assignable, but generally either inherited or mechanical. When inherited, it is from a disproportion between the size of the teeth and the size of the jaw, or, more strictly speaking, the arch of the alveolar ridge. This is believed to arise from inheriting a large arch from one parental side, or small teeth from the other side, or both combined. I think there are more cases from inheritance of a too large arch than of too small teeth.

This disproportion is the result of crossing of different types. There are cases, however, caused by fewness of teeth.

In childhood the anterior part of the alveolar arch generally enlarges, thus causing the deciduous front teeth to separate from one another. This growth continues until about the age of six years, and then the anterior part of the arch generally ceases (or nearly so) to enlarge, while the posterior parts (of the arch) continue to extend posteriorly into adult age. This posterior growth furnishes room for the eruption of the first, second, and third molars.

The mechanical causes of separation of teeth may be those that lead to protrusion. Among these causes may be mentioned thumb-sucking, pulling upon the (lower) teeth by the fingers, too long front lower teeth antagonizing against the upper teeth, too powerful antagonizism of teeth that stand diagonally to one another, or looseness of the teeth. Another cause of scattering is loss of some of the teeth by decay, or by wrong extraction where teeth are irregular.

Extraction, however, is sometimes necessary in order to correct the irregularities, as in cases where to retain all would cause them to protrude too far, and where to obtain proper facial expression necessitates the loss of one or two side teeth, even though it would leave slight extra space after the teeth are regulated. It is owing to this condition, whatever the cause may be, that the operation called closing of interdental spaces is necessary.

Effects of Lifting Heavy Weights by the Teeth.—Abuse of antagonism, causing separation, is found in the habits of acrobats who lift heavy weights by their teeth. The cause in such cases is twofold: first, too powerful antagonism; second, cross draft upon the teeth while lifting the weights.

Fig. 1144, drawn from the cast of one of the noted "strong men" (so called) of recent times, represents a case of this class.

It may be mentioned in connection with this subject that strong men of the pugilistic kind generally have

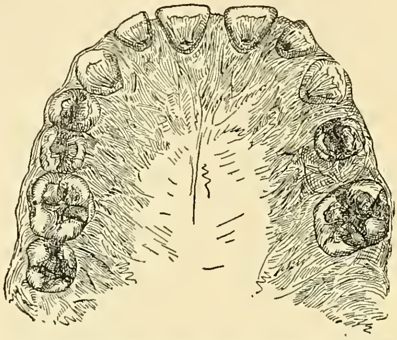


FIG. 1144.—Teeth of an acrobat who lifted heavy weights.

short, regular teeth of medium size. Some acrobats, who have discovered that lifting heavy weights by their teeth causes them to separate, resort to the trick of first grasping between the jaws a vulcanite pad, having recesses exactly fitting each and every tooth. These pads, which are made by dentists, have anchored in them a hook or a metallic strap from which the weight is suspended.

Swaying Teeth.—The correction of interdental spaces between front teeth has been extensively treated in Part XIII., Chapters LX., LXI., pp. 615–639; but these operations were mainly for closing one or two spaces. Operations for closing several spaces, by moving several teeth, to place them evenly upon each side of the medial line will now be considered. There are two ways of swaying teeth: first, by pulling force; second, by pushing force. The latter plan is adopted where the pulling force would move the anchorage teeth in a direction that would be detrimental to the case. The following case is presented to illustrate the principle of all such operations.

Figs. 1145, 1146, 1147 illustrate steps in an operation for swaying eight anterior upper teeth one-eighth of an inch to the patient's left, to close up several spaces between

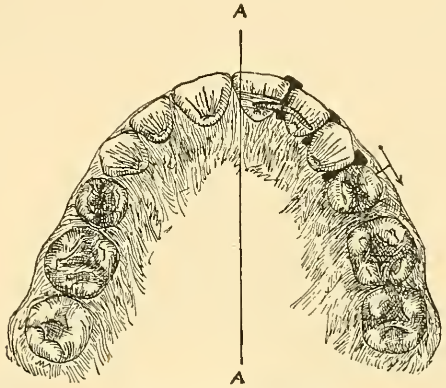
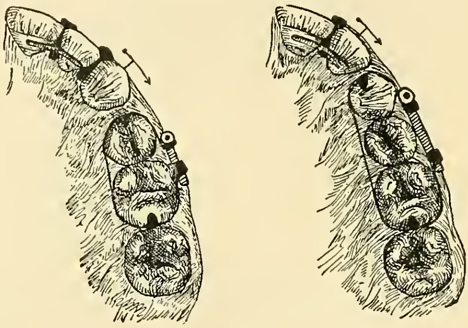


FIG. 1145.—Beginning an operation for swaying eight teeth to the left. (First step.)

them, and also to place the teeth evenly upon each side of the medial line.[1] This entire operation (for a man about thirty years of age) was performed by wooden wedges, one in every space, except at the end of the line. Only one wedge, however, was applied sufficiently tight to move a tooth; the others simply acted as supports to the other teeth. The first tooth to move was the left first bicuspid. After this tooth had been moved up against the first molar, it was held there by a clamp-band embracing it and the first molar, while the next tooth (the cuspid) was wedged up against this bicuspid; and then all three teeth were included in a larger band. The next tooth anterior to these was then acted upon by a wedge, until it also had moved across the space and had reached the cuspid, when it was

[1] Some of these spaces were caused by the enlarging of the anterior part of the arch, and others by drifting of the teeth after the enlarging operation, because of lack of firm lateral support to one another. This drifting occurred during the first year, after the moving-forward process, a change that is liable to take place while the teeth are somewhat loose.

tied to the clamp-band by a silken thread. By repeating the same process of wedging, all the other teeth were moved, one at a time, until the right first molar had been reached. These second bicuspids had been extracted in a previous operation to make space for correction of a very jumbled arrangement of the same teeth.



FIGS. 1146, 1147.—Eight teeth being swayed to the left. (First and second step.)

To retain in place all these eight teeth that had been moved by wedges a gold thimble-crown was cemented upon the right molar; this had a fish-tail prominence upon its anterior approximal side, of sufficient fullness to extend across the space and rest against the posterior wall of the bicuspid, thus acting as a prop to all the teeth swayed.

About six months after this retainer had been applied I noticed that the right cuspid and lateral were becoming slightly irregular, which indicated that this molar was moving forward. To relieve the teeth of this pressure I occasionally passed a sand-paper wheel between the gold prominence and the bicuspid, removing at each time a part of the gold; this was repeated until all of the prominence was gone, and also all that (anterior) side of the gold crown, leaving the tooth-tissue exposed to view. Fig. 1148 illustrates the case when completed.[1]

[1] See full account of this case in Part XVIII.

The molar bearing the thimble-crown being of proper length, most of the antagonizing part of the thimble was filed away before it was cemented upon the tooth. The final retaining support of these teeth was obtained from so grinding the side teeth that all the teeth in the mouth

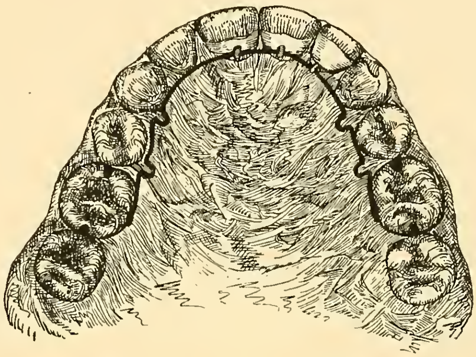


FIG. 1148.—The same case after the thimble-crown had been removed, and the case was completed.

properly antagonized, thus constituting matrices to each other. Subsequently the gold shell was taken off the molar. Several months have now elapsed since this time, and the teeth still remain as when the operation was completed.

LOWER BICUSPIDS.

SECTION F..................DIVISION I.

CHAP. CXV. Moving Lower Bicuspids by
- U-plates.
- Plain and Coil Wire Springs.
- Clamp-bands and other screw-acting Mechanisms.
- An Arm-ferule.

CHAPTER CXV.

SECTION F................DIVISION I.

MOVING LOWER BICUSPIDS BY SPRINGS AND BY SCREWS.

OUTWARD AND INWARD MOVEMENTS.—LONGITUDINAL MOVEMENT.—GENERAL REMARKS.—THE U-PLATE OPERATION.—OPERATION BY A WIRE SPRING ANCHORED TO A PLATE.—BY A BOW-SPRING.—BY A CLAMP-BAND.—OLD SPRINGS.—BY AN ARM-FERULE.

THE treatment of the majority of operations for correction of the lower bicuspids more properly belongs to chapters on Widening and Enlarging the Arch, but a few cases do not belong there; these will therefore be explained in this place. The cause of irregularity of lower bicuspids may lie in their roots being too far anterior or posterior to their proper places, but generally it lies in the improper degree of inclination of the crowns, generally inward or outward. The latter position is not so often found as the other. The crowns of irregular bicuspids, by cramping of the adjacent teeth, sometimes arrest their eruption, causing them to be too short.

The operations for correction are of three kinds, viz., lateral, longitudinal (to the alveolar ridge), and elevating. These are generally simple, and the plans few in kind. It may be said that the mechanisms used are similar to those for widening the (lower) arch and for elevating teeth.

The primary essential in operations for correction of offstanding lower bicuspids is the same as that in many operations for offstanding upper bicuspids, viz., making sufficient space for them. This is done by moving the adjacent tooth or teeth out of the way, or by extracting a tooth. (For elevation of arrested teeth, see Part XVII.)

Lateral Movement.—When a single bicuspid inclines inward it can be moved outward by the arm-ferule; but where more than one tooth requires correction a larger mechanism is superior. Of the latter class some form of the U-shape hard-rubber plate is practicable (Fig. 1149); but the hinged cleft-plate, or the bail mechanism, acting by a bow-spring or by a screw, is easier to manage. All these large mechanisms are applied by springing or by screwing them into their place within the dental arch, and are as manageable by the patient as by the operator.

In Part XVIII., on the subject of widening the lower arch, will be found represented several mechanisms that are equally suitable for some cases presented in this chapter. When, however, there is only one tooth to be moved, the *arm*-ferule is better and less inconvenient to wear than larger mechanisms. See arm-ferule, Fig. 1158.

Longitudinal Movement.—A lower bicuspid that inclines forward or backward may be corrected by a tight metallic hoop, or by a clamp-band anchored around it and some neighboring tooth or teeth. Such a tooth may also be corrected by a wire spring fixed to a hard-rubber U-plate, and so formed that it will pull or push upon it. Thus far there is nothing in vogue equal to the longitudinal clamp-band or united ferule-anchor, with a splice.

Spring U-plates.—Fig. 1149 represents a hard-rubber

U-plate for moving outward instanding lower bicuspids. To prevent the plate from working itself downward and injuring the gums, gold-wire lugs are vulcanized into the borders, as represented in the figure. Transversely to the end of each of these lugs is soldered a short piece of wire to rest in the sulci of the teeth. (These cross-pieces, however, are not always necessary.) To apply the mechanism the arms are sprung toward each other, then the plate is

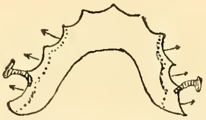
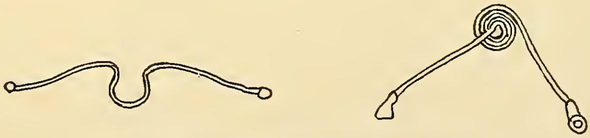


FIG. 1149.—Hard-rubber U-plate.

placed in position and liberated. When the teeth have moved so that the plate ceases to press with sufficient force upon them, holes are bored into its borders at points off against the teeth to be moved, and wooden fish-tail-shape pegs inserted into them to bear upon the teeth. This is a simple mechanism, and one that is cheaply made. Another kind of mechanism acting upon this principle is the wire spring having "shoes," bands, or clasps to hold the extremities.



FIGS. 1150, 1151.—Delabarre Springs (1820).

Coil Bow-springs with Plates.—Figs. 1150, 1151, represent two springs published by C. F. Delabarre in 1820.[1] One has a coil and the other a modification of a coil. These springs (devised to hold artificial teeth in their proper place)

[1] "Traité de la partie méchanique de l'art du chirurgien dentiste," Tome II.

are practicable in these mechanisms if they are properly combined. Especially are they useful for widening the dental arch. These springs, and various modifications of them, with or without plates, have been used for some time for this purpose by several dentists.

Fig. 1152 illustrates a mechanism for moving outward an instanding right second bicuspid, as recently suggested by Dr. Talbot. It consists of a steel-wire coil-spring and a

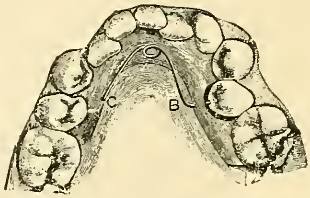


FIG. 1152.—Plan of moving a bicuspid outward by a coiled wire spring anchored to a plate (Talbot).

hard-rubber U-plate. The plate is made, in the usual way, to fit the lingual side of the alveolar ridge and the lingual walls of the teeth. Through the left arm of this plate, and at a point opposite the tooth to be moved, is drilled a deep pit, C. In this pit rests one extremity of the steel spring. The extremity of the spring resting in the pit is bent at right angles; the other extremity, also bent at right angles, projects loosely through a hole in the right arm, and bears upon the tooth to be moved. To enable proper play of the part of the spring that enters this hole, it is so bent that there is one-eighth of an inch space between the main wire and the lingual surface of the plate. The bow part of the spring, having a coil, is held in place by an upright post (vulcanized into the anterior part of the plate) projecting into the coil.

The mechanism should be so made that it can be easily removed for cleansing. This is done by so shaving the border of the plate that it will not require too great force to dislodge it from the "underhang" caused by the inclination of the crowns. Such a plate should have metallic gum-guard lugs vulcanized into it in such a way that their free extremities will rest in the sulci of some of the side teeth, to prevent it (the plate) from sliding down the crowns and injuring the gum. Before this mechanism is applied there should be sufficient space made in the arch for the inclined tooth to stand.

FIG. 1153.—Steel-wire Spring (Talbot).

Fig. 1153 illustrates a similar spring, having one coil, A, and two long extremities, B, B. This is used in combination with a similar plate for moving outward two opposite instanding side teeth.[1]

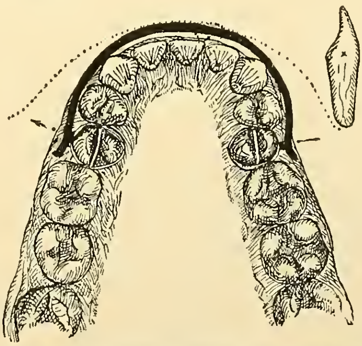


FIG. 1154.—Moving outward instanding lower bicuspids and inwardly outstanding cuspids by a bow-spring.

Springs without Plates.—Fig. 1154 illustrates the beginning of the second stage in a larger operation. This part of the operation was for moving the two instanding lower second

[1] Several modifications of these mechanisms were published by Dr. Talbot in the "Dental Cosmos," January and June, 1886, and June, 1888.

bicuspids outward, and the outstanding cuspids inward to line, by the use of a bow-spring.[1] The little mechanism, which was as effective as the principle is old and simple, was made of stiff, round gold wire about the size of a small knitting-needle, and two gum-guard rings connected as shown in Fig. 1155.[2] When ready to apply, one guard-

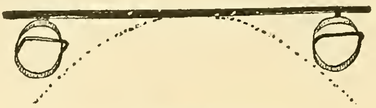


FIG. 1155.—The Mechanism (A).

ring was placed upon one of the instanding bicuspids, after which the wire was sprung down against the outstanding cuspids, and held there by the other guard-ring being caught upon the opposite instanding tooth. The mechanism was then left there to do its difficult wedging work.

The bow while moving moved the bicuspids, and so bore upon the outstanding cuspids that they moved inward. Every two days this mechanism was taken off the teeth, the wire "straightened," and then reapplied.

For such cases as this there are but few mechanisms as simple to construct or as easy to apply. In the majority of cases the bow does not require to be made of so large wire as was thought necessary in this case. In the chapter on Widening the Arch by Bow-springs without Plates, are illustrated several mechanisms for use inside of the dental arch, for similar operations.

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[1] To make sufficient room for these cuspids and bicuspids was the object of the first stage of the operation. The right central incisor was extracted, and the remaining incisors moved up together by a clamp-band.

[2] The principle of this mechanism is similar to that used in Bourdet's mechanism (1757). Bourdet used a flat strip of plate instead of round wire. It was tied to the instanding teeth by strings instead of ferules. The application of ferules as anchors to a long-band (to tie front teeth to) was mentioned by Desirabode in 1823.

Longitudinal Movement by Screws.—Fig. 1156 illustrates an operation for moving posteriorly a right lower first bicuspid into the space left by a second bicuspid that was extracted to make it possible to correct an outstanding cuspid.

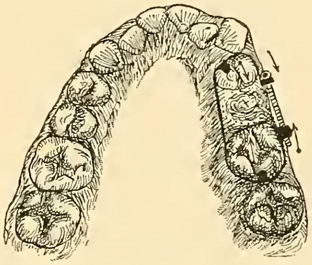


FIG. 1156.—Moving posteriorly a lower first bicuspid by a longitudinal clamp-band (A).

The mechanism was simply a clamp-band (18 k. gold) having a longitudinal screw. This was anchored around the bicuspid and first molar as shown. The object of including only the first molar in the band (for anchorage) was to move this tooth forward so as to partly fill the extra space that would not be needed by the cuspid, or, in other words, to arrange the teeth so that there would not be much space left between it and the tooth anterior. Had there been any extra space left after such management it would have been between the first and the second molar.

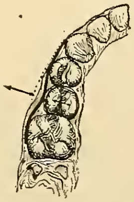


FIG. 1157.—Moving an instanding lower bicuspid by an arm-ferule.

A space in this locality (besides being inconspicuous) generally closes in time by the (natural) moving forward of the second molar. To prevent the first molar from retracing its steps it was confined to the bicuspid by two ferules connected (at the sides) by solder.

Fig. 1157 illustrates an operation by an arm-ferule, and Fig. 1158 represents the mechanism, which consisted of a gold ferule having soldered to it a piece of gold spring-wire. The ferule is applied to the offstanding tooth, leaving the wire arms to bear hard upon the adjacent teeth as

FIG. 1158.—An Arm-ferule.

shown in the figure. To maintain the draught upon the tooth the mechanism is removed about once in three or four days, and the wire rebent so that the mechanism will require considerable force to reapply it. This simple mechanism is useful for moving any other instanding teeth, but to move incisors it sometimes requires the aid of a thin, independent ferule cemented upon the tooth to be moved. This is to prevent the bar-ferule from slipping off these wedge-shape crowns.

UPPER MOLARS.

SECTION G................DIVISION I.

CHAP. CXVI. Moving Upper Molars by
- Peg-plates.
- Spur-plates.
- Screw-jacks.
- Gold Wedging-bands.

CHAPTER CXVI.

SECTION G..........DIVISION I.

MOVING UPPER MOLAR TEETH.

GENERAL REMARKS.—OPERATION BY A PEG-PLATE.—BY A SPUR-PLATE.—BY A SCREW-JACK.—BY WEDGE-BANDS.

ALTHOUGH irregular upper molar teeth are somewhat common, they are seldom corrected unless it is necessary to widen the arch or to move posteriorly the last erupted molar to make room for an imprisoned tooth just anterior to it. The reason why molars are seldom corrected is because they are not often conspicuous, and yet are fairly effective for mastication. It is sometimes necessary to move molars to widen the dental arch whether they be irregular or not; but as this class of operation comes more properly under the head of Widening, Elongating, and Enlarging the Arch (Part XVIII.), it will not be considered here.

When antagonism of teeth is so imperfect as to become necessary to improve it in order to benefit health, it may be accomplished by moving molars outward, anteriorly or posteriorly; but if too short, it may be accomplished by inserting prominent plugs in cavities in the crowns, or by cementing upon them gold thimble-caps. As the process of treatment for the two latter plans must be plain to every dentist, we shall pass them and confine our remarks to other plans.

For moving molars outward, peg roof-plates, spur-plates, and screw-jacks, with clamp-bands for anchoring them to the teeth, are generally preferred. U-plates and cleft-plates that act by springs or by screws are, however, used.

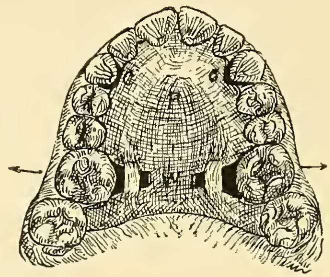


FIG. 1159.—Moving instanding upper molars by a peg-plate.[1]

Peg-plate Operation.—Fig. 1159 illustrates an operation for correcting two instanding upper first molars by a peg-plate. This somewhat old and not very philosophical mechanism consists of a thick hard-rubber roof-plate having two cuspid-clasps and two wooden fish-tail-shape pegs set into holes made through two thick prominences on the plate as shown. These pegs, which were of a length sufficient to bear firmly against the molars, were replaced by new and longer ones whenever the mechanism became loose from the moving of the teeth away from them.

As the construction of similar mechanisms is explained in Part VI., Chapter XIX., p. 216, detailed explanation seems unnecessary, further than to mention that the middle part of the plate, especially the part between the instanding molars, should be very thick, in order to prevent it from bending out of proper shape when forced within the dental arch.

Spur-plate Operation.—Fig. 1160 illustrates the beginning

[1] The principle of this was devised by Redman and by Richardson.

of an operation for moving outward two instanding upper first molars by a spur-plate. This mechanism (which is far superior to the peg-plate) consisted of two flat spurs, S, made of gold plate bent at right angles and anchored into the edge of a hard-rubber roof-plate, P.

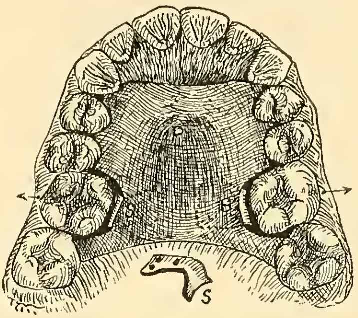


FIG. 1160.—Moving outward the first molars by a spur-plate (A).

When applied, one leg of each of these U-shape spurs projected upward between the teeth and gums, so that they bore firmly upon the necks of the teeth to be moved. As the construction of spur-plates more properly belongs elsewhere, the reader is referred to several places in this treatise, through reference to the Index.

Screw-jack.—Fig. 1161 illustrates an operation for moving outward two instanding upper molar teeth by a screw-jack anchored by two gold clamp-bands placed around these teeth. The form of the mechanism and its application to the teeth are so clearly shown in the figure that it is unnecessary to dwell upon the treatment. The mechanism was operated by a lever-key caught into holes in a bulb on the screw. The details of the process for making this powerful mechanism and similar ones are given in Part VIII., pp. 436–438.[1]

[1] In Part VI., Chapter XXVIII., are also explained various modifications of this mechanism, designed for correcting different forms of irregularities.

After the case had been corrected the teeth (molars) were held in place for several days by the same mechanism. It was then taken off, and a hard-rubber roof-plate, having a short piece of gold wire projecting from each side

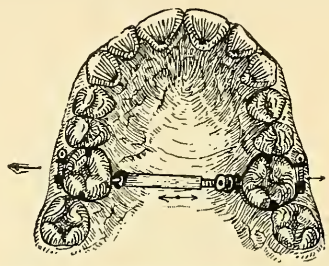


FIG. 1161.—Moving outward instanding upper molars by a screw-jack (A).

to rest in the U-shape spaces between the necks of the molars, was substituted for the jack. To apply this retainer required sufficient force to slightly spring the plate, in order to permit the wires to rest snugly within these spaces.

Wedge-bands.—Fig. 1162 illustrates the beginning of an

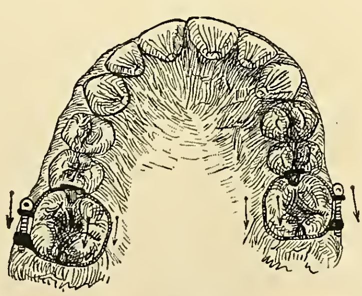


FIG. 1162.—Moving molars by wedge-bands.

operation for moving posteriorly the upper first molars to make room for the second bicuspids, which had become arrested in the process of their eruption because of insufficient space between the molars and the first bicuspids. (See Fig. 1163.) The indirect but special object of the operation was mainly of a prophylactical nature, *i. e.*, to prevent future irregularity of several teeth anterior to the second bicuspids—a result that is always liable to occur where the side teeth are nearly in line, and are crowded.[1]

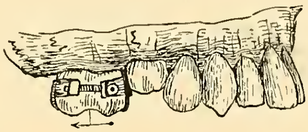


FIG. 1163.—Moving posteriorly the upper first molars to make room for second bicuspids (A).

The correction of a case like this is simple, if proper mechanisms are used at the right time, *i. e.*, before eruption of the second molars. Springs or screw-jacks are practicable, but the best mechanism in most cases is the simple (gold) clamp-band. In this case the operation was performed by two bands, each having a prominence, B, as represented in Fig. 1164.

FIG. 1164.—The Wedge-band (A).

On each of the molar teeth was placed one band. To make them effective was the object of the prominence on the part that rested between the teeth; this was of sufficient thickness to make it necessary to drive the band between the teeth by a mallet; the prominences on these bands then acted as wedges between the molars and bicuspids. After the bands were forced in place they were tightened upon the molars so that they would not slip off.

After wearing these bands one week they were removed

[1] In the case of a boy, who in time will wear a mustache, the degree of deformity by such increase of irregularity is not always sufficiently exposed to warrant an operation on the molars; but in the case of a girl, especially if she be comely, as was this one, the liability of disfigurement of facial expression is too great to risk the "let-alone" plan.

and replaced by new and similar ones; but they were thicker in the prominent parts, where the wedging pressure (between the teeth) was going on. The first increase of thickness of the band was made by the addition of gold solder, but the subsequent thickenings were made by soldering pieces of plate to these prominences. The second set was worn one week, and then it was replaced by the former set, made still thicker in the wedging parts. The use of these two sets of bands was alternated until the spaces between the molars and bicuspids were widened sufficiently to give the second bicuspids ample space to fully erupt.

The molars were retained in their new places by the last-worn bands until the other set had received wire appendages. (See R in Fig. 1165.) Having first filed away the

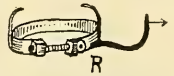


FIG. 1165.—The Retainer (A).

prominent parts that served as wedges, one end of each piece of wire was arranged upon each band so as to project forward against the first bicuspid. These wires when soldered to the bands were bent hook-like, so as to enter between the teeth and bear against the posterior surfaces of the first bicuspids above referred to. Subsequently these retainers were replaced by similar ones, but instead of clamp-bands they were ferules; these were cemented to the molars and allowed to remain there for two months, and until the second bicuspids were fully erupted.

LOWER MOLARS.

SECTION H.................DIVISION I.

CHAP. CXVII. Moving Outward Instanding Lower Molars by Wire Springs and by Screws.

CHAPTER CXVII.

SECTION H................DIVISION I.

MOVING LOWER MOLARS.

OPERATION BY A COILED WIRE SPRING ANCHORED TO A U-PLATE.—A WIRE BOW-SPRING ANCHORED BY FERULES.—SCREW-ACTING BAIL MECHANISMS.

IRREGULAR lower molars do not as often require correction as the upper, but when they do, it is generally outward or slightly forward. The forward movement, however, is seldom attempted, unless it is necessary to close, or partly close, spaces between them and the bicuspids. For moving lower molars, U-shape wire springs, anchored by hard-rubber shoes or by gold ferules or by clamp-bands, are used. A hard-rubber U-plate divided in the middle and hinged together, and then operated by a spring or a screw, is also practicable; but bail-jack mechanisms, acting by springs or by screws, are of a higher order. Whatever kind of mechanism is selected, it should be of a form that will not interfere with the tongue. As these operations made by the U-plate more properly belong to widening of the dental arch, this class will now be passed over. Beginning with mechanisms that operate by springs, we shall rapidly pass along to those that operate by screws.

Fig. 1166 illustrates a process of moving lower molars as suggested by Dr. E. S. Talbot. The mechanism is made of a hard-rubber U-plate and a steel-wire spring; the spring consisting of a coil with two arms, as represented by Fig. 1167. The bow of the spring is anchored by

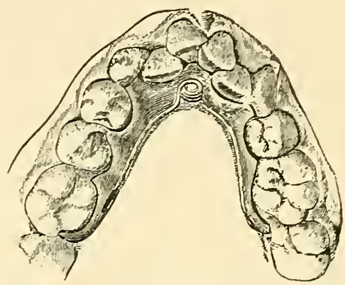


FIG. 1166.—Moving instanding lower molar teeth outward (Talbot).

placing the coil on a post projecting upward from the anterior part of the plate; the arms of the spring are bent, and project through holes in the posterior part of the plate, to bear upon the molars.

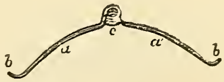


FIG. 1167.—The Spring.

This mechanism is made as follows: On a plaster model of the case a thin, narrow U-shape plate is vulcanized. Before vulcanizing the plate, however, the (metallic) post is forced into the plaster cast in such a way that the remaining part projects upward. The coil of the spring is made by twisting the wire three times around a mandrel of the same diameter, or one slightly smaller than the post; it enlarges when liberated from the mandrel.

Oval holes are now bored through the arms of the vulcanized plate, for the extremities of the arms of the spring to play in. The extremities of the wire, bent at right angles, are projected outward through these holes, to bear upon the teeth to be moved. The tension of the spring is increased by removing it and pulling the arms further apart.

In simple cases this mechanism may be easily inserted and removed, and its action so controlled that only one mechanism is necessary for completing the operation; in other cases more than one spring is necessary in order to keep up the pressure.[1]

Fig. 1168 represents a lingual bow-spring mechanism for moving outward instanding lower molars. It consists simply of a piece of stiff gold or German-silver wire, w, hav-

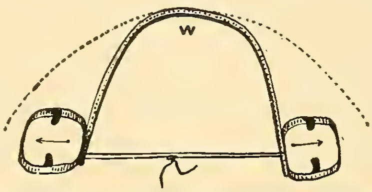
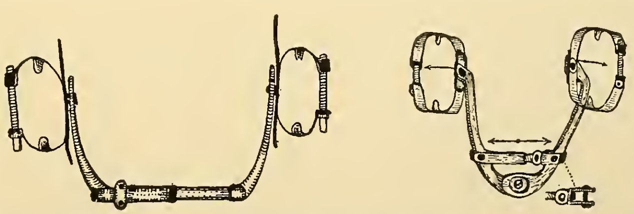


FIG. 1168.—Mechanism for correcting instanding lower molars (old).

ing a ferule soldered to each end, to anchor it to the instanding molars. When used the mechanism is sprung from the shape represented by the dotted line to the form represented in plain lines, and tied by a string. This mech-



FIGS. 1169,[2] 1170.—Bail screw-jacks for moving outward several instanding lower side teeth (A).

anism is as effective as it is simple; it is equally use-

[1] From the "Dental Cosmos."

[2] Shown before the First District Dental Society of the State of New York, November 3, 1885, and published in the "Dental Cosmos," March, 1886.

ful for moving outward instanding molars and bicuspids in either jaw.

Figs. 1169, 1170, represent a gold bail screw-jack for moving lower molars and bicuspids. This mechanism, the first of the kind invented for the purpose, is composed of three pieces, two clamp-bands and a screw-jack, the latter having two arms projecting posteriorly from its ends to connect with the lingual sides of two bar anchor-bands. The bands embrace the bicuspids, and the bars bear against other teeth to be moved. This mechanism will be fully described and its application explained in Part XVIII., chapter on Widening the Lower Dental Arch; therefore its construction will not be dwelt upon here.

This is somewhat complicated and expensive, but if it is properly made it is easily applied and as easily operated. Indeed, the patient can manage it as well as the dentist, by raising the bow on the hinge, turning the screw, and letting it fall back under the tongue.

Fig. 1170 represents a modification of the mechanism represented by Fig. 1169, the difference being that the screw-jack is attached behind the hinge-union of the two side arms. The bow part of this mechanism plays upon rivets that hinge it to the anchor-bands. This is a stronger and more practicable machine than the former. It is the best yet invented.

PART XVI.

Minor Operations.

Turning Teeth in their Sockets.

By Various Kinds of Mechanisms.

Elastic Rubber, Metallic Springs and Screws.

Notes on Various Subjects
Pertaining Thereto.

CLASSIFICATION OF OPERATIONS.

Section A	Upper Incisors.
Section B	Lower Incisors.
Section C	Cuspids.
Section D	Bicuspids.

INCISORS.

SECTION A................DIVISION I.

CHAP. CXVIII.	General Remarks upon Teeth that Require Turning.—Different Classes.—Straight and Crooked Roots.—Proper Age to Operate, etc.	
" CXIX.	Ferules.—Different Kinds.—Ferules in Combination with Levers.	
" CXX.	Turning Upper Incisors by	Strings, Elastic Rubber, in Combination with Short Levers Soldered to Ferules.
" CXXI.	" " " "	Elastic Rubber in Combination with Long Levers Soldered to Ferules.
" CXXII.	" " Anterior Teeth by	Different Kinds of Mechanical Elements Combined.
" CXXIII.	" Two Incisors Simultaneously by	Strings and Elastic-rubber Rings anchored to Metallic Bands.
" CXXIV.	" Two Incisors Simultaneously by	the Trapeze Mechanism.
" CXXV.	" Two Incisors Simultaneously by	Elastic Rubber in Combination with Two Ferules.
" CXXVI.	" Upper Incisors Singly by	the Arm-ferule.
" CXXVII.	" Upper Incisors Singly by	Wire Springs and Rubber in Combination with Plates.
" CXXVIII.	" Upper Incisors Singly by	Wire Springs without Plates.
" CXXIX.	" One (or Two Simultaneously) by	Screw-acting Mechanisms of Various Kinds.
" CXXX.	Placing of Upper Incisor Teeth by	Forceps, by Transplantation, by Replantation; Implantation.

CHAPTER CXVIII.

SECTION A..........DIVISION I.

TURNING TEETH IN THEIR SOCKETS.

GENERAL REMARKS.—STRAIGHT AND CROOKED ROOTS.—FOUR CLASSES OF CASES.—THE PROPER AGE FOR TURNING TEETH.—TURNING TEETH SINGLY.—TURNING MORE THAN ONE TOOTH SIMULTANEOUSLY.

A TOOTH that has erupted so that the approximal side turns outward may or may not be sufficiently unsightly to require correction. If the tooth is a bicuspid or a molar it is seldom, if ever, necessary to turn it, but with the anterior teeth it is very different; to reiterate, there are cases in which the disfigurement is so slight that it would not be advisable to attempt correction, and then again there are cases in which correction is absolutely necessary to the interest of the patient. While slight irregularity may be noticeable, it does not always follow that it is wholly a disfigurement; on the contrary, it may be in keeping with other facial conformations; especially is this occasionally true in angular faces. Some persons have a strong partiality for irregularity of the teeth, and even pride themselves upon resembling a parent in that respect; but that is no evidence that they have esthetic taste.[1]

[1] I have known such persons, who, upon discovering a small cavity in a tooth, have become almost distracted about it, and yet could see nothing unsightly in the irregularity of their teeth. I now recall to mind a singular case of this kind, in a woman about twenty-five years of age, who, having irregular

A tooth requiring correction may have been forced out of its proper position before it appeared through the gum, or it may have turned after its eruption; usually only a single tooth is found in such a position, but in some cases there are several. The incisors frequently require turning, but occasionally the bicuspids need it. One side of a tooth may be nearly in its proper position, the other side being out of the proper line, or, as it were, swung, as if on a hinge, out of its proper place, and appear like a gate partly open.

Incisors requiring operations may be divided into four classes (to make this point clear we will at first confine our remarks to the centrals), viz.:

First, when the *lingual surfaces are turned toward one another*, as represented in Fig. 1171.

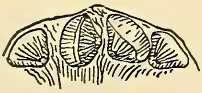


FIG. 1171.—First Class.

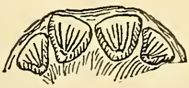


FIG. 1172.—Second Class.

Second, when the *labial surfaces are turned toward one another*, as represented in Fig. 1172.

Third, when only *one tooth is abnormally situated*, as represented in Fig. 1173.

teeth, preferred to have them remain so, and yet became frantic when she discovered that she had a cavity in one of the lateral incisors. When first I saw the case this cavity had been beautifully filled with gold, yet the patient was dissatisfied, and desired to have the tooth turned so that the plug would not be seen. When told that a greater disfigurement would result from such treatment, she said that she would be satisfied even if the tooth were "turned only a quarter around" (which would leave the approximal side facing front). When told that under no circumstances would an honorable dentist turn the tooth, she threw up her hands and cried, "I am ruined for life; I came this long distance all for nothing;" and after having cried bitterly, she closed the scene in a rage and left the office, saying that she would hunt for a dentist who would do as she desired.

Fourth, when *two teeth are turned* so as to face *in one direction*, *i. e.*, to the left or to the right; the latter condition is represented in Fig. 1174.

Fig. 1175 illustrates a case of the second class, in which two of the incisors are poised similarly to those represented

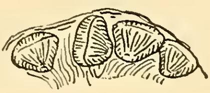


FIG. 1173.—Third Class.

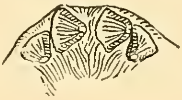


FIG. 1174.—Fourth Class.

in Fig. 1172, the difference being that, instead of two centrals, there is one central and one lateral. In such cases the teeth may be turned singly, or both may be turned, one to the right, the other to the left, at the same time. When two teeth are favorably poised, as in this case, or as represented by Figs. 1171 and 1172, it is easier to turn

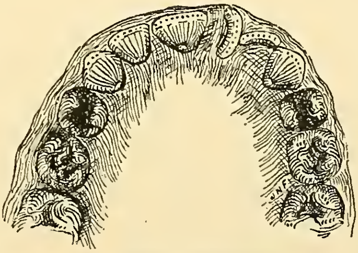


FIG. 1175.—Case of the Second Class.

both at the same time than to turn them singly, because they can be made of mutual service to aid in furnishing anchorage one to the other. Upon this phase of the subject more will be found later on.

Straight and Crooked Roots.—To turn an irregular tooth fifty years ago, so that it would face in the right direction, was regarded as a difficult operation; at the present time, however, it is not universally so regarded; indeed, some dentists now assert that it is always easy of accomplishment. I am inclined to believe that this optimistic opinion arises from want of wide experience, for there are variations in the form of roots that cause more or less difficulty. If the roots are nearly cylindrical they may be turned easily, but if crooked it is not easy. It may be said that flat roots can always be turned to place by persistent action, but crooked roots that interfere with adjacent roots cannot, as a rule, be fully turned by any kind of mechanism without disturbing the poise of the adjacent teeth; still a tooth turned partly toward its place is sometimes advisable. A tooth may sometimes be turned entirely around; but this extent of turning is unnecessary in any case, because the proper facing of a tooth can always be accomplished within half a revolution. The requirements in different cases vary from one to ninety degrees, but generally they do not exceed forty-five.

The Proper Age.—The best age for turning incisors is as early as the operation is practicable; this implies that the patient should have arrived at an age of intelligence to have sufficient personal pride to feel willing, if not anxious, to have the operation performed. If the case be neglected too long, a tooth that subsequently erupts may, by crowding upon it, leave insufficient space for the accommodation of the broadest diameter of the tooth to be turned. The fact that such teeth range in number from a single tooth in an otherwise even dental arch to several teeth in a jumbled arch renders the operations so varied that without this degree of intelligence to aid the operator he will not enjoy the operation, if he does not become disgusted with the case.

CHAPTER CXIX.

THE LEVER-FERULE FOR TURNING TEETH.

GENERAL REMARKS UPON DIFFERENT KINDS OF FERULES.—THE COIL-WIRE LEVER-FERULE.—LEVER-CLASP.—PLATE-FERULES.—BROAD AND NARROW FERULES.—PLATE-FERULES WITH LEVERS SOLDERED TO THEM.—THE HARRIS LEVER-FERULE.—THE LANGSDORFF LEVER-FERULE.—STATIONARY AND DETACHABLE LEVERS IN COMBINATION WITH METALLIC BANDS.—APPLICATION OF DIFFERENT KINDS OF LEVER-FERULES TO THE TEETH.—TEETH APPARENTLY DISCOLORED BY FERULES.—HISTORICAL NOTES.

MENTION was made in the preceding chapter that one difficulty experienced in turning some teeth lies in the unfavorable form of the roots; there are other difficulties, however, such as shortness of the visible part of the crowns, inclination of the teeth, and hardness of the socket-tissue. An unfavorable form of the root (especially if crooked) and shortness of the visible part of the crown are the more troublesome conditions, while straight and conical roots, with long crowns, are the conditions that are the most favorable.

Leverage.—The instrument for conveying force necessary to turn teeth must act upon the principle of a lever, the attachment of the lever upon the tooth and the anchorage of the engine of force being sufficiently firm to do the work without slipping. The thumb and index-finger probably constituted the earliest engine of force used for turning teeth; but so far as I have ascertained, the first of all mechanisms used by the early modern dentists was the string, so tied around the tooth to be turned that when drawn taut and tied to other teeth (serving as anchorage) the effect of the draught upon this periphery of the crown of the tooth was the same as that from pulling upon the tire of a wheel. This old plan of using a string to turn a tooth, however, is becoming obsolete, because the metallic lever-ferules are firmer, the operations easier, and the results more successful.

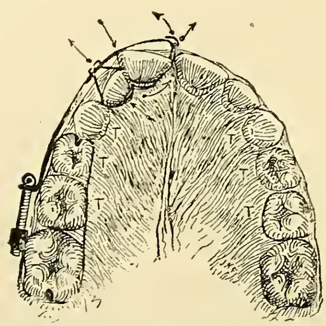


FIG. 1175A.—The String Plan (A).

For a long time after metallic levers were introduced they were not as useful as the string, because there did not appear to be any way of firmly fastening them to the teeth to be turned; the use of quick-setting cements was then unknown. To overcome the difficulty (looseness of the lever-ferule upon the tooth) several plans, more or less practicable, were devised at different times; some were simple, others complicated, but none were reliable except when they were in the hands of experts. The first mechanism that overcame this ricketiness of the instrument was the matrix-wrench (Part VI., p. 344, Fig. 305), which, by a nut, firmly tightened the band upon the tooth, but it was clumsy and inconvenient to wear. By the introduction of quick-setting cement, phosphate of zinc, which occurred soon after, this wrench was supplanted by the return of the old but delicate mechanism, the lever-ferule, which, with the cement, has been made firmer than any other mechanism yet known.

Beginning with the simpler machines and proceeding to the more complicated, the different kinds will now be considered in regular order. Probably the earliest mechanism, excepting the string, for turning teeth was the ferule with a short knob, or perhaps it was a wire twisted tightly around the neck of the tooth, the extremities of the wire being twisted to serve as a lever.

As several persons in the present generation, each evidently unaware of the efforts and claims of the others, have studied along similar lines and arrived at similar conclusions in devising mechanisms, it may be proper at this place to glance briefly over the history of the ferule and the lever-ferule. Without going back to the time of the Etruscans, hundreds of years before Christ, when ferules were used to anchor artificial teeth ("bridge-work") upon natural ones (Part II., p. 32, Fig. 2), nor even as far back as the time of Desirabode (1823), who used them to anchor long-bands upon teeth to regulate them (Part VI., p. 337), we find that C. A. Harris mentioned in his work (published in 1839[1]) the use of one having two knobs. We also find accounts, in the works of Magitot[2] and others, of a similar one used by Langsdorff; all of which shows that the first person to apply this principle of mechanics to teeth does not belong to the present generation.

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[1] In his first work he simply describes the band, but in his revised "Principles and Practice of Dental Surgery" (edition of 1850, p. 154) he illustrates by picture the same mechanism used in the case.

[2] "Dental Anomalies," 1867.

The Harris Knob-ferule.—Dr. Harris refers to the knob-ferule that he used as follows: "This species of irregularity may be corrected by accurately fitting a gold band or ring on the deviating tooth, with *knobs* on the anterior and posterior edges, to each of which a ligature should be attached. The ligatures thus fastened to the ring should be carried back on either side in front and behind the arch, and be secured to the bicuspids."[1] (See Fig. 1176.)

Fig. 1176 represents the operation by Chapin A. Harris, in which he used the ferule with knobs acted upon by strings. Dr. Harris does not assert that the ferule with knobs is an invention of his own.

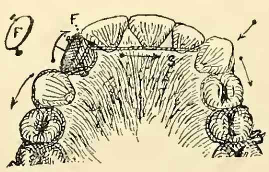

FIG. 1176.—Turning a right lateral by a string in combination with a knob-ferule (Harris, 1839).

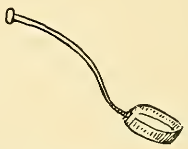

FIG. 1177.—Lever-ferule (Langsdorff).

The Langsdorff Lever-ferule.—Fig. 1177 represents the form of a long-lever ferule used in an operation for turning an incisor, many years ago, by Dr. Langsdorff, mentioned in Magitot's work, "Anomalies" (1867). This agent was used in combination with a roof-plate. To turn the tooth the end of this lever was from time to time moved laterally, and then caught upon one of a row of knobs projecting from the palatine surface of the plate.

Later, in America (1871), Dr. M. E. Magill used a similar mechanism. He soldered one end of a narrow strip of gold to a ferule, and turned a cuspid; but although one

[1] *Further Historical Notes Regarding the Ferule and the Ferule with Knobs.*—In tracing the history of ferules for teeth, I find that Desirabode described them in his work published in 1823, and that Dr. Harris used them as early as 1839. Dr. W. H. Dwinelle also claims that he used a ferule in 1849 to anchor a draw screw-jack.

author has accredited him with priority, calling it the Magill band, Dr. Magill does not claim priority.[1]

Broad Ferule.—By whom very broad ferules were first used for the purpose of regulating teeth is not known, unless it be those of Desirabode (1823). The broad ferule, however, is only a slight modification of the narrow ferule, and the knob-ferule and Langsdorff lever-ferule are similar in construction, the only difference being in their dimensions; therefore they all must be classed as lever-ferules.

For the purpose of turning a tooth the broad ferule is superior to the narrow one, because, by being broader, the cement is enabled to give the mechanism a firmer grip upon the tooth; indeed, when such a ferule is cemented upon the tooth, it is often so firm that it is impossible to dislodge it without first cutting open the band. In a case where the anchorage is weak, the broad ferule offers an opportunity for the use of a sufficiently long lever to gain the desired turning without disturbing the anchorage.

The construction and application of broad ferule mechanisms is so similar to that of the narrow ferule kind, ex-

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[1] In reply to inquiries from the profession concerning the position of Dr. Magill in regard to the assertion made by a writer accrediting him (Magill) with the invention of the lever in combination with a ferule, the latter (Magill) wrote to me (October 15, 1888) as follows: "Referring to record of work done, I used the cemented band in 1871. Have never made any claim to priority of use. I make each band [ferule] of platinum; form it on the tooth to be rotated; remove it to solder, and afterward adjust and solder on the bar [lever]."

"My use of the bar [lever] was coincident with the use of the ferule, because the object of the mechanism was to rotate a cuspid upon its axis."

To whom credit for being the first to cement ferules upon teeth should be given is as yet undetermined, but it has been reported by one author that the plan originated with Dr. W. E. Magill, in 1871. Dr. L. D. Shepard, however, claims that he used cement for this purpose as early as 1867; but I do not know the kind of cement that he used. As mentioned in the "Dental Cosmos" of June, 1879, Dr. Shepard suggested to me his use of zinc cement. I have not ascertained the exact date of the introduction of phosphate of zinc into the dental profession, but in America I think it was between 1870 and 1872. It was used earlier for teeth in England.

plained in Part VIII., pp. 427–429, that but little more is necessary to be said than that the strip of platinum or gold plate (Nos. 32 to 34) should be cut sufficiently long to encircle the tooth, and sufficiently broad to be firm (Fig. 1178).

FIG. 1178.—Broad ferules with staples.

FIG. 1179.—The ferule in a nest, ready to be soldered.

To obtain the strongest hold the ferule should cover all the visible part of the crown. To prevent slipping upward the ferule should slightly overlap the end, or be like a cap. (Fig. 1180.)

The thin plate having been bent into the form of a hollow cylinder, and bound with steel hair-wire to hold it in that form, the roll is placed into a wire "nest" having a handle (Fig. 1179); then the overlapping parts are painted with liquid borax, and a small piece of 18 k. gold solder applied to the joint, and all is then held in the flame of a spirit-lamp until the solder is melted. An ordinary office-lamp (without the aid of a blowpipe) is sufficient to unite the parts. If the base of an incisor tooth interferes with the easy adjustment of a cylindrical ferule, the lingual side (of the ferule) should be so bent that it will conform to the tooth. Such a ferule, having a staple upon its labial side, is represented by Fig. 1180A.[1]

Long Stationary and Long Detachable Levers in Combination with Broad Ferules.—Although long levers are more inconvenient to wear than short levers, such as knobs or staples, they are sometimes more valuable because they are capable of exerting greater force by the same or less degree of power. Especially are they valuable for use in

[1] From a lecture by the author given before the Massachusetts State Dental Society, at Boston, Mass., 1885 ("Independent Practitioner," July, 1886).

stubborn cases, where the roots are flat or crooked; but they always require to be used with broad ferules. To whom the priority of the long-lever ferule belongs I am not able to say. Certainly it is not new; nor is it more

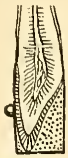

FIG. 1180.—Sectional view of the crown of a central covered by a broad cylindrical cap.

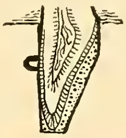

FIG. 1180A.—Sectional view of the crown of a central covered by a beveled ferule.

than a slight variation of the Harris knob-ferule. As a mechanical combination there is no difference between a lever that is as short as a knob or a staple, and a lever that is an inch or more in length.

Figs. 1181 and 1182 represent ferules with levers varying in length from that described by Harris to that by Langsdorff. These two figures are presented mainly to show that all sizes of lever-ferules are the same in principle. Long-lever ferules may, however, be divided into classes, viz., those in which the levers are soldered to ferules, and those that are independent and detachable.

The long-lever ferule has been used for many years by dentists in England and Germany, and it is not at all new in America. In the latter country it has lost favor, because engines of equal power are made practicable by the use of smaller anchors, that are much less inconvenient to wear than plates. By the use of clamp-bands or of multiple ferules the short-lever ferules are as practicable, if not more so: again, they do not cause disturbance in sleep.

Anchorage.—The difference in the power exerted by long and by short levers is so great that the operator can, by taking advantage of it, accomplish nearly uniform results.

The firmness of a cuspid being so much greater than that of a lateral incisor, the former is always sufficient to turn the latter without materially disturbing the anchorage, even if the band on the lateral has only a knob to attach the engine of force upon. But if an attempt were made to

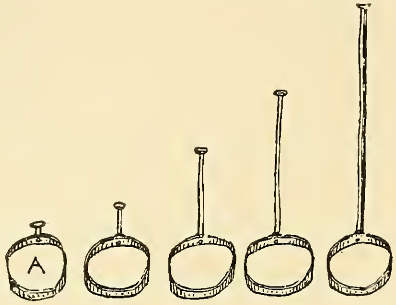

FIG. 1181.—Ferules with straight levers of minimum to maximum lengths.

turn a bicuspid by the same kind of anchorage, the cuspid might be somewhat disturbed. If both a lateral and a cuspid need turning, and it is desirable to turn both at the same time with the same engine of force, calculations should

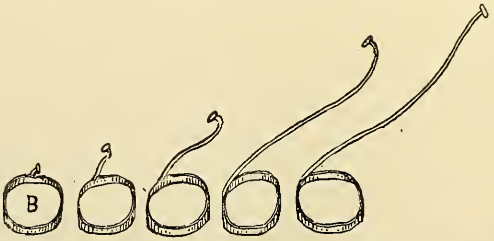

FIG. 1182.—Ferules with crooked levers of minimum to maximum lengths.

be made for the difference in their socket resistance and have the two levers vary in length, to balance each other.[1] Long levers are so powerful that a lateral or a bicuspid can sometimes be successfully used as anchorage for turn-

[1] However, should one of the teeth be turned too far, it would be no great drawback to the operation, because, if liberated within a short time, the tooth would soon return to its former place.

ing a firmer tooth, without itself becoming materially disturbed, provided the lever be of sufficient length.

Fixed Levers.—Long levers for ferules are generally made of wire, single, or double and twisted. In form the lever may be straight or crooked, but it should have a head, or hook upon the end, to hold the engine of force to the lever. The form of the head may be a matter of choice, but the hook is generally preferred, because it is more reliable. Several forms of these hooks and levers are to be found illustrated in this Part (XVI.).

Detachable Levers.—Instead of having the lever soldered to the band, it is occasionally more convenient to have it detachable; especially is this true in cases where it is desirable to change one form of lever for another without removing the anchor.

The lever can be attached to a ferule by having soldered to it a staple and a bifurcated resting-piece, or by two staples or rings, as represented in Fig. 1183. An excellent

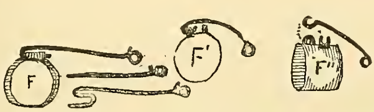

FIG. 1183.—Different forms of detachable levers and their ferule attachments.

FIG. 1184.—The Crane-lever.

plan is to solder a piece of smooth-bore tubing or "jewellers' piping" to the ferule, into which a smooth-wire lever is lodged, as suggested by Dr. Talbot.[1] A still better plan for an adjustable lever is to have on one end a head, or have one extremity threaded to fit into the tube previously screw-cut. Staples for attachment of levers to ferules, as

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[1] There appears to be some diversity of opinion concerning priority in the use of the tube in combination with the ferule. Three years after Dr. Talbot devised his tubed ferule above mentioned (1884) Dr. Angle put forth, at a meeting in Washington, a mechanism exactly like it. The evidence thus far given is in favor of Dr. Talbot.

represented by Fig. 1185, are somewhat rickety, therefore they are not equal to the tube.[1] The crane-lever, represented by Fig. 1184, is superior.

The extremity of the lever that rests in a staple or a tube may be of any form, depending upon the circumstances of the case. An oval form is important only where

FIG. 1185.—Staple-ferules for detachable levers.

it is necessary to avoid turning of the levers in the tube. The lever that swings like a crane, however, is my preference. In all cases it is well to have the staple or tube correspond with the form of the extremity of the lever.

When it is necessary to alter the length of a lever during the process of turning a tooth I generally use a piece of platinum wire, sufficiently stiff, yet easy to bend by round pincers. When it is necessary to shorten the lever it is done by curving the wire, and when necessary to lengthen the lever it is done by straightening it. Other changes in the form of levers, that are often necessary to prevent interference of antagonism, may be made.

When a ring is needed on the free end of the lever for attachment of rubber rings, there is none better than a loop made by bending double a wire, and then twisting the extremities to form the lever, leaving an eye at the free end. Platinum wire is preferred to gold wire, because, being more pliable and less elastic, its form is more easily altered without removing the cemented ferule from the tooth. The degree of stiffness in wires can be governed

[1] Concerning the making of staples, rings, and tubes for lodgment of levers, see laboratory rules, Parts VII., VIII., pp. 371–427.

by the quantity of metal in them. This quantity may be included in a single wire or by having two smaller wires twisted as above suggested.

Application of the Lever-ferule.—When a mechanism is ready to apply, it is first tried upon the tooth to be turned, and the wire bent to the proper form; then all is removed, the tooth dried, the ferule filled with phosphate-of-zinc cement (of a sticky consistency), and then forced upon the tooth and held there (dry) until the cement hardens, which requires about ten minutes to become very firm.

Apparent Discoloration of a Tooth in a Ferule.—In the use of broad ferules upon teeth it should be remembered that they always cause the teeth to appear darker than normal; indeed, they sometimes resemble old pulpless teeth. This is caused by the ferule preventing transmission of light through the translucent tooth. When the ferule is removed from the tooth the normal shade is always instantly restored, if it is alive.

In 1872 A. N. Fuller published a coil-wire ferule-lever constructed as follows: a platinum wire is wound about the tooth on a metallic cast until the coil is as broad as an ordinary ferule; upon this coil, when it has been transferred to a plaster cast, gold solder is flowed to unite the wires constituting the coil. In this way Dr. Fuller says that a ferule-like band of perfect fit is made.[1] Several years subsequent to the date when Dr. Fuller devised his mechanism, Dr. Hyde published an all-wire lever mechanism; this one did not have a coil, nor was it soldered. (See Part VI., p. 339, Fig. 294.) To facilitate operations and at the same time cause as little inconvenience to patients as possi-

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1 Dr. Fuller says clasps also can be made to fit teeth in this manner, by the use of heavier wire soldered with 20 k. gold, and then cut open to form clasps that will embrace the teeth.

ble, both of these mechanisms should be small. Large and clumsy ones not only annoy, but are liable to cause failure of the operation by becoming loose.

Lever-clasp.—This mechanism, devised by Dr. Guilford, consists of a strong clasp, with one end of a piece of wire or a narrow strip of plate soldered to the middle of the outside of this clasp. This has not been found to be as practicable as the rigid ferule-lever or the crane-lever. (See Chap. CXXV.)

CHAPTER CXX.

TURNING INDIVIDUAL INCISORS BY STRINGS AND BY ELASTIC RUBBER IN COMBINATION WITH SHORT LEVER-FERULES.

GENERAL REMARKS UPON THE USE OF THE SIMPLEST ENGINES OF FORCE.—STRINGS AND RUBBER FOR TURNING TEETH.—REMARKS UPON THE EFFECT OF PLACING KNOBS UPON DIFFERENT SIDES OF ANCHOR TEETH.—OPERATIONS BY STRINGS AND KNOB-FERULES.—BY RUBBER RINGS, KNOB-FERULES, AND CLAMP-BANDS.—BY RUBBER RINGS, A LONG-ARM FERULE, AND A HOOK-FERULE.

IN the preceding chapter the construction of lever-ferules for turning teeth was explained. Now we will consider the different plans of using them. In so doing I shall have occasion to speak of knobs and small staples as *short levers*, and of larger ones as *long levers ;* I shall also refer to strings and rubber rings as classed among the *engines of force ;* and the anchors to these will be called *anchor-bands.*

The use of strings in operations for turning teeth is not new; in fact, strings have certainly been in use for more than fifty years[1] for turning teeth, and probably for nearly a century and a half, for it is hardly reasonable to suppose that Fauchard and Bourdet did not think of this, when they used strings so much for fastening irregular teeth to strips of gold plate. Nor can the use of rubber be

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[1] Desirabode, Delabarre, Maury, Harris.

regarded as very new; for when the process of vulcanizing rubber was discovered,[1] dentists regarded the new material as a possible benefit to them in different ways, though it was not until 1846 that it was thought it might be useful as a substitute for strings in the regulation of teeth.[2] At that time, however, rubber tubing being then unknown, the pieces used were cut from sheet-rubber. The invention of rubber tubing was a great stride in this use of rubber, because it was then easy to make cylindrical rings. Teeth can be turned by strings alone, but rubber rings, although requiring aids to prevent them from slipping upon the teeth to be turned, are more easily applied.

In Fig. 1176 (p. 1228) was shown a plan of turning teeth by a string; in that case the string was anchored directly upon the anchorage tooth, very much as some old-school dentists do now, using no mechanical anchor whatever. Notwithstanding the fact that clever manipulators of strings perform some very successful operations, the process, as a means to an end, is far inferior to the modern plans of operating, which are easier, more reliable, and less annoying to the patient.

Fig. 1186 illustrates the turning of two upper centrals by two strings in combination with aids. These aids consisted of two ferules made similar to those suggested by Harris. One, H, having two knobs, was placed upon the right first molar for an anchor; the other, D, having only one knob, was placed upon the left central. One of the strings was tied to the lingual knob upon the molar-ferule, and the other to the knob upon the buccal side. This string attached to the buccal knob extended along the outer sur-

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[1] Invented by Goodyear in 1839.

[2] Elastic rubber was first used for regulating teeth in 1846, by Dr. Tucker, of Boston, Mass.

faces of the bicuspids, thence between the first bicuspid and cuspid, and forward anteriorly along the lingual wall of the dental arch, thence between the centrals, and there tied to the knob on the left central. The other string extended from the knob on the lingual side of the molar-ferule to the knob of the ferule on the left central. The object of the first-mentioned string was to force the right

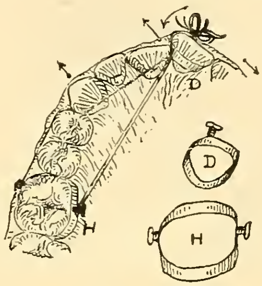


Fig. 1186.—Turning a central by strings and knobbed ferules.

central and lateral outward to make room for the left central to turn in, while the other string acted upon this tooth. Of course the bearing of the former string acted inwardly and unfavorably upon the right cuspid, but after the centrals and lateral were corrected, and while being held in place by a retaining mechanism the cuspid was liberated, and then it returned to its proper place.

The placing of two knobs upon the sides of an anchor-ferule, as here represented, is necessary in cases where two such lines of draught are made, because a knob on one side only would tend to turn the anchor tooth. If a single knob is placed upon the anterior side of the anchor-ferule, or as near there as is practicable, draughts upon it will not turn the anchor tooth. (See Figs. 1188 and 1189.)

Fig. 1187 illustrates an operation for turning a left upper lateral by a rude plan of using an elastic-rubber ring, in combination with a ferule having soldered to it a platinum staple. The ferule being first cemented upon the tooth, the rubber ring was tied to the staple (on its lingual side), and then stretched between the lateral and cuspid, thence

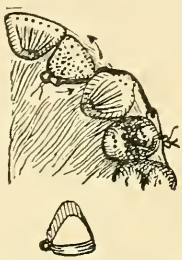


FIG. 1187.—Turning a lateral by an elastic-rubber ring in combination with a stapled ferule.

past the first bicuspid, and tied to the second bicuspid by a string. The tendency of direction of the lateral, by the force from the rubber ring, is indicated by arrows. The form of the staple-ferule is represented in the lower part of the diagram. This operation was similar to one described

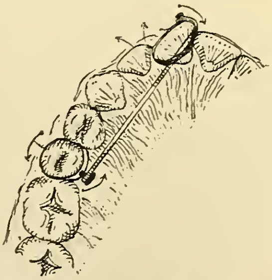


FIG. 1188.—A case illustrating the wrong place for the knob upon the anchor-ferule.

by Dr. Harris; the ferule, however, was cemented upon the tooth instead of being without cement. In place of the string, rubber was used, and instead of a knob on the ferule there was a staple.

As before mentioned, when only one tooth is used for anchorage, and the turning of that tooth is not desired, the ferule should be so placed upon the tooth that the line of draught upon the knob will be as nearly as possible on a straight line from the central axis of the anchor tooth to the tooth to be turned. (See Fig. 1189.) If a ferule is so

FIG. 1189.—A case illustrating the right place for the knob upon the anchor-ferule.

placed that the knob or staple is located at one side of the anchor tooth, as represented in Fig. 1188, the line of draught will be at right angles to the central axis of the tooth; consequently there will be a tendency for the anchor tooth to turn in its socket.[1]

The selection of the proper tooth for anchorage is also important. I have known an operator of limited experience to misuse a single bicuspid for anchorage for turning an upper central incisor. Fig. 1188 represents this case.

Unless it is desirable to move the bicuspid as well as the incisor, the ferule should be made to embrace more than one anchorage tooth. It is proper sometimes to embrace two bicuspids and even one or two molars. If only one tooth is to be used for anchorage, it may be a cuspid or a molar, because, these teeth being firmer than a bicuspid, they are less liable to be disturbed. Still cuspids and molars are not always sufficiently firm, unless a long lever

1 These suggestions are made because some text-books have, by wrongly drawn pictures, misled some inexperienced operators into difficulties.

is used. If a draught-cord is curved partly around some other tooth or teeth (to secure a fulcral bearing), the draught will not be so great upon the anchor tooth. This

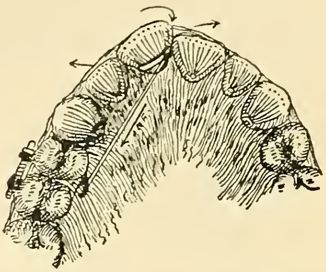


FIG. 1190.—Turning a right upper central by a rubber ring anchored to a gold clamp-band (A).

may be illustrated by the case of the boy who with one hand could hold a fractious colt, after the halter-strap had been passed half around a post or a tree.

Figs. 1190 and 1191 illustrate two operations (similar to the two last-illustrated operations) for turning upper in-

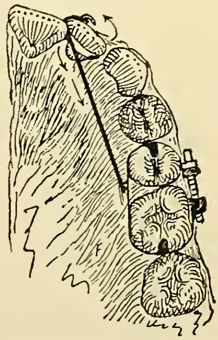


FIG. 1191.—Turning a left upper lateral by a rubber ring anchored to a clamp-band (A).

cisors by a modification of the Harris plan, the difference being that clamp-band anchors and rubber rings, instead of strings, were used. In these two cases (Figs. 1190 and 1191) the draught-cords were anchored by hooks instead of knobs. In the case illustrated by Fig. 1190 an outstanding right central required more room before it could be properly turned; this extra space was gained by drawing the tooth wedge-like between the adjacent ones. To do this required strong anchorage. This was obtained in the two right bicuspids, in a clamp-band, and in the cuspid outside of the band. Upon a hook soldered to the lingual side of the anchor-band the rubber ring was caught, and then stretched, and again caught upon a knob upon a narrow ferule on the outstanding central. The tension of the rubber turned this tooth, and at the same time forced the right lateral out of its way. The directions of movements of the teeth are indicated by arrows.

In applying such ferules they always should be cemented upon the teeth (the cement being applied while in a sticky

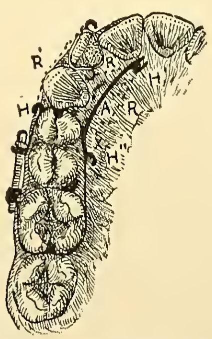


FIG. 1192.—Turning a lateral by rubber rings in combination with an arm clamp-band (A).

consistency). When hardened, the surplus cement should be removed from under the margin of the gum, to prevent inflammation. This operation was not strictly scientific.

Fig. 1191 illustrates a more scientific operation; this was for turning a left lateral by the same kind of mechanism.

Fig. 1192 illustrates the beginning of an operation for turning a right upper lateral by two elastic-rubber rings, a gold clamp-band, and a ferule. Fig. 1193 represents the different parts of the mechanism independently: clamp-band, B (with an arm), ferule, F, and two rubber rings, R and R′.

To the lingual side of the clamp-band was soldered one end of the piece of stiff gold-wire arm, A (the other end free),

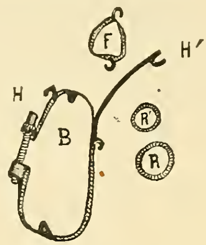


FIG. 1193.—The different parts of the mechanism (A).

which projected forward past the right lateral incisor; this wire had soldered near its extremity a hook, H′. Upon the forward part of the buccal side of the clamp-band was soldered another hook, H, and upon the ferule for the lateral were two hooks to serve as short levers for the rubber rings to draw upon. (See F in Fig. 1193.)

The process of applying the mechanism consisted in first placing the anchor clamp-band around the bicuspids and first molar; the platinum ferule was then cemented upon the lateral, after which the rubber rings were added as follows: having caught one rubber ring, R (see dotted lines), upon the lingual hook H″, it was stretched forward through the hook H′, and then back, and caught upon the lingual hook of the ferule as shown. The other ring, R′, was caught upon the buccal hook H of the clamp-band, and then stretched and caught upon the labial hook of the ferule.[1]

[1] In principle the different parts of this mechanism are separately represented in Part VI., p. 340, Fig. 296. To turn an incisor in the opposite direction, see Fig. 1282, p. 1328, representing an operation for turning a cuspid.

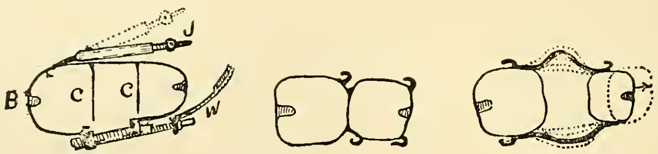
CHAPTER CXXI.

TURNING INDIVIDUAL INCISORS BY ELASTIC RUBBER IN COMBINATION WITH LONG LEVERS ANCHORED TO NAKED TEETH OR TO METALLIC BANDS.

GENERAL REMARKS UPON THE VARIOUS KINDS OF SMALL ANCHORS THAT ARE USED IN THIS CLASS OF OPERATIONS.—OPERATION BY THE LONG LEVER AND AN ELASTIC-RUBBER RING.—BY A BOX-WRENCH AND A RUBBER RING.—BY A LEVER-FERULE AND A CLAMP-BAND.—BY A CRANE-LEVER AND A RUBBER RING.—MORE ABOUT ANCHORAGE.

HAVING in the preceding chapter (CXX.) considered operations by the use of the short-lever bands, there now remain for consideration operations by the use of the long-lever ferules. The latter are generally more inconvenient to wear than the former, but they have their merits in operations requiring great power, or in operations where the anchorage is weak; they are also useful in double operations, *i. e.*, where two teeth are to be turned at the same time, the tooth turning with the greater difficulty requiring a longer lever. Several double operations will be found explained in Chapter CXXIV. As with single-tooth anchor-bands in combination with short-lever ferules, so are single-tooth anchor-bands with long-lever ferules often practicable in operations for turning teeth; but unless it is desirable (as often is so) to turn the anchorage tooth also, they (ferules) generally should be so applied that one or more other teeth will be between the banded anchorage tooth and the one to be turned.

When clamp-bands can be applied to anchorage teeth, however, they are often more useful for anchors than single ferules, because they are adjustable. But it is well, as a matter of convenience, to keep on hand small sizes of all the different kinds of these anchors. Moderately broad clamp-bands are generally better than narrow ones, because they are less liable to become twisted when tightened upon by the binding-screws. There are cases, however, where a narrow band or a platinum-wire band is superior.[1] Two ferules united by side wires are practicable.



FIGS. 1194, 1195, 1196.—Three kinds of anchor-bands.

If the teeth are "pear-form," rendering them liable to wedge one another up or down in their sockets when drawn tightly together by a clamp-band, the band may have one or more partitions, one end of each being soldered to the lingual side; the partitions projecting between the teeth to furnish a perpendicular wall that will prevent wedging. (Fig. 1194.) In some cases, however, this kind of anchor is not equal to two ferules joined together by solder (Fig. 1195), or connected at the sides by platinum wire, as represented by Fig. 1196.

A single broad ferule, with a stiff buccal bar to bear upon some of the adjacent teeth, constitutes an excellent anchor where the draught of force is transpalatine. When the

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[1] Fig. 191 (Part VI., p. 278) illustrates another detachable anchor.

crowns of teeth are favorably formed (as they generally are) the clamp-band will not disturb them, and will prove to have superior advantages, among which is easy detachment when necessary to remove them for alterations in the mechanism. If there is liability of rising of the posterior tooth in an anchor-band of any kind, the draught should always be connected with the anterior part of the band.

Fig. 1197 illustrates a somewhat old operation for turning a right upper lateral and moving the cuspid inward at the same time, by a rubber ring and a long-lever ferule, the anchorage being the bicuspid. The ferule was cemented to the tooth to be turned, after having first tied the rubber ring to a small ring on the free end of the lever. After

FIG. 1197.—Turning a lateral by elastic rubber and a long-lever ferule.

the cement had hardened (set) the rubber was stretched over the labial side of the outstanding cuspid, thence posteriorly to the first bicuspid, to which it was tied as shown in the figure. The only drawback to this operation was the encroachment of the cuspid upon the lateral, which, being so firm, required a long time to cause sufficient looseness of these and the adjacent teeth (by decalcification of the socket-tissue) to form the teeth into line. After this mechanism had caused slight looseness of the lateral and cuspid, the lever was bent posteriorly until it was nearly in contact with the cuspid, and the draught of the rubber would act in a direction to force a slight separation of the lateral and the cuspid. After this, the turning force was reëstablished, by rebending the lever partly to its original form. This plan of operation should become obsolete.

Fig. 1198 illustrates the beginning of an operation for turning a left upper central by an adjustable matrix-wrench, acted upon by an elastic-rubber ring, R, anchored upon the

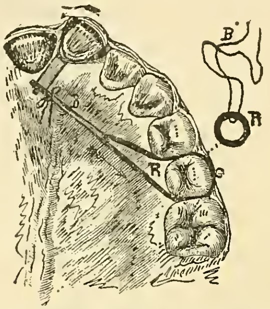

FIG. 1198.—Turning a central by elastic rubber in combination with a matrix-wrench.[1]

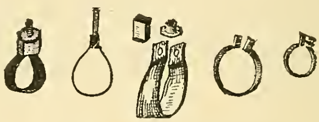

FIG. 1199.—Matrix-wrench in parts (A).

left second bicuspid. This wrench (Fig. 1199), devised to overcome looseness, found in the use of all ferules (before quick-setting cement was known in dentistry), consisted of a loop, barrel, screw, and nut.[2]

To apply the mechanism, the ribbon, acting as a ferule, was tightened upon the cuspid by having its extremities drawn into the barrel (lever) by the screw and nut. The rubber ring R was then caught upon the screw and nut; then it was stretched, and caught upon the second bicuspid as shown.

The matrix-wrench is easily adjusted to a tooth of any size, but it is clumsy and more inconvenient to wear than a lever-ferule; consequently this wrench, at the present time, is not often used. In having only one tooth for anchorage it will, of course, tend to move it out of its place. This was

[1] Published October, 1877, in the "Dental Cosmos" (A).

[2] For details of construction of this mechanism, see Parts VI.–VIII., pp. 344–439.

the case in this instance, but as soon as it was noticed it was arrested by placing upon the anchor tooth a gum-guard ring having a bar soldered to the outside of it,[1] to rest upon the buccal side of the adjacent teeth. A similar mechanism is represented by V in Fig. 1200.

Fig. 1200 illustrates the beginning of an operation for turning a left lateral for a young woman about twenty-one years of age. This operation (which was a part of a larger

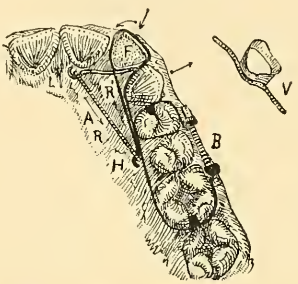

FIG. 1200.—Turning a stubborn lateral by elastic rubber, a lever-ferule, and a clamp-band (A).

one) included the moving into line the outstanding tooth. Both acts combined (the turning and moving into line) were difficult, not only because of hardness of the alveolar process, but the root was crooked.

The mechanism consisted of a gold anchor clamp-band, B; a thin, broad platinum ferule, F, having attached to it a strong platinum-wire lever, L; and two rubber rings, R, R′.

Having fastened the clamp-band tightly around the two left bicuspids and first molar, and cemented the ferule upon the outstanding lateral, the two rubber rings were applied as follows: Upon the clamp-band hook H was first caught the ring R, which was then stretched forward and caught upon the hook on the end of the lever L; this was for turning the tooth. The other ring, R′, was caught upon the

[1] See Part VI., p. 339, Fig. 295.

same clamp-band hook H, and stretched forward past the cuspid, and then caught around the lateral as shown. The object of this rubber ring was to force the cuspid outward, to widen the space for the lateral, and at the same time draw this tooth into line.

After about three days it was found that the combined effort to turn and at the same time draw the lateral into line was causing pain because of too great force. To relieve the patient, the ring R was now removed, leaving only the ring R′ to continue the work. After this latter ring was worn about three weeks the space was nearly sufficient for the lateral, which had also now made some progress in moving toward its proper place. The other ring, R, was now returned, but instead of catching it upon the hook of the lever, it was lodged nearer the tooth, so as to draw upon the other extremity of the wire, close against the ferule, the object being to cause less pain.

After about one month the combined effect of the two rubber rings caused sufficient room for the outstanding lateral, and also moved it nearly to line. The ring R was now moved along the lever L and caught upon its hook to increase the turning force. Though a stubborn case, the operation was successfully completed after several weeks of persistent effort.

The tooth was now retained in its place by a gold ferule (less than one-eighth of an inch in width) having soldered to its lingual side a piece of platinum wire (about the size of a pin), to rest upon the lingual side of the cuspid and central. This retainer is represented by V, at the right of the main figure.

In the same case (not shown) was a partially erupted right upper cuspid; this case, which was moved and turned by the use of screws, is explained in the section on Turning of Cuspids, Chapter CXXXIV. For operations for similar cases, see also Chapter CXXIX.

Fig. 1201 illustrates an operation for turning a left upper central by an elastic-rubber ring in combination with a crane-lever.

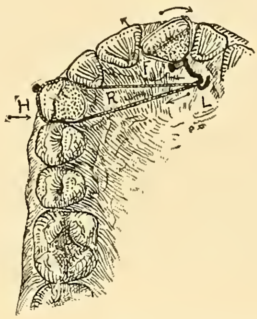

FIG. 1201.—Turning a left upper central by a crane-lever and a rubber ring (A).

Fig. 1202 represents the working parts of the mechanism. The straight pin P, and the crooked pin P, represent the form of the pin as it appeared before and after being used. The ferule F was made similar to the Talbot ferule by having soldered to its lingual side a piece of small tubing or "piping" about an eighth of an inch in length. Through

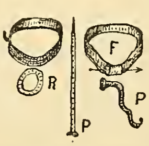

FIG. 1202.—Different parts of the mechanism (A).

this tube projected the lever, which was only a common brass pin, P, with its point cut off. After placing this straight pin through the tube, it was bent into the form represented at the right. Upon a hook on this movable lever was first caught the rubber ring R; then it was stretched, and caught over the right cuspid as shown. The rubber ring was prevented from slipping upward and injuring the gum by a gum-guard ring, H. (See Fig. 1202.)

For a temporary lever I have found that the ordinary brass pin is often equal to anything else; not only because it is of the proper size, but it is always at hand, ready for use. If the pin is properly bent it will not only swing outward like a crane, so that it is easy to catch the rubber upon, but it will swing back into the mouth out of the way of the teeth, and when drawn upon may remain close to the gum. Such a movable lever, when practicable, is less annoying to the tongue during the act of swallowing than a rigid lever, and, being coated with tin, it is harmless.[1]

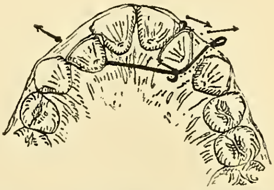

FIG. 1203.—Turning one lateral and moving directly outward another, by one elastic-rubber ring in combination with two anchor-ferules (A).

Fig. 1203 illustrates the beginning of an operation for turning a left upper lateral and moving directly outward a right upper lateral by one elastic-rubber ring in combination with two ferules, one of which had soldered to its lingual side a long arm, and to the other a hook.

FIG. 1203A.—The mechanism in detail (A).

Fig. 1203A represents this mechanism, consisting of thin platinum ferules, F, F, and a wire, A. To the right ferule was

[1] Although in such cases this is often the best kind of lever, it is not as practicable in some cases as the rigid lever.

soldered one end of this piece of gold wire, A, having a hook, H, midway its length. The free end of it was also bent in the form of a ring, E. The other (left) ferule, F, had a hook soldered to its labial side. The dotted line represents the elastic-rubber ring. In applying the mechanism this ferule was fitted upon the left upper lateral, so that its hook was on the labial side of the tooth, and near the central. The other ferule (having the long wire) was similarly fitted, and cemented to the other lateral as shown in the figure. The wire arm projected from this ferule, across the dental arch, thence between and beyond the left lateral and cuspid. The rubber ring was then caught upon the hook of the ferule on the left lateral, and (see dotted lines) stretched through the ring E (on the end of the wire A) and caught upon the hook H; the contraction of the rubber ring, acting oppositely, moved the two teeth in the direction indicated by the arrows.

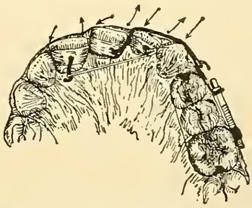

FIG. 1204.—Turning three incisors by four elastic-rubber rings (A).

Fig. 1204 illustrates the turning of two centrals and a left lateral by four rubber rings. These are stretched among the front teeth, and caught upon hooks on the gold clamp-bands that had been previously used in widening the arch, by means of a screw-jack. The details of the operation are so clearly indicated in the figure that it is unnecessary to further explain them.

CHAPTER CXXII.

TURNING MORE THAN ONE INCISOR AT THE SAME TIME BY STRINGS AND BY ELASTIC RUBBER IN COMBINATION WITH CLAMP-BANDS.—LONG-BANDS AND OTHER METALLIC AUXILIARIES ACTING FROM FIXED ANCHORS.

GENERAL REMARKS UPON TURNING MORE THAN ONE TOOTH AT ONE TIME.—OLD AND NEW IDEAS.—STRING AND RUBBER AS ENGINES OF FORCE.—OPERATION FOR TURNING FOUR TEETH SIMULTANEOUSLY BY ELASTIC RUBBER AND ARM ANCHOR-BANDS.—TWO OPERATIONS BY MECHANISMS HAVING TWO ARTIFICIAL TEETH UPON EACH.—TWO SIMILAR CASES THAT REQUIRED DIFFERENT TREATMENT.

THERE are two plans of anchoring turning mechanisms, when two or more incisors are to be turned at the same time: one by anchoring to other teeth than those to be moved; the other by making the teeth to be turned serve as anchorage to one another. The present chapter will treat of operations in which the first plan of anchoring is used; the other plan, which is very interesting, will be treated in following chapters (CXXIII., CXXIV., and CXXVIII.). One of the oldest plans of turning teeth is that of tying them to a narrow strip of metallic plate fastened to the adjacent teeth, the strip extending along the greater part of the arch. Bourdet (1786), though not the first to perform operations by this plan, describes the process as follows: "A strip must be pierced at each extremity with three holes, distant about half a line from each other, into which threads are passed, so that their ends come on the outside. The loop of the thread is passed around the upright tooth at each side of the one that is out of line. The threads are tied so that the strip will be firmly held on the teeth. They should be untied and replaced about twice a week until the tooth is turned into place."

This old plan of attaching the ends of the strip of plate to the anchorage teeth by strings is still followed by some dentists in Europe and America. Sometimes one or both ends of the strip were anchored by clasps. At the present time, however, such strips, now called long-bands, are anchored by ferules, or by clamp-bands soldered or screwed together.

The construction of the old-style strips of plate is so fully illustrated in Part VI. that it is unnecessary to further describe them; therefore only the modern mechanisms of this class will be presented in this chapter.

Turning Two Teeth at One Time.—In early days the turning of two incisors simultaneously was regarded as improper; as late as 1850 Dr. C. A. Harris recommended[1] that "if two centrals are out of place only one should be turned at a time." This was because, in cases where two incisors are irregular, the labor of correcting them was then regarded as being twice as difficult as the turning of only one tooth. Now, however, the difficulty is not always regarded as twice as great; indeed, it is sometimes easier to turn two teeth than it is to turn one. Even four teeth can sometimes be thus turned. When both upper central incisors have moved oppositely out of line as shown in

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[1] Harris's "Dental Surgery," p. 486.

Fig. 1172, or reversely as in Fig. 1205, both teeth can safely be moved at the same time by the same mechanism.

To construct a mechanism for centrals that would be free from all inconvenience is perhaps impossible; but if the more annoying parts be placed outside of the dental

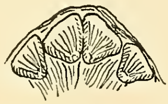

FIG. 1205.—Slightly malposed central incisors.

arch the inconvenience will be less than if placed upon the inside. Such placing of a mechanism would of course be more conspicuous, but as a rule patients prefer comfort to personal appearance.

The old plan of using nothing more than strings or rubber rings skilfully wound around and between the teeth is often practicable; but when used in connection with a long-band they are more so. Such strings, besides being extremely disagreeable from accumulation of *débris*, are liable to fail, from their slipping around the tooth to be turned. But if strings be used in combination with ferules or lever-ferules there is less liability of accumulation of *débris*, and the operation will be easier to manage. Elastic-rubber rings, however, are superior to strings and much easier to apply. Various operations by the use of strings or of rubber in combination with skeleton metallic anchors will now be illustrated.

Fig. 1206 illustrates an operation for turning two upper laterals by strings and a long-band anchored by clamp-bands.

A gold long-band having lock-screws was fastened upon the front teeth by the screws entering the posterior (double) nuts of the clamp-bands previously placed upon the opposite bicuspid teeth. This part of the mechanism, though the most expensive, was simply to furnish a purchase for the strings, which were tied by clove-hitch knots upon the laterals to be turned. The ends of the strings were passed through the holes in the long-band and drawn tight and tied.[1]

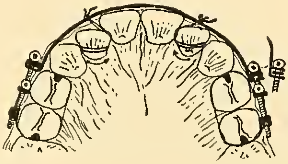

FIG. 1206.—Turning two upper laterals by strings (A).

Fig. 1207 illustrates the beginning of an operation for turning four upper incisors by rubber rings. The mechanism consisted of three elastic-rubber rings, a gold T-piece, T, having hooks and two gold anchor clamp-bands, C, C, each having soldered to it a stiff platinum-wire arm, H, having three hooks. The T-piece is represented separately in the left upper corner of the figure.

In applying the mechanism the anchor-bands were first bound around the bicuspids, and then the T-piece was placed between the centrals, after which the rubber rings, A, A, were caught upon the T hooks, and stretched, right and left, between the centrals and laterals, and caught upon the hooks, H, H, on the platinum arms.

Another rubber ring, B, was stretched between the laterals and cuspids and caught upon other hooks, H, H, and T. The general forms of the three rubber rings, when stretched, are approximately represented in miniature in the lower part of the figure. The effect of the former rubber was to turn the centrals by the rubber

[1] To find a description of the various kinds of knots that are practicable in dentistry, refer to Knots in Index.

rings bearing upon their outer corners in the direction represented by arrows. The object of the latter rubber was to bear upon the medial corners of the laterals to offset the opposite effect of the former rubber upon them. The turning of these laterals was accomplished later by the rubber B alone.

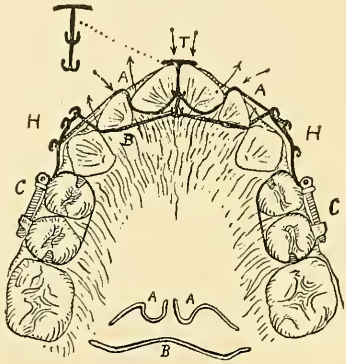

FIG. 1207.—Turning four upper incisors by rubber rings and arm clamp-bands (A).

It will be readily seen that various modifications of this mechanism can be easily constructed to suit different conditions. The simple stretching of rubber rings so as to bear upon corners of two teeth to be turned is not mine; both Dr. Northrop and also Dr. Kingsley used them similarly; it was from the former that I obtained the idea.[1]

Fig. 1208 illustrates the closing of an operation for turning two upper laterals for a woman, who said that her central incisors had been extracted because they were decayed. The laterals being prominent, as well as turned, were so unbecoming that she desired them corrected. The mechanism used in this operation consisted of two parts: one for work, the other for esthetic purposes. The ele-

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[1] For a similar case in which a T-piece was used, see Part XIV., p. 724.

ments were two clamp-bands, K, a long-band, B, two lever-ferules, and two rubber rings, R. Projecting forward from each of the clamp-bands, which were worn upon the molars, was an arm, E, upon the end of which was soldered a threaded nut for a screw, S, to connect the long-band with these anchor-bands. The long-band was made of stiff round platinum wire, which spanned the space caused

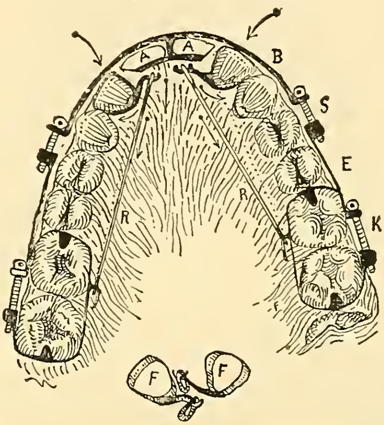

FIG. 1208.—Turning two laterals with rubber rings anchored by clamp-bands (A).

by the missing centrals. The object of this wire was simply to temporarily support (in the space) two artificial teeth, A, A; these teeth constituted the esthetic part. The engines of force, the rubber rings, were caught upon the lever-ferules (cemented upon the laterals) and upon hooks on the lingual sides of the anchor-bands.[1] The figure represents the rubber rings as being caught upon the ends of the levers, but during the main part of the operation the rubber drew upon the other ends, near the ferules.

Fig. 1209 illustrates a case similar to the one last explained. It was corrected by a similar mechanism. As

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[1] The lever-ferules are represented separately by F, F, in the lower part of the figure.

this operation (for a girl about eighteen years of age) is more valuable as a lesson than the other, it will be dwelt upon at greater length.

The patient formerly had protruding upper teeth, in a V-arch. By wrong advice she had the centrals extracted,

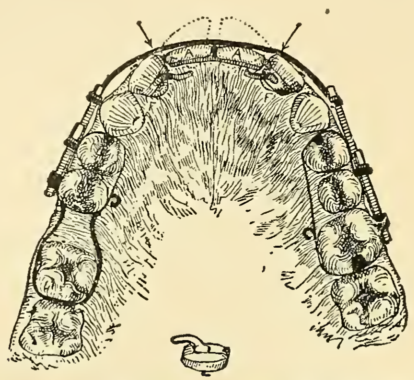


Fig. 1209.—Drawing protruding laterals to line, and simultaneously turning them (A).

and had them substituted by artificial teeth mounted upon a hard-rubber plate; although her personal appearance had thus in a measure been improved, it was not so great as the case would permit. Of course the process was wholly wrong (when considered in the light of the possibilities of the art of correction of irregularities of the teeth), for now the patient will be obliged to wear artificial teeth during the remainder of her life (unless she resort to implantation, which is now being regarded as of doubtful value) if she desires to remain comely.

When the patient applied for treatment, the laterals (as also did the artificial teeth) protruded so far that they rested upon and slightly projected over the lower lip. The laterals stood in a position that required them not only to be turned, but also to be moved posteriorly. (See dotted lines across them.)

The first step was to secure sufficient anchorage for the drawing part of the mechanism. This was obtained by clamp-bands, embracing the teeth on the sides of the arch as shown; each band had a hook soldered upon its lingual side to hold a rubber ring.

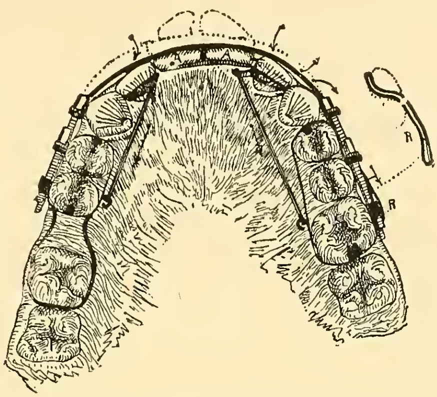


FIG. 1210.—Close of the operation.

The left bicuspids and the first molar were embraced by a clamp-band, but on the other side only the right bicuspids were embraced, because the first molar was missing. To increase the anchorage on the right side, the lone second molar was included by a round platinum-wire loop soldered to the posterior end of the clamp-band.

The next step was the cementing of the ferules upon the laterals. The form of the ferules is shown in the lower part of the figure. Having placed all the bands upon the teeth, a long-band made of stiff platinum round wire (supporting upon its middle part two plate teeth) was attached by screws to the anchor-bands. As soon as these teeth had become loosened by the pressure upon them, two rubber rings were added within the dental arch, to turn, and at the same time move them further inward. One ring was caught upon the left anchor-hook and stretched forward over the lever on the left lateral, thence back and caught again upon the first-mentioned hook. The other ring was similarly attached to the opposite side. (See Fig. 1210.)

While these changes in the position of the teeth were going on, the long-band wire and the artificial teeth of course followed. This was accomplished by tightening the screws connected with the anchor-bands. The artificial teeth on the wire were to take the place of those that the patient had been wearing before I saw her. This operation was slow in action, but it was very successful. The artificial teeth so disguised the truth that no stranger suspected the loss of the natural organs; indeed, the wire holding them seemed to be simply a regulating-band across the dental arch for correction of irregular teeth.

To show my usual plan of noting operations, the minutes of the process are given below:

January 3d.—Placed all the parts (excepting the rubber rings) upon the teeth, and began the decalcifying process about the laterals by tightening the screws. (See Fig. 1209.)

January 11th.—Laterals moved sufficiently to narrow the space of the centrals and crowd upon the artificial teeth. Ground the artificial ones narrower, and applied rubber rings as represented in Fig. 1210.

January 15th.—Laterals moved so far that their distal corners were in proper line, but their mesial corners were yet outside. The laterals were again in contact with the artificial teeth. Ground the latter narrower, and renewed the rubber rings.

January 24th.—Right lateral is in its proper position, but the position of the left lateral has not materially improved. Ground the artificial teeth still narrower, and placed an additional rubber ring upon the lever of the left lateral.

January 29th.—Not much change. Root of left lateral probably crooked. Removed the ferule from the right lateral and put on another without a long lever. Caught the rubber ring upon a hook soldered upon its labial side; retained the left lever-ferule. To obtain a stronger draught upon this tooth an additional rubber ring was caught upon the lever and carried outward between the lateral and cuspid, thence posteriorly, and caught upon the end of the screw on the buccal side of the clamp-band.

January 31st.—Left lateral slowly turning.

February 4th.—Left lateral continues to turn.

February 29th.—Both teeth are in their proper places. Took impression for a U-shape (gold) retaining-plate to support artificial centrals.

March 4th.—Inserted the plate with teeth.

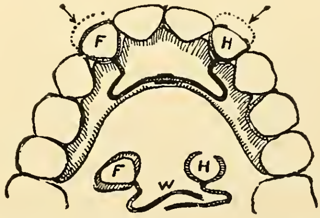


FIG. 1211.—An adjustable retaining mechanism similar to the one used (A).

Trial, in this case, proved that to hold the left lateral in its place required something stronger than is generally used for such cases. At first I supposed that all that would be necessary was to grind the sides of the (wide plain) artificial teeth so thin that they would overlap the laterals; but in addition I added temporary spurs (delicately made of clasp material) to extend outward and hook upon the labial surfaces of these laterals. Even with these I found that the right lateral moved sidewise outward as if trying to get around the end of the spur. To arrest this movement I added another auxiliary, viz., a narrow ferule fitted around the lower part of the tooth. To make this retainer adjustable the ferule and the clasp fingers were soldered to ends of crooked platinum wires, the other extremities of which were soldered to the lingual surface of the gold plate. Further alteration in position of the ring and clasp was made, from time to time, by bending these crooked wires. The principle of this adjustable retainer is shown in Fig. 1211, which represents a similar retainer made for a different case.

Sometimes I have been able to correct irregular teeth by a mechanism like this; in such cases the mechanism also serves as the retainer after the case is corrected.

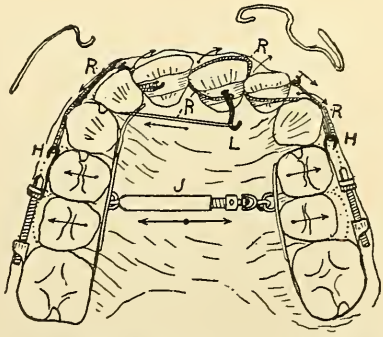


FIG. 1212.—Turning four incisors by elastic rubber (A).

Fig. 1212 illustrates the beginning of an operation for the correction of a peculiar case of irregularity of the upper teeth and deformity of the alveolar ridge. The irregularity was mostly confined to the left side; the right central required turning only slightly. The teeth to be moved to make space were the left upper central, lateral, cuspid, and the two bicuspids. The deformity of the alveolus was mainly confined to the left side of the arch, and consisted in lack of development to such an extent that the teeth did not reach down sufficiently to antagonize with the lower teeth. The teeth of the right side of the dental arch were about one-eighth of an inch longer than those of the opposite side, thus causing lopsidedness of the jaw when they were forced to antagonize.

The operation consisted in widening the arch by moving the teeth of one side (only), and turning the two centrals and left lateral, and grinding the teeth of the right half of upper and lower arches shorter. The teeth that were moved to widen the arch were the left bicuspids.

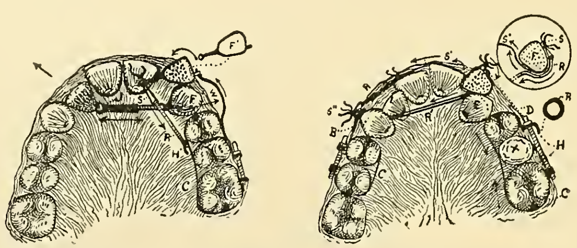
The mechanism used to widen the arch was two clamp-bands and a swivel screw-jack. To prevent moving of the anchor teeth on the right side the clamp-band was of a size to embrace more teeth than those to be moved. These anchor teeth were the cuspid, two bicuspids, and the first molar. Having placed the anchor clamp-band upon the right side and the moving clamp-band on the left bicuspids, they were connected by the jack. It was attached by rings soldered to the lingual sides of the bands, as represented in the figure.

When the left bicuspids had been moved so as to widen the arch sufficiently to liberate the crowded incisors, they were turned to line. This turning was caused by three elastic-rubber rings, caught upon platinum-wire levers, and stretched, and caught upon the hooks H, H, soldered upon the clamp-bands. The same rubber ring that aided in turning the left central also aided the left lateral to turn and move into its proper position, by being stretched over and between the teeth, as represented in the figure.

Similar Cases Sometimes require Different Kinds of

Mechanisms.—As a rule, similar cases of irregularities of the teeth can be treated upon the same general plan; but occasionally cases are found that require different plans of treatment. To illustrate all the various processes would not be easy, nor would it be wise to attempt it, even if easy, because it would be wearisome, and hence unprofitable to the reader; therefore only two operations will be presented.

Figs. 1213 and 1214 illustrate the two cases, both being confined to the upper jaw. These are presented more to



FIGS. 1213, 1214.—Similar cases treated differently (A).

show, comparatively, how slight differences in the arrangement of teeth may require greater differences in the plans of treatment, than for showing any special excellence in the mechanisms used.

The principal differences between the two cases are in the positions of the left laterals, the labial surface of one facing from the medial line, and that of the other toward it; there is also dissimilarity of space between the left centrals and the cuspids.

The main point to be observed in following the treatment is to note the difference in the widening of the spaces for accommodation of the outstanding laterals.

In the first case, Fig. 1213, the right lateral failed to take its proper position before the right central had encroached upon its territory. This, however, is not clearly shown in the figure. When the mouth was closed, the right lateral stood outside the lower teeth. In the case illustrated by Fig. 1214, the lateral stood partly inside the lower teeth.

As the central incisors in both cases were not far from the correct line, and the bicuspids and molars were not sufficiently out of their proper places to cause disfigurement, and their antagonism being fair for mastication, the regulating process was chiefly directed to turning and moving the left laterals inward after having first moved the right and left cuspids outward.

In the first case (Fig. 1213) there would be sufficient room for the left lateral when turned if the instanding right lateral and left cuspid were moved outward to line, and the centrals were swayed to the right so as to be in contact with the right lateral when moved. In the second case (Fig. 1214), however, such movements would not increase the space sufficiently to accommodate the left lateral, and, as it would not have been proper to move the incisors forward, extraction of a tooth would become necessary. But as sufficient additional room for the left lateral was only equal to one-half of the diameter of the tooth, and the extraction of any tooth would leave a space after the remaining teeth were placed in line, it was important to follow a plan that would cause the least disfigurement.

Extraction of the lateral would leave a space, but the placing of a cuspid in contact with the central would be wrong because three broad teeth in contact would coarsen the facial expression. To extract the first bicuspid and move the cuspid and lateral into line would be better treatment, as the extra space would then be posterior to the cuspid; still it would be conspicuous. Should, however, the second bicuspid be extracted (Fig. 1214) and the first bicuspid moved posteriorly sufficiently to let the lateral and cuspid into line, the space would then be so far back in the mouth that it would not be very noticeable, the degree depending upon the action of the lips during laughter.

Had the operation been performed just prior to the eruption of the second molar, the space could have been permanently closed by moving forward the first molar;[1] the second molar would then have erupted forward, and held the first molar in place against the bicuspid.

Even if the second molar had already erupted, and there would be left a space between the bicuspid and first molar, experience has shown that this space within two or three years would probably close by the forward movement of both of the molars, by force of the mastication.

Having determined which teeth to move, the next step was to devise the necessary mechanisms. Some movements were made by elastic-rubber rings anchored by ferules and by clamp-bands, while other movements were made by screws.

The First Case.—The mechanism for the first case (Fig. 1213) consisted of a clamp-band, C, and ferule, F. The clamp-band had a hook, H′, soldered to its lingual side, and a delicate gold spring-wire, W, soldered to the opposite side. The ferule F (gold) had on its lingual side a wire lever and on its labial side a staple.

When the mechanism was ready, the clamp-band was firmly screwed upon the left bicuspids and first molar, and

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[1] By the same clamp-band (if one was used) that moved the cuspid and first bicuspid backward.

then the ferule was cemented upon the lateral. To cause the left lateral to turn, the spring-wire W was sprung into a curve sufficiently to permit its end to enter the staple on the ferule. A lug was soldered near the end of the spring to prevent it (spring) from sliding too far into the staple. To aid in turning the lateral, a rubber ring, R, was first caught upon the hook H on the clamp-band, and then drawn forward by a string, S, and tied to a little ring on the end of the lever of the ferule. One object of the wire W was to prevent the lateral from being drawn backward by the power of the rubber ring.

While the left lateral was thus being turned the right lateral and left cuspid were being forced oppositely outward by a spindle screw-jack, J, one end of which was attached by a link to a ferule set, with phosphate of zinc, upon the lateral L, the other end resting in a pit made in the lingual side of the cuspid.[1]

The Second Case.—In the second case, illustrated by Fig. 1214, it was necessary to turn the outstanding left lateral in the opposite direction; consequently the anchorages of the mechanism were located upon the other side of the mouth. To make room for the left cuspid and left lateral the (left) second bicuspid was extracted and the first bicuspid drawn back by a clamp-band, C′. The lateral was turned and drawn to line as follows: a ferule, having soldered to its opposite sides two platinum-wire staples, as shown, was cemented upon the left lateral, after which a delicate rubber ring, R′, was tied to each of these staples and passed between the lateral and cuspid, thence diagonally across the arch, where it was tied to a ring upon a ferule, S″, on the end of an arm, B, projecting from an-

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[1] Instead of a pit I now use a thin cuspid ferule having a gold socket soldered to it.

other anchor clamp-band, C, fixed upon the two right bicuspids.

To aid in turning the lateral, another but very weak rubber ring, R′, was tied to the same outside staple of the ferule on the left lateral, and then stretched alongside the other elastic ring (see small figure on right of illustration) between the lateral and central, thence along in front of the incisors, and tied to the ring S″ on the arm of the right clamp-band. Later in the process this outside rubber ring was dispensed with, and another stretched from the hook H, on the buccal side of the left anchor-band C′, to the staple on the ferule. (See dotted line D.) This change was made to relieve the stress upon the centrals.

The outward movement of the right lateral L was partly accomplished by the transpalatine rubber ring R″, which bore diagonally upon it. After the first bicuspid had been moved back the left cuspid E was started outward by a rubber ring caught upon it, thence stretched, and caught upon the hook H on the clamp-band C′. Later the rubber was carried forward and caught upon the left lateral.

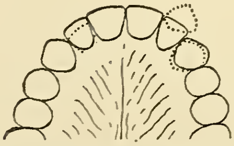

FIG. 1215.— First case, showing the changes made in the positions of the teeth by the operation.

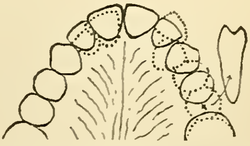

FIG. 1216.— Second case, showing the changes made in the positions of the teeth by the operation.

The changes made in the positions of the teeth by these two operations are represented by plain and dotted lines in Figs. 1215 and 1216.

It is hardly necessary to mention that in this operation, as in nearly all complicated cases, the rubber rings were occasionally shifted from one point to another, so as to cause variation in the degree and direction of force upon the teeth.

CHAPTER CXXIII.

TURNING TWO INCISORS SIMULTANEOUSLY BY THE TRAPEZE MECHANISM.

GENERAL REMARKS UPON FIXED AND UPON SWINGING ANCHORS, THE ENGINE OF FORCE BEING AN ELASTIC-RUBBER RING. —HOW THE TRAPEZE MECHANISM IS MADE.—OPERATION BY THE TRAPEZE WITH ONE RUBBER RING.—TWO OPERATIONS BY THE TRAPEZE OPERATED BY TWO RUBBER RINGS.—A SET OF THE ELEMENTS OF THE MACHINE.

As mentioned in the preceding chapter, the mechanisms for turning a single tooth are various in form, though not numerous in kind. It was also stated that the construction of all turners is based upon applying the force off at one side of the central axis of the tooth; in other words, all of them operate upon the principle of the lever. In the past the power-giving part was always based upon a fixed anchorage directly connected with other teeth than the one to be turned. To reiterate, it was connected directly with an anchorage tooth or with a band upon it, or by a plate covering several teeth or some part of the soft tissues, gums, or roof of the mouth.

The lever (as now used) may be of considerable length or it may be only a short knob; this is soldered to a ferule, which is then cemented upon the tooth. The subject of this chapter is not turners that have fixed anchorages, but novel mechanisms that act from anchors that have no connection with any other tooth or teeth than those to be turned; indeed, the anchor is a derrick suspended in mid-air, and the anchorage is the tooth or teeth to be turned. The especial merit of the trapeze mechanism is its ability to turn two teeth at one time.

This mechanism, which I denominate *trapeze*, because it resembles that of the gymnasium, can be used for turning upper central incisors; but its greatest value over other mechanisms is found in turning two upper laterals.

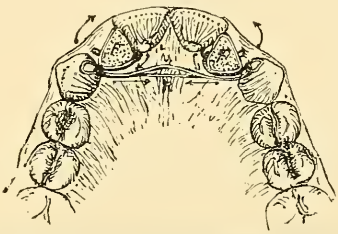

FIG. 1217.—Turning laterals in opposite directions by the trapeze mechanism.

Fig. 1217 illustrates an operation for simultaneously turning two upper lateral incisors by this mechanism, which consists (Fig. 1218) of a rubber ring, R, two thin platinum ferules, F, F (each having a staple, O, and a hook, H), and a gold-wire rod, W, having soldered to each end a

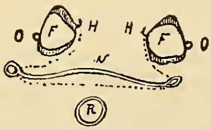

FIG. 1218.—Independent parts of the trapeze mechanism (A).

ring, through which plays the rubber ring. The rod is of sufficient length to extend across the dental arch and project a short distance beyond the teeth to be turned.

After the ferules are so arranged and cemented upon the laterals that the hooks face each other, the rubber ring is stretched from the hook H on one ferule, through one ring of the rod W, thence along the rod, through the ring on the other end, and then it is caught upon the hook H of the other ferule. (See dotted line in Fig. 1218.) The rubber ring, by being stretched beyond the line of the dental arch, thence back, and along the lingual surfaces of the laterals to these hooks, draws them toward the rings on the ends of the rod W, and thereby turns the teeth. As the application of the rubber is somewhat difficult to a beginner, I will further explain the process: two pieces of string about eight inches in length are first projected through the rubber ring; by these strings the rubber is pulled through the two rings of the rod, and then held there (by the strings), to prevent it (rubber) from drawing back until the rod and the rubber are carefully placed in the mouth, and the rubber ring is first caught upon one of the hooks H (by aid of a right-angle plugger-like instrument), and then upon the other hook H. The strings are then withdrawn, leaving the rod swinging upon the rubber.

In order to hold the rod W so close to the gum that the rubber will not slip over the ends of the laterals, these hooks are soldered upon the gum margin of the ferules. If the rubber ring is not equal to the demand upon it, another one may be stretched along the labial surfaces of the centrals, and caught upon staple-like hooks, O, O, on the labial side of the ferules.[1] A better way, however, is to stretch the first rubber double through the trapeze rod.

If one lateral requires to be turned farther than the other, and the desire is to correct both at the same time, a corresponding difference in the length of the lever-hooks

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[1] This second rubber is not always necessary.

on the two ferules will accomplish it. In this case, however, I did not resort to levers of different lengths, but continued to turn both laterals with levers of equal lengths until the lagging tooth was a little past the proper position. Both were then temporarily held steady for a day or two, and then being liberated, they returned to their proper places, when each was held there by a single-arm ferule, consisting of a platinum wire soldered transversely to the ferule. These ferules, which were less than one-eighth of an inch in width, were cemented upon the teeth and worn there one year. The object of turning these teeth beyond their proper places was to break, in a measure, their strong tendency to return too far when liberated.

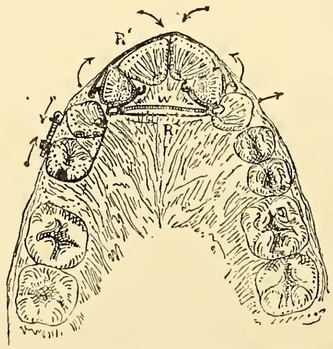


FIG. 1219.—Turning two upper laterals by a trapeze mechanism operated by two rubber rings.

Fig. 1219 illustrates an operation for turning the upper laterals by a process similar to the one last explained, but in addition to it there was the operation of moving a cuspid and a bicuspid. This case came into my hands after another operator had made the mistake of extracting the right first bicuspid, instead of the second, and therefore had caused more space behind the right cuspid than was necessary to liberate the crowded lateral. To prevent any space being left between the cuspid and lateral when corrected, the bicuspid was drawn forward by embracing it and the cuspid by a gold clamp-band. The cuspid was also drawn slightly posteriorly, but sufficiently to liberate the lateral. By drawing the bicuspid forward the extra space was transferred, as it were, from before it to behind it, thus making it less conspicuous.

After this step had been completed, two platinum ferules, each having two hooks, were so placed upon the laterals that the labial hooks were as far back, and the lingual ones as far forward, as possible. Having cemented these ferules upon the teeth, a rubber ring, R, was drawn through the rings of the trapeze rod W and caught upon the lingual hooks, while another ring, R′, was stretched in front of the centrals and caught upon the labial hooks as shown in the figure.

The left cuspid (by being slightly inside of the esthetic line) crowded upon the left lateral; but the rubber, by the aid of the left ring of the rod, so bore upon the tooth (cuspid) that fortunately it was finally forced outward sufficiently to make the desired space. Such action, however, cannot be relied upon in all cases.

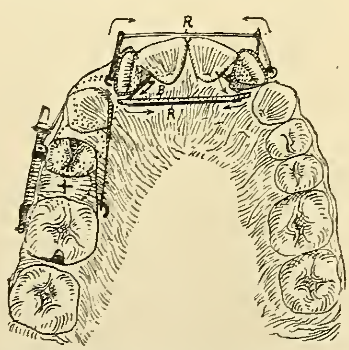


FIG. 1220.—Turning two upper laterals by a trapeze mechanism aided by two long-lever ferules, acted upon by a rubber ring.

Fig. 1220 illustrates the second stage of an operation for turning opposite upper laterals by a modification of the trapeze mechanism last described; this modification was more powerful and more unsightly.

A considerable difficulty in this case (a girl about thirteen years of age) was through the necessary reduction to line a jumbled arrangement of the teeth before the laterals could have sufficient space in which to be turned. The first stage was the correction of the side teeth; this was begun by the extraction of the right second bicuspid, after which the cuspid and first bicuspid were moved posteriorly until sufficient room had been made for the right lateral. This was accomplished by the use of a splice clamp-band, anchored upon the first molar. The diagram shows the case as it appeared at the close of this stage and at the beginning of the second stage of the operation—turning.

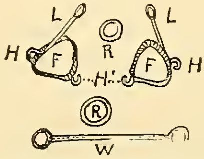


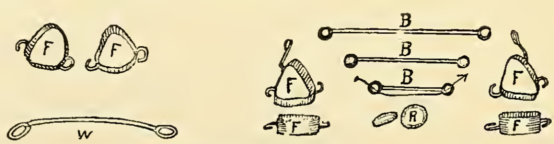
FIG. 1221.—The trapeze part of the mechanism (A).

The laterals were turned by the mechanism represented by Fig. 1221. It consisted of the following parts: two ferules, F (each having two hooks, H), a lever, L, projecting forward from each, a wire rod, W (about the size of an ordinary pin), having a small ring at each end, and two elastic-rubber rings, R, R.

In applying the mechanism the ferules were first arranged and cemented upon the laterals as shown in the figure, after which one rubber ring was stretched through the rings on the ends of the rod W, and then caught upon the lingual hooks as shown (see checkered line in Fig. 1220).

This rod, being longer than the distance between the two lingual hooks on the laterals, caused the rubber to draw outward, thus turning the laterals opposite to each other. To aid this rubber ring, as well as to prevent the laterals from being drawn too far outward, another rubber ring, R, was stretched through rings on the ends of the long levers L, L, and caught upon the labial hooks of the ferules. These two rubber rings, thus acting upon the two stubborn laterals, made success easy.

To make the wire rod W effective, it should not only be as long as the space between the cuspids is wide, and sufficient to project slightly beyond these teeth, but it should not interfere with antagonism of the teeth. Interference, however, seldom occurs with the rod; but, if care is not exercised in placing it, the rubber ring, by antagonism, may be injured by the lower teeth.



FIGS. 1222, 1223.—Elements of the trapeze mechanism (A).

Figs. 1222 and 1223 represent different forms of elements of the trapeze mechanism for turning upper lateral incisors; R represents rubber rings; F, different forms of ferules; W, B, wire rods of different lengths. A set of different lengths of rods is generally more useful than a set of different sizes of ferules, because the latter must be of a size to exactly fit the teeth to be turned. It would require a large number of ferules to fit all cases, which is not necessarily the case with swinging rods.

CHAPTER CXXIV.

OPERATIONS FOR TURNING AT THE SAME TIME OPPOSITE UPPER CENTRAL INCISORS BY ELASTIC RUBBER AND LEVER-FERULES, SOME OF THE LATTER HAVING PIERS.

GENERAL REMARKS UPON THE MECHANISMS.—HOW TO MAKE SMALL RUBBER RINGS.—OPERATION BY A BRIDGE MECHANISM.—SEVERAL OPERATIONS BY PIER-FERULES.

THE turning of two central incisors in different directions at the same time, by a very small and simple, yet positively acting mechanism, is a modern achievement. Some of these mechanisms act by continued force, others by intermittent. Of the former class there are several that act by the power of elastic rubber; these will be considered first, after which will be explained (in other chapters) those that act by the repeated bending of wire, and those that act by screws. In the different classes of mechanisms we shall see that although the engines of force are different, the other parts are similar, and the philosophy of their operation is exactly alike—leverage.

As the mechanisms to be explained in this chapter are very small, the rubber rings for them must be correspondingly small. The smallest rings now found in the market are nearly one-fourth of an inch in diameter, and consequently are not practicable in all cases. Still, by doubling and stretching the ring back and forth two or three times around the levers, they can be used in most cases. The best very small ring is improvised, not from tubing, but by cutting it from strong sheet-rubber of sufficient thickness, by means of punches. These are of two sizes; one cuts the outside, the other the inside of the ring. The larger punch is made of steel tubing, about one-eighth of an inch in diameter, sharpened at one end, and having a gimlet-like handle at the other, while the smaller punch is that used for cutting molar holes in common rubber dam when filling cavities.

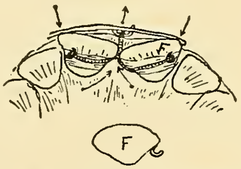


FIG. 1224.—Turning centrals by a rubber ring anchored by two ferules and a bridge-piece (A).

Fig. 1224 illustrates the plan of turning two upper centrals by one of the weakest of the class of mechanisms above mentioned. It consists of two broad but thin ferules, F (each having a hook), a rubber ring, and a bridge-piece. In applying this mechanism the ferules are first fitted to, and cemented upon the centrals with phosphate of zinc. The rubber ring is then first caught upon the hooks on the lingual side of the ferules, after which the middle part is drawn up between the teeth and through the hook on the under side of the bridge, and again drawn between the teeth and caught upon the same hooks on the ferules, as shown. To prevent dislodgment of the bridge-piece one extremity is nested over a V-shape lug soldered upon the labial surfaces of one ferule, while the other extremity (having a hole in it) is caught loosely upon a pin soldered to the labial side of the other ferule; when the mechanism is carefully made its success is assured. If the teeth are very close together sufficient space for turning them is made by this rubber, which acts like a wedge between the teeth.

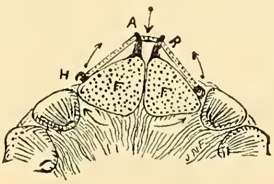


FIG. 1225.—Turning distal corners of stubborn centrals outward by a rubber ring and long pier-ferules (A).

Fig. 1225 illustrates the case of two irregular centrals, and the beginning of an operation for correcting them by one of a class of what I call pier-ferule mechanisms, of which there are several modifications. All of these are practicable for cases where both central incisors are so arranged that their labial surfaces incline from or toward each other. The mechanism used in this case consisted of two broad gold ferules, F, F, each having a short hook, H, soldered to the outer corner, and a pier, A, upon the inner corner as shown. The free ends of the piers, or studs, are bifurcated for lodgment of a rubber ring; the teeth are turned by force derived from the rubber ring caught upon the short hooks upon the distal corners of the ferules. This rubber, which is applied double, causes a lifting force upon the distal side of the teeth and at the same time a depressing force upon the medial side. The directions of movements of the teeth are indicated by arrows.

Instead of bifurcating the ends of the piers, or studs, a small ring made on the end of each is preferable, not only because it is less irritating to the upper lip, but the rubber ring is so confined that it cannot become dislodged. When rings are used the rubber is drawn through them by a string. The drawback of this kind of mechanism is the prominence of the studs; but its efficiency overbalances this drawback in *stubborn cases*, the only class for which the mechanism is intended. The ends of these bifurcated studs should be large and smooth.

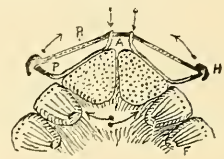


FIG. 1226.—Turning distal corners of central incisors outward by a rubber ring and two long hook-ferules with short piers (A).

Fig. 1226 illustrates an operation for turning stubborn upper centrals by a mechanism similar to that represented by the preceding figure. This one (Fig. 1226) differs only in the length of the hooks and piers. The mechanism (entirely of platinum) consisted of two broad, thin ferules, each having a long lever-hook and a short pier, each pier and hook being made in one piece, of stiff wire. After the ferules had been cemented upon the teeth to be turned, and the rubber ring R had been drawn through the rings on the

FIG. 1227.—Turning laterals and cuspids by rubber rings and lever-ferules (A).

ends of the piers, it was caught upon the hooks as shown. The arrows indicate the direction of the force upon the teeth.

This mechanism is inconvenient to wear, but in stubborn cases it is very effective.

Fig. 1227 illustrates the first attempt at turning, together, a right upper lateral and a cuspid by a rubber ring attached to lever-ferules. Two ferules (of very thin platinum) are first cemented upon the teeth to be turned, and then a rubber ring is stretched from lever to lever as shown.

In a case where one tooth requires greater force than the other the lever for the more stubborn one should be correspondingly longer than the lever for the weaker one. In this case, the levers being of equal length, the operation was not successful until the rubber ring on the lateral hook had been forced down the lever to the tooth, leaving the cuspid leverage greater than that upon the lateral.

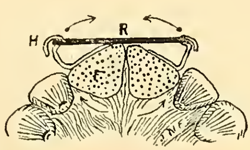


FIG. 1228.—Turning distal corners of the centrals anteriorly by a rubber ring and two long lever-ferules with no piers (A).

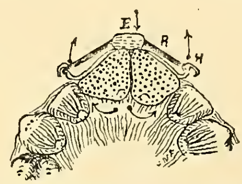


FIG. 1229.—Turning two centrals by a rubber ring and two lever-ferules aided by a cushion-pier (A).

Fig. 1228 illustrates a process of turning two upper centrals by a modification of the mechanisms represented by the two preceding figures. The hooks H are sufficiently long to cause great leverage. The rubber ring R draws in a straight line from hook to hook, turning the teeth in the direction indicated by arrows.

If the middle part of the rubber R does not bear upon the teeth, their medial corners sometimes move anteriorly, and thus defeat the object sought. If this occurs, it may be prevented by placing a block of wood, or rubber, between the elastic ring and these corners of the teeth, to serve as a double pier. (See Fig. 1229.)

Fig. 1230 illustrates a plan for turning two upper incisors in a direction contrary to those represented in the preceding cases, by rubber applied to the lingual side of the teeth. Although the working parts of the mechanism are on this side of the teeth, the action is based upon the same principle of philosophy as that in the other case.

This mechanism, uncomfortable to wear, consists of two thin, broad platinum ferules, upon the lingual side of each of which is soldered the middle part of a platinum wire,

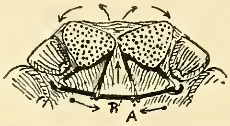


FIG. 1230.—Turning medial corners of central incisors anteriorly and the outer corners posteriorly by a rubber ring and two ferules having two wire arms each (A).

the extremities being left free, one of which is used as a lever, the other as a pier; each has a small ring, through which is drawn a rubber ring, R, afterward caught upon the hooks. The draught of the rubber causes the teeth to turn in the directions indicated by arrows.

Like several of the others, this effective mechanism is easily constructed and easily applied. These wires, however, are so long that they annoy the patient somewhat unless smoothly made. Fortunately, cases demanding such powerful leverage are few. A short lever with strong tension of rubber is superior in most cases. The piers, however, are sometimes necessary to aid in forcing the medial corners anteriorly.[1]

[1] Long hooks and piers upon either side of teeth are very liable to irritate tender tissues; therefore they should be no longer than is absolutely necessary, and when made they should have very smooth surfaces.

CHAPTER CXXV.

TURNING UPPER INCISORS BY REPEATEDLY BENDING NON-ELASTIC WIRE, OR STRIPS OF PLATE.

OPERATIONS FOR TURNING LATERAL INCISORS BY REPEATEDLY BENDING SINGLE-FERULE LEVERS.—OPERATION BY BENDING A DOUBLE LEVER.—BY A SINGLE-LEVER CLASP.—BY A DOUBLE-LEVER CLASP.—BY A DETACHABLE LEVER.

THE turning of teeth by repeatedly bending what is called non-elastic wire, or narrow strips of metal, is not new: nor are such mechanisms equal to some other kinds; but as they are occasionally useful, some of the best of them will be considered. Operations by non-elastic wire are very similar to those by elastic wire; but as the character of the pressure upon the teeth is quite different, one being practically intermittent, the other continuous, they will be considered in separate classes. It should be remembered, however, that the metals called non-elastic are not entirely so; thus platinum, the best that is now known for this purpose, has slight elasticity, but not sufficient to place it in the class of elastic metals.

Fig. 1231 illustrates an operation performed for turning a left upper lateral by repeatedly bending a platinum-wire lever, L, soldered to a ferule, F, cemented upon the tooth to be turned. In applying the mechanism the ferule is so placed upon the tooth that the lever will project toward the middle of the mouth, after which it is carefully turned outward, over the left cuspid, and pushed upward toward the gum, leaving the wire so that it will have a slight leverage upon the lateral, tending to turn it in the direction desired. To renew the force after it has weakened, the wire is let off the anchorage tooth, reformed, and returned upon it; this is repeated two or three times a week. To avoid caus-

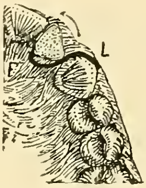


FIG. 1231.—Turning a left lateral by repeatedly bending a wire ferule-lever.

ing pain when the lever is rebent, the extremity of the wire that joins the ferule is firmly held by a pair of pincers, while the other extremity is bent by another pair.[1]

When a tooth is corrected, it can be held in place indefinitely by the same mechanism; this, however, is not equal to a single-arm ferule, so arranged and cemented upon

FIG. 1232.—Arm-ferule.

the tooth that the wire arm (soldered to the labial side of the ferule) will project posteriorly and rest upon the tooth beyond.[2] (See Fig. 1232.)

Fig. 1233 illustrates the beginning of an operation for turning a left upper lateral, and moving it, at the same time, from the posterior position outward to line, by a single-lever ferule made of platinum wire (about the size of a small pin), soldered transversely to the labial side of

[1] "Independent Practitioner," July, 1886 (A).

[2] See Fig. 326, Part VII., p. 370.

a ferule cemented upon the tooth. This mechanism differs from an ordinary lever-ferule in that the *side* of the wire, instead of the end, is soldered to the ferule.

The process of operation consists in dropping the wire off the anchorage tooth, and then bending it lingually, and

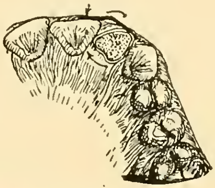


FIG. 1233.—Turning a left lateral by a single-lever ferule.

carefully pushing the wire back and upward upon the anchorage tooth, and repeating the act two or three times a week.

Sometimes there is a drawback to this plan, caused by a movement of the anchorage tooth upon which the lever bears, but such disturbed teeth, if not kept too long in an abnormal position, will regain their lost ground upon being liberated. When an anchorage tooth is thus liable to be moved, it is well to use a longer lever-wire, so that it may rest and bear upon more than one anchorage tooth. This mechanism constitutes the best kind of retainer for holding a tooth in place after it is corrected.

Sometimes a tooth is so favorably formed that a ferule, driven snugly upon it, will not need the aid of cement to hold it; in the majority of cases, however, the ferule should be cemented upon the tooth in order to prevent decay. This is especially true of teeth having cavities, even if they are filled.

Fig. 1234 illustrates the closing stage of an operation for turning a right upper lateral for a woman thirty-five years of age; the tooth, which was considerably instanding, was also moved outward to line. The approximal sides of this tooth were so nearly parallel to each other that the ferule remained sufficiently firm upon the tooth

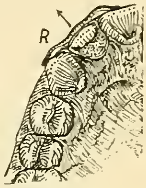


FIG. 1234.—Turning and moving outward a right lateral by a double-arm ferule.

without the aid of cement. Whenever this mechanism can be used without cement, the operation is much easier than when cement is used.

In Fig. 1235, B represents, edgewise, this mechanism, and A, C, two modifications of the same.[1] The one marked B is made as follows: From gold wire, rolled to No. 35

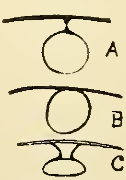


FIG. 1235.—Different modifications of the mechanism. Edge view.

in thickness, is cut a piece about one-tenth of an inch in width, and of sufficient length to barely encircle the lateral. The ends of this strip are then soldered together to form a ferule. To the middle part of this ferule is now soldered a narrow strip of spring-clasp gold wire, about three-thirty-seconds of an inch in width, and of sufficient length to reach the middle of the central and of the cuspid. This ferule, purposely made sufficiently small, is

[1] Regarding the origin of this class of mechanisms, see Part VII., p. 370.

placed upon the shaft of a steel plugger, and then gently hammered until it is of the exact shape and size to closely fit the tooth, after which it is driven upon it by a hammer and a piece of orange wood. The extremities of the wire are so bent before being applied that they lift upon one side of the lateral more than upon the other. When the force becomes spent, the cuspid-arm is further bent, so as again to bear hard upon it. The repeated bending of this arm for several days turned this lateral, and at the same time moved it into the line of the dental arch. To adjust the mechanism so that it would cause the tooth to turn, and at the same time move it outward, called for skilful manipulation of the two arms. When this tooth had been corrected, it was retained in its new position for several weeks by the same mechanism. Sometimes turned teeth may be retained in place by wart-shape plugs placed in cavities, these plugs being so formed that they project, and overlap the adjacent tooth.[1]

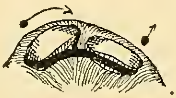


FIG. 1236.—Turning a central by a lever clasp.

FIG. 1237.—The Mechanism (Guilford).

Fig. 1236 represents a plan of turning a right upper central by a mechanism by Dr. Guilford. In outline it is a modification of the lever-ferule, the ferule being cut open.[2] This mechanism is formed as represented independently in Fig. 1237. The part serving as the clasp is bent so as closely to embrace the tooth; the lever is formed so as to bear upon the opposite central in such a

[1] For special explanation of such plugs, see Part VII., Chapter XXXVII., p. 393.

[2] A mechanism resembling this modification of the lever-ferule is represented in Magitot's work, "Anomalies," Plate XII., Fig. 8 (1867). See also Part VI., Chapter XXXII., in the present work.

way that it will lift upon the tooth. The daily rebending of the lever keeps up the force upon the tooth to be turned. Of course the success of this mechanism and of the operation itself depends mainly upon the tooth being of a shape and length that is favorable for retaining the mechanism upon it. Considerable depends also upon the carefulness of the patient. Clasp-levers are far inferior to ferule-levers.

Fig. 1238 illustrates an operation by Dr. E. S. Talbot (1884) for turning a right upper central. The mechanism consisted of a piece of steel wire (for a lever) and a narrow

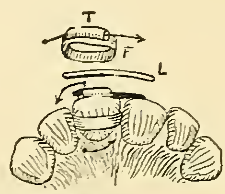


FIG. 1238.—Turning a right central by a detachable lever-ferule (Talbot).

platinum ferule having a short piece of platinum tubing soldered transversely to it. The ferule was so placed upon the tooth to be turned that the wire rested upon the labial side of the left central. When ready to apply, the ferule was first cemented upon the tooth, and then one extremity of the wire was forced into the tubing, leaving the other extremity to bear strongly upon the left central; this lifted upon the right central and turned it. As the wire upon the left central became loose from turning the other tooth, it was taken from the tubing and bent, so that when it was again applied it continued to lift upon the tooth.

To prevent the lever-wire from turning in the tube, it (wire) should be flattened, and the tube compressed so as to correspond.

Fig. 1239 illustrates a plan for turning two upper centrals as suggested by Dr. Guilford.[1] Fig. 1240 illustrates this double-clasp mechanism, which was made as follows: a piece of gold backing, one-eighth of an inch in width, and of sufficient length to clasp the lingual sides of both cen-

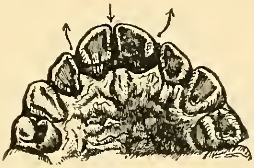


FIG. 1239.—Turning upper centrals by a T-clasp (Guilford).

trals, is bent to conform as closely as possible to these teeth; a T-piece is then soldered to the middle part of it. This T-piece is composed of two strips of plate. The mechanism should be removed daily to rebend its arms, in order to keep up the force upon the teeth.

FIG. 1240.—The T-mechanism.

If this mechanism can be so placed upon the teeth that the tongue and lip will not easily dislodge it, it will do its work; but, like all machines that are not fastened firmly upon the teeth, it is liable to slip off. To prevent it from falling into the throat if dislodged during sleep, it should be tied to some tooth by a string.

1 "Dental Office and Laboratory" (1871). This is also referred to by the author in the "Dental Cosmos," November, 1871.

CHAPTER CXXVI.

TURNING UPPER INCISORS BY METALLIC SPRINGS IN COMBINATION WITH PLATES.

SPRINGS IN COMBINATION WITH PLATES COMMON, BUT NOT NEW.—SPRING MECHANISMS PRACTICABLE, BUT SELDOM BEST.—OPERATION BY A MECHANISM EXPLAINED BY SIR JOHN TOMES.—OPERATION BY THE BOW-PLATE.—REMARKS UPON THE USE OF MORE THAN ONE SPRING.—SPRINGS BEARING UPON OPPOSITE SIDES OF A TOOTH PREVENT IT FROM MOVING SIDEWISE WHILE IT TURNS.

OF all the kinds of engines of force for the correction of irregularities of the teeth, probably there are none that have been tried oftener than wire springs, in some way combined with plates to serve as anchors to hold them in place. These combinations are so various that it would be tedious to the reader to go over them all; therefore only those that show the principle of the best have been included in this work. In this chapter no deviation from this rule will be attempted. The number of spring mechanisms for moving to line offstanding teeth is far greater than the number for turning teeth; but the principle upon which both kinds are constructed is so similar, and all are so simple, that but very little study is necessary to understand them sufficiently to construct variations that will meet all cases possible to be corrected by springs in combination with plates. It should not be understood by these remarks, however, that springs in combination with plates are often found to be equal to properly constructed spring mechanisms that have no plates in their composition; nor that they are always equal to mechanisms that operate by rubber rings. The force from rubber is generally less difficult to graduate than that from metallic springs. Indeed it is thought by experienced dentists that from the difficulty of controlling springs, more dental pulps are destroyed than from all other kinds of engines of force combined. This statement, however, should not be construed to mean that springs are never safe in the hands of experts.

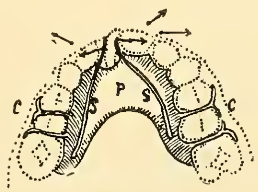


FIG. 1241.—Making room for a central by metallic springs in combination with a plate (Tomes).

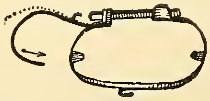


FIG. 1242.—Spring having a clamp-band for anchor.

One of the earliest plate spring mechanisms used in operations for turning teeth was designed for increasing space between teeth; this was recorded by Sir John Tomes.[1] Fig. 1241, from his work, illustrates this preparatory part of the operation for turning a right upper central. The mechanism consisted of two springs, S, S, and a roof-plate, P, the former being fixed to the posterior part of the latter by solder as shown.

The springs were so arranged that they projected for-

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[1] See in Part XV., p. 937, another reference to this case. I have not been able to ascertain the date of this invention, nor do I know that Mr. Tomes claims the invention. See "Principles and Practice of Dental Surgery," by C. A. Harris (1863), p. 161.

ward between the left central and right lateral, to force them farther apart to form sufficient space for turning the right central. This metallic roof-plate was anchored to the side teeth by bifurcated clasps, the value of which (as clasps) has never since been excelled except by clamp-bands. (See Fig. 884A, p. 937, also Fig. 1242.[1])

The same springs probably might have been effective for turning this tooth in a later stage of the operation, had the direction of the forces been reversed so as to bear upon its opposite corners, or had the springs been applied to thus act upon knobs on a ferule set upon the tooth.

Mechanisms similar to this are now claimed by other dentists; the principles of their construction are the same.

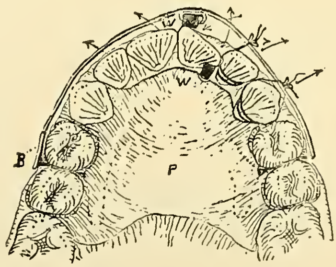

FIG. 1243.—Turning a left central by a bow-plate (Tomes).

Fig. 1243 illustrates the turning of a left upper central by a bow-plate, as published (prior to 1863) by Sir John Tomes.[2] The operation consisted in so arranging the metallic bow outside of the dental arch that by interposing a block of wood, w, between it and the medial corner of a tooth (here the left central), the tooth would turn.

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[1] All similar clasps made to-day are but modifications of this, which I call the "Tomes clasp."

[2] The general form of this bow-plate, and those that have been used by several American and English dentists many years subsequently, are very similar. See Fig. 95, Part VI.; see also Harris's "Dental Surgery," p. 151 (ed. 1863).

To aid in turning it, another block of wood, W, was also interposed upon the opposite side of the tooth, between its distal corner and the anterior border of the roof-plate.

To make these blocks of wood (represented in black) most effective they are so formed and adjusted that the grain lies crosswise to the teeth. To prevent the blocks from becoming dislodged they are fitted into little dovetailed places; one a little clasp soldered to the inner surface of the bow, the other soldered to the anterior border of the plate. (See Fig. 1244.[1])

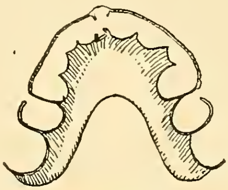

FIG. 1244.—The Tomes bow-plate.

Fig. 1245 illustrates the beginning of an operation for turning and at the same time moving outward two upper centrals and a lateral by a mechanism consisting of two wire springs, W, L, projecting from a hard-rubber roof-plate, P, anchored by two gold clamp-bands, B. The springs were made of gold wire, one extremity of each of which was vulcanized into the plate.[2] These arms were so adjusted that they projected from the plate outward behind the cuspids, thence anteriorly sufficiently far to be in front of the teeth to be turned.

When the mechanism was ready to apply, the plate was

[1] In 1882 Dr. Patrick devised a modification of this mechanism in which he used a sliding metallic wedge instead of a wooden block. See Fig. 288, Part VI., p. 333.

[2] This anchoring of spring-wire arms into a plate is not new. I adopted it from mechanisms devised by Drs. Taft, Coffin, and Kingsley. The clamp-band anchors, however, are original. See Figs. 95, 96, Part VI., p. 222.

inserted within the arch, and then fastened to the side teeth by the clamp-bands, after which the spring W was pressed toward the teeth to be turned, and tied to them

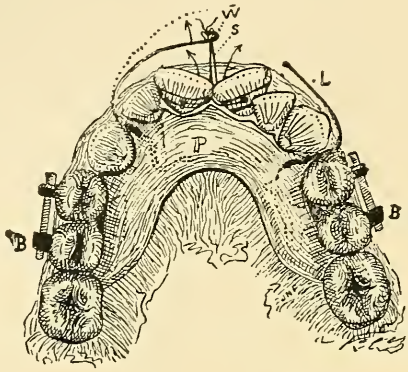

FIG. 1245.—Turning two upper centrals by tying them to spring-wire arms projecting from a roof-plate (A).

by strings, S, as plainly shown in the figure. To aid in securing these strings firmly to the teeth a Harris knob-ferule was cemented upon each. The directions of the forces upon the centrals, when the spring was liberated by removal of the fingers, are indicated by arrows.

To prevent these teeth from being drawn forward bodily an elastic-rubber ring (not shown) was stretched along the labial side of the dental arch, and caught upon the posterior ends of the screws of the clamp-bands.

The wire arm L extending from the left side of the plate (represented as idle) was used in a later stage of the operation for turning and moving outward the left lateral. This movement, like those of the other teeth, was accomplished by tying the lateral to the end of this arm by a string; a knob-ferule was also first cemented to the tooth for easy attachment of the string. All the strings were renewed every two or three days.

Opposite Springs.—Sometimes two springs may be used for turning a single tooth, one acting upon the labial, the other upon the lingual side. Springs placed to bear upon opposite sides of a tooth are used where it requires turning, but does not require moving bodily outward or inward. Upon the principle of this plan, and upon that of the above-described mechanism, all this class of mechanisms (springs in combination with plates) are constructed, the variations being confined to placing the spring or springs upon the plate in accordance with the requirements of the case. The principle of the two-spring mechanism is shown in Figs. 1096, 1097, pp. 1145, 1146.

CHAPTER CXXVII.

TURNING UPPER INCISOR TEETH BY ELASTIC STRIPS OF FLAT METAL, OR BY SPRING-WIRE, WITHOUT THE AID OF PLATES.

PRELIMINARY REMARKS.—OPERATIONS BY SHORT SPRING-WIRE LEVERS IN COMBINATION WITH FERULES.—BY LONG SPRING-WIRE LEVERS IN COMBINATION WITH FERULES.—THE COIL-WIRE LEVER.

IN the last chapter was briefly explained the principle of turning teeth by using metallic springs in combination with plates. In a still earlier chapter a few plans for turning teeth by repeatedly bending platinum wire (which has but slight elasticity) were explained. We shall now consider operations by means of long and short pieces of elastic wire without plates. All these mechanisms act somewhat upon the principle of the lever.

Short Wire Springs.—Short pieces of flat strips of metal have been in use for tying teeth to since the days of Fauchard;[1] but the first use of short pieces of round wire for such purposes is of later date. At the present time round wire is preferred to any other form, because it can be easily bent in any desired direction, and can be used in more various ways. The first short strips of plate were

[1] 1746.

used independently, and were not soldered to anchors; they were anchored to the teeth by strings.

When two teeth require to be turned, it is sometimes easier to perform the double operation than it is to turn a single tooth.

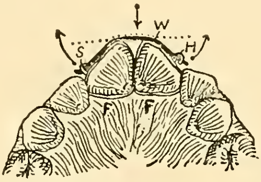

FIG. 1246.—Turning the upper centrals by the short bow-spring (A).

Fig. 1246 illustrates the beginning of an operation for turning two upper central incisors simultaneously by a double-acting lever (made of a straight piece of delicate spring-wire), W, and two gold ferules, F, F. Upon the labial side of one of these ferules was soldered a ring, S, and upon the labial side of the other was soldered an open ring, H.[1]

In applying the mechanism the ferules were fastened upon the teeth to be turned with phosphate-of-zinc cement, after which one end of the bow-wire was projected into the closed ring about one-eighth of an inch, and then having forced the other end down to the surface of the other ferule, it was caught into the open ring or hook H, similar to the fastening of the pin in a brooch.

When the mechanism was in place the middle of the wire bore upon the medial corners of the centrals, while the extremities lifted upon their distal corners. This caused the two teeth to turn simultaneously toward each other like the sides of a closing book. When the wire is of the

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[1] Illustrated in principle in the "Independent Practitioner," July, 1886, Part VII., p. 339, Fig. 6 (A).

proper size and proper temper (not so stiff as to cause pain), the mechanism is not only satisfactory, but it is easy to manage. In principle, however, it is only a modification of one described by Berdmore (1768), by Fauchard (1746), and by Bourdet (1786); the difference being that where we now use round wire, and confine it to the teeth by ferules having rings and hooks, they used flat strips of plate, and held them upon the teeth by strings.

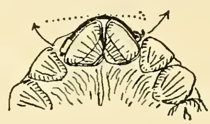

FIG. 1247.—Operation of turning a tooth by the lever and tube-ferule (A).

Fig. 1247 illustrates an operation that is similar to the one last given. Instead of soldering a ring to the ferule to hold the lever, a short piece of tubing fixed (by solder) transversely to it is sometimes preferable.[1] The other extremity of the lever is held by a hook similar to that shown in Fig. 1246. For turning two central incisors this mechanism is superior because it is less rickety. As the lever-wire is straight, it is easily passed snugly into the tube, and as easily removed whenever necessary, and can be relied upon to do its work satisfactorily if the force is not so great as to cause pain.

When gold wire cannot be conveniently obtained, a very small pin (with the head retained) is practicable. In order that the lever may not work loose, its size and form should correspond nearly with the bore of the tubing. In order to keep up the force upon the tooth, this wire should be

[1] This tube-ferule was devised in 1884 by Talbot.

removed once in about three days, and straightened. To prevent the end of the pin from working out of the tube and hook, it should be slightly bent, but not sufficiently to make it difficult to remove when desired.

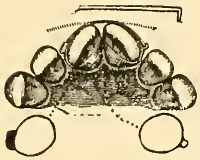

FIG. 1248.—Turning two teeth by wire having a gate-hook extremity. End view (Angle).

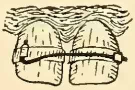

FIG. 1249.—Front View.

FIG. 1250.—The Parts.

Figs. 1248 and 1249 illustrate a plan for turning two upper centrals by a mechanism that is a slight variation of the one last described. This variation was made by Dr. Angle (1885).

Like the mechanism last described, this one consists of a piece of spring-wire and two ferules, one having a tube soldered transversely to the band like that of Fig. 1247, the other having a short tube soldered longitudinally to it (after Talbot's plan, 1884). The variation by Dr. Angle lies in the longitudinal arrangement of the tube with the ferule, and in one extremity of the wire being bent at right angles to the main part, as shown in Fig. 1250.

The ferules or bands are first cemented upon the teeth, and then the longer extremity of the wire is projected into the shorter tube, after which the other extremity is hooked into the longer (Talbot) tube. The ends of the wire are then cut off by cutting-forceps, to slightly change their form so that the lever cannot work out. Excepting the last act (which renders the wire somewhat difficult to remove), this modification is sometimes nearly equal in value to that represented by Fig. 1247.

Long Spring-wire Levers.—Long levers are used by a few operators for turning teeth; some of these levers are made of piano-wire, others of gold spectacle-bow wire; but any kind of stiff elastic wire of fine quality that will not blacken or taste badly will serve for this purpose fairly well. The size of the wire generally used varies somewhat according to the demands of the case, but it should neither be too stiff nor too frail. The average size used is about that of a small pin, or less. Whatever the size of the wire may be, it should be used with care, as the force is continuous, and therefore liable to cause pain.[1]

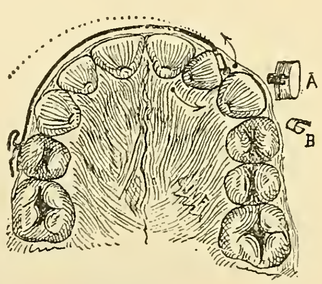

FIG. 1251.—Turning a lateral with a long wire lever (A).

Fig. 1251 illustrates the turning of a left upper lateral by a long piece of elastic wire. The entire mechanism consists of a gold ferule, A (about an eighth of an inch in width), having soldered to it a broad hook, B (made from a strip of gold plate), and a piece of spectacle-bow wire.

When all parts were ready to apply, the ferule, with the hook B, was cemented upon the tooth to be turned, after which one end of the wire lever was caught into the hook, and then the other end was sprung from the position of

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[1] Several patterns of this class of mechanisms are represented in Part VI., Chapter XXXII., p. 342.

the dotted line to the teeth on the other side of the dental arch, where it was tied to a bicuspid with a small piece of platinum wire, thus offering a weak anchorage.

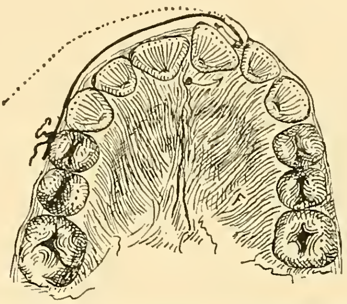

FIG. 1252.—Turning a central by a wire lever (Angle).

Fig. 1252 illustrates a plan suggested by Dr. Angle for turning a left central. The difference between this mechanism and the one last described lies in the form of the lever. Instead of one end of the lever being caught under a broad hook on the anchor-ferule, this one is bent like a hook and caught into the distal end of a Talbot tube.

The process of applying the force is the same as that in the other plan: simply the springing of the lever down upon the teeth on the side of the arch, opposite to the tooth to be turned, and then tying it to a side tooth.

Whatever the plan of anchoring the wire lever to the ferule may be, the form of the tube should generally be oval or square, and the end of the lever made to correspond; this is to prevent it from turning in the tube. The hook in the wire has its advantage in certain cases, but occasionally it interferes with the lip more than the straight wire; this, however, is not a serious drawback. The novelty that belongs to Dr. Angle is the hook on the lever. The ferule part belongs to Dr. Talbot.

Fig. 1253 illustrates a plan of operation for turning a left upper central incisor by a coil-wire lever. The mechanism (see Fig. 1254) consists of a ferule, F (having soldered transversely to it a piece of oval tubing, T), a piece of

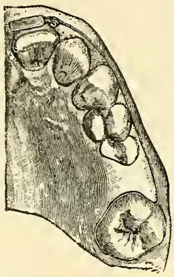

FIG. 1253.—Plan of turning a tooth by a long steel-wire lever having a coil.

FIG. 1254.—The Parts (Talbot).[1]

piano-wire, W (No. 27 United States gauge), having a coil, S, with a short arm, O, and a long arm, L.

In applying this mechanism the ferule F is first cemented upon the tooth to be turned, and then the short arm O is inserted into the tube T; after which the long arm L is sprung down so as to extend along (outside) the left bicuspids to the molar, and thence bent inward around this tooth (molar) sufficiently to hook upon its lingual wall as represented in Fig. 1253.

When this lever is sprung into place, its power turns the tooth. The object claimed for the coil is that it increases the duration of the lever action.[2]

[1] Exhibited in 1888 before the First District New York Dental Society.

[2] By many operators the coiled spring is regarded as more difficult to adjust to the proper degree of force upon the teeth than any other engine of force.

For lateral movements of teeth, however, such as moving outstanding or instanding teeth to line, the coiled spring used with care is practicable. The coiled-spring lever, on the whole, however, must be regarded as not only more troublesome to manage, but more dangerous (to teeth) than the plain spring.

CHAPTER CXXVIII.

TURNING ONE OR MORE INCISORS BY SCREWS.

TURNING BY A SCREW AND TWO LEVER-FERULES.—HOW TO TURN ONE TOOTH ONLY, AND HOW TO TURN TWO TEETH SIMULTANEOUSLY.—OPERATION BY A SCREW-RIBBON AND A ROOF-PLATE.—SEVERAL DOUBLE OPERATIONS BY SCREWS IN COMBINATION WITH FERULES.—OPPOSITELY ACTING FORCES FOR TURNING STUBBORN INCISORS.—OPERATIONS BY DUPLEX AND BY TRIPLEX-ACTING MECHANISMS.—PRACTICAL SUGGESTIONS.

THE use of screws for the lateral movement of teeth is not old,[1] and the use of screws for turning teeth is new, but the practicability of the screw for turning teeth, until now, has been thought to be very limited.

When screws are practicable for turning teeth the operations are generally not only easy, sure, and painless, but screws are in every respect superior to all other engines of force yet devised. Especially is this true in operations for turning simultaneously two teeth situated side by side. Screws, however, for one tooth are not so often practicable as rubber.

In this chapter will be explained several operations for turning incisor teeth by screw-acting mechanisms, but, excepting the one used in the first case, the mechanisms are not only powerful, but exceedingly small, and generally are for turning two teeth simultaneously.

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[1] For history of the use of screws, see Part II., p. 57; also Part XV., p. 989.

Only one operation for turning a single central incisor by a mechanism having its anchor upon the mate to the tooth to be turned (hitherto thought difficult to be accomplished) will be represented. This one and all the small machines represented are simple and equally easy to be operated, even by the patients. These, which are among the best now known for correction of irregularities of the teeth, need to be seen to be fully appreciated.

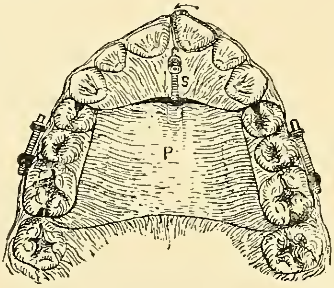

FIG. 1255.—Turning a central by a screw in combination with a roof-plate (A).

Turning One Tooth.—Fig. 1255 illustrates an operation for turning a left upper central by a swivel-screw, S, connecting the tooth with the anterior part of a hard-rubber roof-plate, P, anchored to the side teeth by two gold clamp-bands (attached to the plate by wings vulcanized into its body). The swivel-screw was connected with the tooth by a thin gold ribbon projecting between the centrals and soldered to the labial surface of a broad, thin ferule cemented upon the tooth.

This ferule was first made cylindrical and then placed upon the tooth, after which its medial side was bent toward the tooth banded to make room for the ribbon, which (the ribbon) was afterward soldered to the ferule. Having everything ready, the ferule was filled with cement and then forced upon the tooth and held there until the cement hardened. For so slight an operation, this mechanism was large, but it did its work successfully without causing pain. This was an improved modification of the old-fashioned roof-plate operated by rubber. (See Fig. 83.)

For some cases a strong hook, made of clasp metal, would be sufficient for attaching the central by such a screw; the hook is prevented from slipping upward and injuring the gum by a spur so formed that it rests upon the lingual inclined surface of the tooth and at the same time it hooks over its cutting edge. Such a hook, however, would be inferior to a ribbon soldered to a ferule.

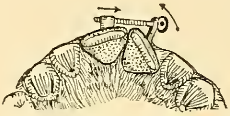

FIG. 1256.—Turning a single central by the Eureka mechanism (A).

Fig. 1256 illustrates an operation for turning only one tooth, a left upper central. This was performed by a mechanism that was much smaller than the one last described. This peculiarly acting mechanism, which did its work marvellously well, consisted of two broad ferules and one screw. A threaded nut was soldered upon the labial side of the right ferule, and a long staple (constituting a lever) was soldered upon the other.

In applying it to the tooth the screw was projected through the staple into the nut as shown. This nut, being of considerable length, prevented the draught of the screw from turning its ferule (on the right central), and therefore the tooth within it remained stationary. On the other hand, the staple of the other ferule (on the left central), by being larger than the screw, permitted play of the screw, causing the tooth within the ferule to turn. This powerful little mechanism, which in my hands has never failed to act exactly as desired, is operated by a lever-key caught into a hole in the head of the screw. The mechanism may be temporarily worn as a retainer after the tooth has been turned to its proper place. This machine I denominate the Eureka.

Turning Two Teeth Simultaneously by Duplex-acting Mechanisms.—For turning two centrals at the same time there are similar reliable mechanisms that are as easily managed as the one last described. These mechanisms are of two varieties, both having parts that resemble those explained in Chapter CXXV. Instead of being operated by elastic-rubber rings, however, these are operated by screws, one variety having the screw upon the labial side of the teeth, the other having it upon the lingual side.

FIGS. 1257, 1257A.—Operations for turning two central incisors by one screw (A).

Figs. 1257 and 1257A illustrate two operations by one of these varieties of mechanisms for turning simultaneously both central incisors.

The mechanism for the first case (1257) consisted of one screw and two broad but very thin ferules; upon the labial surface of each of these was soldered one extremity of a stiff strip of gold plate, P, bent as represented in the figure. In the free extremity of each of these strips (levers) was a hole through which the screw S projected. The size of this screw was much smaller than the holes. To turn the teeth these levers were tightened upon by the screw being advanced through the holes into a loose nut, A. The screw was operated by a lever-key caught into a hole in its spherical head, while the nut was being prevented from turning by a large watch-key.

The drawing of the levers toward each other lifted upon their opposite extremities, P (soldered to the ferules), causing the distal corners of the teeth within them to turn outward.

Fig. 1257A, illustrating the other operation, shows the mechanism used to have been quite similar to the one last described, the difference being that the screw-cut nut was fixed, and required no key to hold it steady while the screw was being turned. The nut was held steady by being sufficiently large for one side of it to rest upon the ferule.

All the parts of the screw and levers were made as smooth as possible to prevent the mechanisms from irritating the lip.

Fig. 1258 illustrates the beginning of an operation for turning two upper centrals by a pushing-screw operating upon two lever-ferules, the screw being placed upon the lingual side of the teeth.

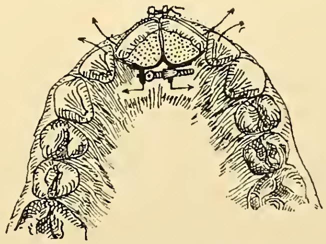

FIG. 1258.—Turning central incisors by a pushing-screw upon the lingual side.

This mechanism (Fig. 1259) consists of the screw S, nut N, and two platinum ferules, F, F, each ferule having a staple constituting a short lever, L, soldered to the lingual side (for the screw). There is also a small staple upon the labial side of each ferule. One extremity of the screw is of spindle form, having between it and the threaded part a bulb with a hole for a lever-key. The little rings R, R (made of round wire about the size of a small pin) are designed for tying the labial sides of the ferules together.

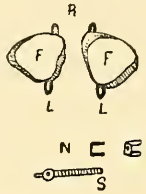

FIG. 1259.—Different parts of the mechanism (A).

These ferules were first cemented upon the teeth to be turned; then, having placed the nut N upon the screw, the extremities of the screw were projected through the staples L, L; then it was turned by a lever (placed in the hole in the bulb) until the nut N pressed against the medial side of the left staple and the head of the screw against the medial side of the right staple; this forced the two teeth farther apart and at the same time turned them.

To prevent the loose nut N from turning with the screw, two ears were soldered oppositely upon it, to rest upon two sides of its staple. (Two views of this nut are shown in the lower part of Fig. 1259.) The teeth (centrals) were prevented from being forced (by the screw) too far apart by tying the rings R, R together with platinum wire.

It might be thought that, instead of having a loose nut upon the screw, the left lug L might be screw-cut and thus simplify the mechanism. This would be practicable provided the lug or the nut be pliable. The looseness of the screw in the staples permits freedom of action of the teeth borne upon.

Fig. 1260 illustrates a case similar to the one last described, but this one was corrected by a somewhat differently constructed mechanism. It consisted of a screw, two ferules, and two ribbons. The connection of the two ferules was made by the screw and the ribbons S, the free ends of the latter being caught upon hooks, H, soldered to the distal parts of the ferules. On the other ends of these ribbons, which were made of gold wire rolled thin

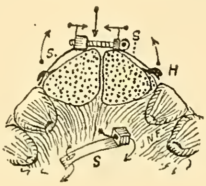

FIG. 1260.—Centrals turned by a screw and two drag-ribbons anchored by ferules (A).

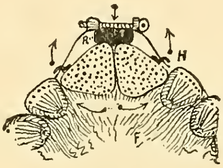

FIG. 1261.—Centrals turned by a screw and two drag-wires in combination with a cushion (A).

as note-paper, were soldered nuts, one smooth-bore, the other threaded for accommodation of the screw. (See the form of union of the ribbon and nut in the lower part of the diagram.)

By advancing the screw through the threaded nut its head pulled upon the other nut and tightened the ribbons upon the hooks of the ferules, thus causing the distal sides of the teeth to turn outward.

If in using this kind of mechanism the pressure upon the mesial corners of the incisors do not constitute sufficient fulcral effect to cause the cords to lift upon the distal corners of the teeth, a block of rubber or wood may be interposed between the screw and the mesial corners of the teeth as shown by R in the case illustrated by Fig. 1261. The difference between the latter and the other one lies not only in this block, but in the form of the draught-cords, the former being ribbons, the latter being round platinum wire, one end of each being curved upon itself, and then soldered to form an eye to catch upon the hooks.

Fig. 1262 illustrates the case of a boy for whom the two upper centrals were turned by a ribbon-clamp mechanism operated by a screw.[1] The mechanism, which is represented in parts by Fig. 1263, consists of two bridges, a screw, and a gold ribbon (having on each end a nut). The mechanism is constructed as follows: To the middle

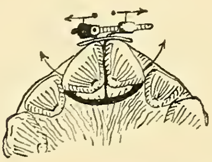

FIG. 1262.—Turning centrals by a ribbon-clamp mechanism.

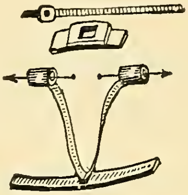

FIG. 1263.—The different parts of the strong mechanism, enlarged (A).

of the longer bridge, consisting of a stiff strip of tough, hard gold about one-tenth of an inch in width (and of sufficient length to extend across the lingual sides of the two teeth to be turned, and so bent that it bears upon their distal corners only), is soldered the middle of a ribbon made of gold wire rolled thin as writing-paper and bent double[2] (Fig. 1263). To the free ends of the ribbon are soldered tubular nuts; one smooth-bore, the other threaded to receive a screw of the spindle variety as shown in Fig. 1262.

The labial bridge consists of stiff gold plate, strengthened by another piece, a frame, rectangular in form, soldered to its middle part as represented. To strengthen

[1] This mechanism is a part of a set of triplex-screw mechanisms devised in 1883 by the author, and published in the "Dental Cosmos."

[2] These ribbons might be attached to the lingual strip by a hook, but such an attachment would have no advantage over that by solder.

the corresponding part around a hole cut through the bridge is the object of this rectangular piece.

The spindle extremity of the screw plays in the smooth-bore nut, while the other end plays in the threaded nut. This forces the two nuts farther apart and draws the ribbon extremities farther through the rectangular hole in the shorter bridge, thus lifting upon the longer bridge on the lingual side of the teeth, causing the ends of it to pull hard upon their distal corners. At the same time that these distal corners of the teeth are thus being turned outward, the medial corners are being pressed upon from the opposite side by the same draught, thus mutually aiding each other in turning the teeth. All this is done by the simple act of turning one screw by a lever. (See Fig. 1264.)

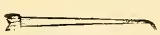

Fig. 1264.—Extremity of a lever-key.

As the operation advances the bearings of the longer bridge are changed by further curving its extremities. To prevent the ribbons from moving the teeth too far apart when the screw is forcing the nuts (on the ends of the ribbons) from each other, they (the ribbons) are restricted within certain limits by the rectangular frame through which they project.

While either of these mechanisms will work well when the teeth have small necks, they are sometimes difficult, if not impossible, to be kept upon tapering teeth unless they are aided mechanically by broad ferules (cemented upon them) or by some ear, lug, or similar aid.

Fig. 1265 illustrates a modification of the mechanism, differing from the other in that the draught-ribbon L is made double in order to rest upon both sides of the bridge B.

Like the single ribbon, these draw upon the tooth by lifting upon the bridge. This modification is a novelty, but it is not of sufficient value to be recommended.

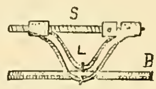

FIG. 1265.—Modification of a part of the double bridge mechanism (A).

Fig. 1266 represents a modification of the mechanism represented by Fig. 1263. It differs from that mainly by the addition of rollers, W, to the shorter bridge C for the ribbon L to play over instead of sliding upon the border

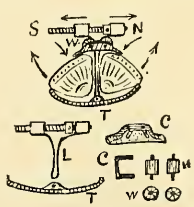

FIG. 1266.—Another modification of the mechanism (A).

of the rectangular hole in the bridge. It further differs by the ribbons L being attached to the longer bridge T by a rivet through two ears instead of being soldered directly upon it. This is shown in the lower part of the figure.

The mechanism is operated by forcing the nuts on the ends of the ribbon farther apart by turning the screw S. The direction of effect upon the teeth is shown by arrows.

Fig. 1268 illustrates a peculiar case, upon which different turning mechanisms were tried. As this operation was difficult, it will be explained more fully than average operations. For this patient (a strong and healthy boy nine years of age) the teeth required several preliminary operations, but the main operation was the turning of the right upper central and both of the laterals.

At first this part appeared simple, but later it proved to be very stubborn; in fact, it was not successfully completed until I had used one of the most powerful mechanisms I ever devised (Fig. 1267). What the cause of the

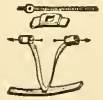

FIG. 1267.—The strong mechanism (A).

stubbornness was could only be conjectured, but it appeared to be either flatness or crookedness of the roots, or their entanglement. That the roots were not united was proved by final success of the operation.

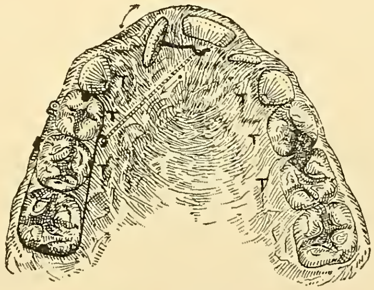

FIG. 1268.—First stage of the operation (A).

When the boy applied for treatment he had in the upper jaw several deciduous teeth (marked T) and several adult teeth. At this time the adult teeth on the left side of the arch, excepting the lateral, were in their normal positions; but on the right side the central had erupted diagonally to the proper line. The lateral had not yet erupted, but when it did appear it also stood diagonally to the line, the labial surface partly facing the central. When the left lateral erupted, it also required turning. (See Fig. 1269.)

At first I thought that the right central could be easily corrected, and therefore an attempt was made to accomplish it by a lever-ferule cemented upon the tooth. (See Fig. 1268.)

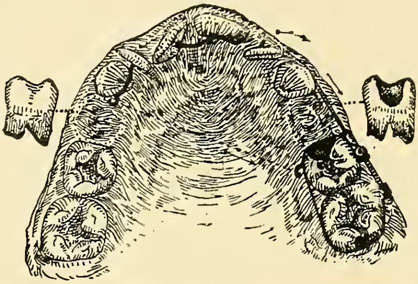

FIG. 1269.—Second stage of the operation (A).

This lever was made of stiff platinum wire about half an inch in length, soldered to the ferule, which was of gold. (See the largest cut in Fig. 1270.)

The lever was drawn upon by a rubber ring, caught upon a hook on a gold clamp-band on the right deciduous and first molars (Fig. 1268). By this rubber ring the central started to turn, but it moved only a short distance before it

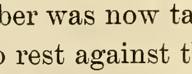

FIG. 1270.—Lever-ferules used in the operation.

stopped. The force applied, though so great that it started the anchorage teeth out of line, failed to turn the central any farther. The rubber was now taken off the tooth, and the lever bent so as to rest against the left central in such a way as to retain the ground already gained (Fig. 1269). The case was then rested for several months, partly to await the eruption of the right lateral, and partly with the view that possibly the root of the right central, through the eruption of the new tooth (lateral), might become liberated and thereby move into its proper position.

After the right lateral had erupted sufficiently to permit a firm hold upon it, a ferule having a (platinum) wire lever similar to the one tried upon the central was applied to it. This lever was also acted upon by a rubber ring, stretched, and caught upon a hook on a clamp-band on the second deciduous and the first adult molar of the left side of the dental arch. (See dotted line in Fig. 1269.) While this was going on, the first deciduous molars T, T were extracted to hasten eruption of the first bicuspids, which I desired to extract also to make room for the adult cuspids should more space be found necessary.

Like the right central, this lateral started to move, but when half turned it also balked and would go no farther. Believing that entanglement of roots must be the cause, further operation upon this tooth was for the time suspended. The ground gained was held, however, by bending the wire lever so that it rested against an adjacent tooth, there to await the down-growing of the cuspid which at this time had just begun to appear through the gum.

While waiting for the right central and lateral to act, the left lateral was being turned by another lever-ferule, drawn upon by a rubber ring anchored to a molar clamp-band as shown in Fig. 1269. This tooth gradually turned to its proper place, and was held there by a single arm-ferule as shown in Fig. 1271.[1]

When the right first bicuspid had erupted, and the labial surface of the adult cuspid had appeared high up in the gum, the bicuspid was extracted and the wire levers cut

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[1] This lever-ferule, together with others used in this operation, is represented independently in Fig. 1270.

away, leaving the ferules to remain upon the teeth to aid in holding another, but more powerful, turning mechanism.[1]

Fig. 1271 illustrates the case as it appeared at this time, with the mechanism upon the central and lateral. Having adjusted it, a lever-key was given to the parents with instructions to turn the screw, twice a day, as far as possible short of causing pain, the degree of pressure being determined by the patient. The teeth now slowly, but

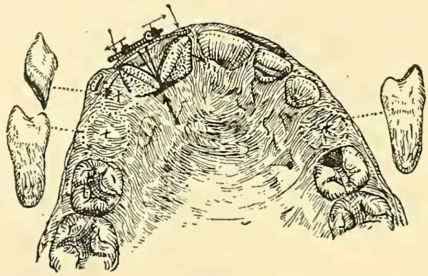

FIG. 1271.—Third stage of the operation. Application of a ribbon-bridge mechanism (A).

steadily, turned by this powerful machine, until they were nearly in their proper positions. But just before reaching their proper positions they again balked. The stopping of the central was caused by overlapping its mate (the left central), but why the lateral stopped could not then be determined.

At this point a duplex-acting H-separator[2] (not shown) was applied between the centrals to force the left central to the left and away from the other central sufficiently to unlock the two crowns. The separator was then taken off and the former machine reapplied. This soon turned the right central into its proper position, but the lateral still remained comparatively stationary. The machine was now removed, and replaced by the new and more powerful

[1] Devised 1883. For explanation of this machine, see Figs. 1262, 1263.

[2] See Figs. 148 and 149, p. 253, Part VI.

machine of the same kind referred to. By close attention for several months, this one caused the lateral to turn (slowly) to its proper place, when it was held there until the adult cuspid (in its eruptive process) could have time to move posteriorly into the place of the extracted bicuspid. While this was going on the left cuspid erupted in the place of the extracted left first bicuspid.

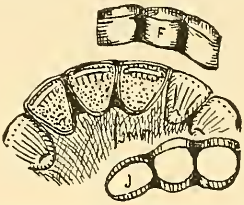

FIG. 1272.—Showing how the corrected teeth were held in place. Two extra views of the retainer.

The right central and lateral were held in place by three ferules soldered together as shown by F and J in Fig. 1272. These teeth, including also the left central, were cemented into place as shown in the figure. The left lateral was held independently by an arm-ferule as shown (Fig. 1271). All

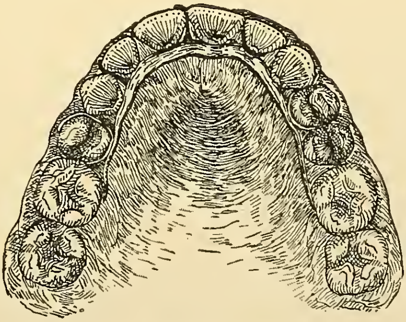

FIG. 1273.—Appearance of the completed case with the final retainer applied.

of these ferules were allowed to remain upon the teeth for several months. The front teeth, which protruded slightly, were then moved inward by a long-band drawn posteriorly by screws connecting it with anchor clamp-bands upon the molars.

After the teeth were corrected and held in place for several months by a rigid mechanism, they were further held by a detachable retainer (made of half-round gold wire) with flat fingers projecting between the front teeth to hook slightly upon their labial surfaces, as shown in Fig. 1273. This second retainer (cleansed every day) was worn two years; since then the teeth have remained in their proper places.[1]

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[1] For an interesting case requiring the turning of several teeth, see Part XVIII. (S. C. H. Case).

CHAPTER CXXIX.

TURNING ONE OR MORE INCISORS BY SCREWS (*Continued*).

SEVERAL MODIFICATIONS OF THE SCREW-ACTING MECHANISMS.—TURNING TWO INCISORS SIMULTANEOUSLY.—OPERATIONS BY GOLD DRAUGHT-RIBBONS IN COMBINATION WITH BAR-ANCHORS.—BY A DRAUGHT-CORD IN COMBINATION WITH A CLAMP-BAND.—BY A DRAUGHT-RIBBON IN COMBINATION WITH A SPINDLE-SCREW.—OPERATION BY OPPOSITELY ACTING DRAUGHT-CORDS.—OPERATION BY A SCREW-JACK.

IN the preceding chapter several operations for turning teeth by different kinds of machines were explained. The great majority of those mechanisms were very small. Some were for turning one tooth only, but most of them were for turning two simultaneously. We will now consider single and double operations by different kinds of mechanisms, most of which are of larger size, though not clumsy. Besides these mechanisms there will be mentioned in foot-notes several others that are practicable, but which are presented more for historical information than for adoption in practice.

Fig. 1274 illustrates an operation for turning two protruding upper laterals for a woman who had sacrificed the centrals because they protruded. The mechanism used consisted of two broad platinum ferules, F, F, each having a gold-wire lever, L, L; two anchor clamp-bands, B, B; two screws, D, D; and a long piece of flexible platinum wire, W (size of a small pin), for the screws D, D to draw upon.

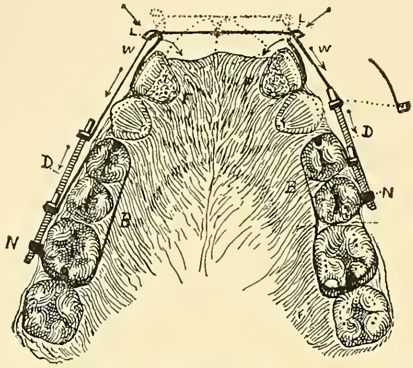

FIG. 1274.—Turning simultaneously two laterals by lever-ferules acted upon by screws (A).

After the ferules F, F are cemented upon the laterals the clamp-bands are fastened upon the bicuspids and first molars, after which the draught-wire W is laid into open rings on the ends of the levers L, L, and then drawn taut by the screws D, D lodged into the posterior double nuts N, N upon the anchor-bands B, B. (See different parts in Fig. 1275.)

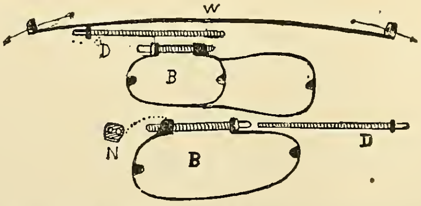

FIG. 1275.—Different parts of a similar mechanism (A).

In operating the mechanism this draught-wire was retightened twice a day by advancing the screws D, D by a bench watch-key. This caused the wire to draw diagonally upon the ends of the ferule-levers, thus turning the laterals in the opposite directions, indicated by arrows.

A curve was made in both levers to enable the draught-wire to slide easily over them. The degree of force caused by this wire varied as the relative position of the levers changed by the turning of the teeth in the ferules. After being sufficiently turned they still needed to be moved further posteriorly; this was accomplished by cutting away the levers and letting the draught-wire rest directly upon the ferules.

When the laterals were brought into their proper positions they were retained there by two artificial centrals so ground that they slightly overlapped them. In some cases such overlapping of artificial teeth will not properly retain the natural ones. When this is the case short clasps anchored into the plate (on which the artificial teeth are mounted), the free extremities extending forward so as to hook over the mesial parts of the labial surfaces, are sometimes practicable. They are not equal in value, however, to a delicate arm-ferule cemented upon the teeth, i. e., a ferule having a wire arm soldered across it to bear upon the lingual sides of the adjacent teeth.

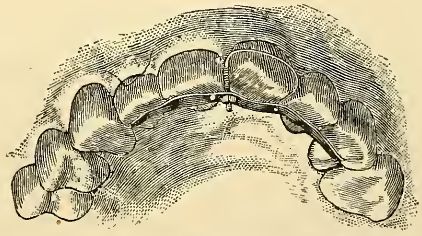

FIG. 1276.—Turning a left upper central by a screw and slip-noose ribbon (A).

Fig. 1276 illustrates the beginning of an operation for turning a left upper central for a man about thirty years of age. The mechanism (Fig. 1277) consisted of a bar (cut from gold plate) and a ribbon slip-noose made of rolled-gold wire. On one end of the ribbon was a small rectangular ring and on the other end was soldered a small screw. One end of the ribbon (which was thin as writing-paper and about one-twelfth of an inch in width) projected through the rectangular hole in the other end, thus forming a slip-noose. This was done before other parts were added.

FIG. 1277.—The Mechanism (A).

In applying the mechanism the slip-noose was first caught around the tooth to be turned, after which the screw was projected through a hole in the bar and tightened by the nut. The extremities of this bar rested upon the adjacent teeth as shown in the figure. At right angles to one end of it (the bar) was a gold pin that entered an artificial pit in the left cuspid, to hold this end steady; the other end was held in place by tying it to the right lateral by platinum wire. The mechanism was operated by turning the nut upon the screw.

I saw this case only once during the process of turning the tooth, the manipulation being done entirely by the patient. The case was completed within one week.[1]

FIG. 1278.—The first retaining-pin (A).[2]

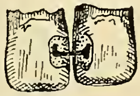

FIG. 1278A.—The second pin (A).

As there were cavities in the medial sides of the centrals, I attempted to permanently retain the corrected tooth by cementing one end of a pin into the cavity of the corrected central, leaving the other end to rest upon a filling in the

[1] Published in "Dental Cosmos," November, 1879, p. 309 (A).
[2] July, 1879.

other central. (See Fig. 1278.) This, however, did not prove as advantageous as expected, because the surface of the filling material (zinc cement) disintegrated after a time. I then tried a different pin, extending from the middle of one cavity into the middle of the other. The pin had a head on one end and a hook on the other (Fig. 1278A). Through difficulty of using a toothpick this pin was in danger of loosening from degeneration of the cement. As

FIG. 1279.—The Yoke (A).

the patient lived a long distance from the city and could not often come to my office, it was thought best to discard the pin and substitute for it an adjustable yoke-band that would embrace the necks of both centrals. (See Fig. 1279.) This was worn until gold fillings of wart form could be built into the cavities.[1]

When a turning mechanism like the one represented in Fig. 1277 is to be used, the bar should generally be made sufficiently long to bear upon at least two teeth on each side of the one to be turned. This is prudent in order to prevent forcing the adjacent teeth out of their proper places.

A better modification of anchor is a wire with a broad ferule soldered to each end to fit upon some tooth on each

[1] Since more lasting cement came into use pins in cavities have proved to be more lasting, but for some patients they are not as advisable as the arm-ferule so arranged and cemented upon the turned tooth that the arm will rest upon an adjacent tooth. In devising any permanent retainer, it is hardly necessary to suggest the importance of so devising it that cleanliness can be easily maintained, as lodgment of food is liable to cause decay. In slovenly patients the arm-ferule is sometimes safer than pins, because it is so conspicuous that it calls attention, whereas unseen retainers are often neglected. Because of heedlessness of some patients it is not sufficient to simply advise them to attend to cleanliness; they should be advised to call at the office for examination every month or two if possible.

side of the arch. To hold the screw to this anchor-bar a smooth-bore nut or ring is soldered to the middle part.[1]

Fig. 1280, representing the last part of a larger operation, illustrates the turning and moving to line an instanding upper right lateral by one of my old-style mechanisms, a

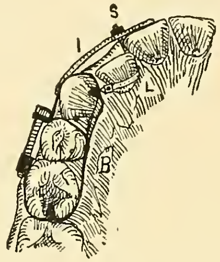

FIG. 1280.—Turning and moving to line by a ribbon anchored by a clamp-band (A).

part of which somewhat resembles that which is described in the following foot-note. To make sufficient space for this instanding tooth the first bicuspid was extracted, and the cuspid drawn posteriorly against the second

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[1] Among my earlier and old-style mechanisms (obsolete) there was one that is represented by Fig. H. This consisted of a single clamp-band, V, in combination with a gold ribbon having a screw soldered to one end, and an anchor-bar, U, with a gold screw-loop, C. In the upper part of the figure this is represented

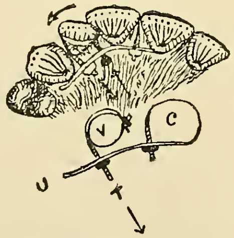

FIG. H.—A prototype turning mechanism and its application to the teeth (A).

as applied for turning an upper right lateral. The mechanism, which is never useful in the hands of unskilled practitioners, is, however, inferior to many others represented in this work. It is given only to show a prototype of better ones that I now use.

bicuspid by a clamp-band, B. One end of a bridge-piece, I, was then soldered to its anterior part, to rest upon the labial surfaces of the right cuspid and central for an arch from which to draw the instanding tooth outward by a ribbon, L, secured to the tooth by a band, the ribbon being drawn upon by a screw projecting through a hole in the

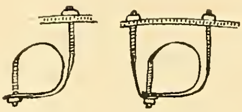

FIG. 1281.—Two modifications of the turning loop (A).

bridge. This screw, which was soldered to the end of the ribbon, was tightened upon by a nut on the upper side of the bridge-piece. This part of the mechanism is represented in the left of Fig. 1281. In the right of this figure is a modification of the same.[1]

The draught-ribbon is attached by being caught upon the screw of the band around the instanding lateral. Neither this kind of band nor the plan of attaching the ribbon is now regarded as up to date, but before quick-setting cement was known in dentistry, both were regarded as superior. Now that phosphate of zinc has been found to be of so great use, the closed ferule is better than the open one. The ribbon is now connected with the ferule, either attached by solder or caught upon a hook.

Fig. 1282 illustrates the closing part of an operation for turning an outstanding upper left lateral by a platinum-wire cord in combination with an incisor-ferule and a clamp-band. The latter, which was fixed around the cuspid and bicuspids, not only served as an anchor for turning

[1] This modification is also one of my old-style mechanisms; these forms are given simply to show the prototypes of later improvements.

the incisor, but served previously for moving the cuspid posteriorly to make space for the former. The anterior end of the platinum cord was soldered to the ferule; the

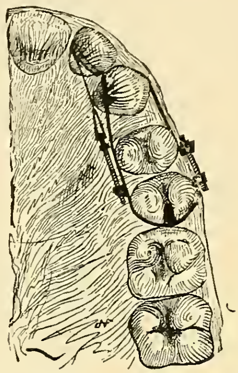

FIG. 1282.—Turning a lateral by a metallic cord in combination with a clamp-band (A).

other end was attached to a swivel-screw connected with the clamp-band by a nut soldered to its lingual side. The cord was operated by turning this screw by a lever placed through the opening in the swivel.[1]

The mechanism, which is an outgrowth of the one represented by Figs. 1280 and 1281, is somewhat difficult to make, but it is delicate and strong, and when applied properly it is not only powerful, but easily managed.

Fig. 1283 illustrates an operation for turning a left upper central by a duplex-acting mechanism consisting of two ribbons, one end of each being soldered to a broad platinum ferule, the other ends being connected with a spindle-screw. (See Fig. 1284.) This is an improved modification of my older loop mechanism. It is superior not only because firmer and less clumsy, but more reliable. To ap-

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[1] Dr. Eugene H. Smith uses catgut for draught-cords instead of wire or gold ribbons. Properly tied, catgut is an excellent cord, and slides over rough places more easily than wire.

ply it the ferule was first cemented upon the tooth with phosphate of zinc, and then the ribbons were projected between the centrals and tightened upon by turning the screw that played in nuts soldered to the ends of the ribbons.

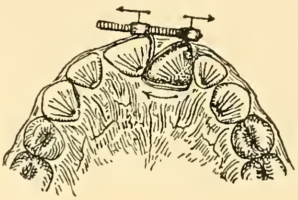

FIG. 1283.—Turning a left central by a duplex-acting ribbon (A).

The turning was conducted very gently in order to avoid crumbling the cement and loosening the ferule. The action of this machine not only caused a widening of the space between the right central and left lateral, but at the same time it drew upon and turned the left central into the space.[1]

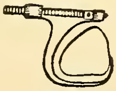

FIG. 1284.—The mechanism, edge view (A).[2]

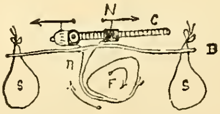

FIG. 1285.—A concentric-loop bridge mechanism for turning incisors (A).[2]

Fig. 1285 represents a concentric-loop bridge mechanism for turning a central incisor. B, the bridge, consists of a strip of stiff gold plate; R, two ribbons; F, broad plat-

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[1] Published in the "Dental Cosmos," 1886.

[2] "Dental Cosmos," March, 1886 (A).

Several of my older concentric loops, which were not only more difficult to construct, but clumsy to wear, are here represented to show prototypes of some of my later improvements; one of these is represented as applied by Fig. A.

To one end of the ribbon O (Fig. A) is soldered a screw-cut nut, P. The other end is soldered to a clamp-band screw-cut nut, N′. The opposite clamp-inum ferule; C, a spindle-screw; S, S, two platinum tying-wires, all combined as shown.

To apply this (one of my somewhat old mechanisms) the different parts are first relaxed, and then, having filled the ferule with phosphate of zinc (cement), the mechanism is so arranged upon the teeth that the ferule will properly cling to the incisor to be turned, while the bridge-piece so spans the space over this tooth that it will rest upon the labial sides of the adjacent teeth, leaving the screw and the ribbons to connect these two parts as shown. To turn the tooth the screw C is so operated that it will force

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band nut N′ is smooth-bore. Between the nuts N′ and N″ plays the screw S. P′ represents another smooth-bore nut, to which is soldered a short platinum-wire loop to catch upon the end of the screw C.

Fig. A.

Fig. B.

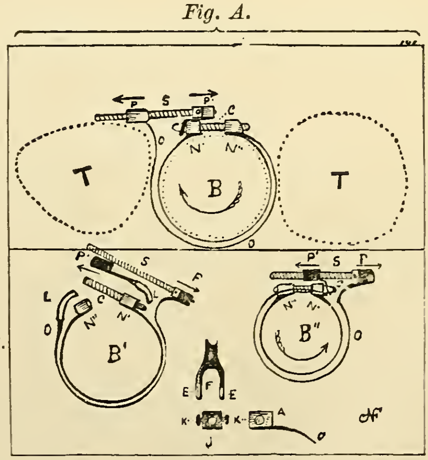

Fig. C.

Fig. D.

FIG. A.—Showing the application of the double-loop turner (A).
FIG. B.—Different parts (similar) reversed.[1]
FIG. C.—The parts connected.
FIG. D.—Special parts.

To operate the mechanism the two nuts P. P′ are simply forced apart by turning the screw S, which causes a turning draught upon the tooth. Fig. B represents independently similar elements, and Fig. C the combination.

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[1] Published in the "Dental Cosmos."

farther apart the nuts that are soldered to the ends of the ribbons R, that play through a hole in the bridge, and thus draw upon the ferule, which turns the tooth in it. If the hole or slot in the bridge is of sufficient length the ribbons not only turn the tooth, but will at the same time increase the space for it by forcing the adjacent teeth farther apart.

This is an effective mechanism when the conditions are favorable for its firm attachment to the teeth; unless, however, the prominent parts are very smooth they will irritate the lips.

The weak points in this mechanism are the anchor-wires S, S. Such anchors I have now abandoned in favor of ferules soldered to the extremities of the bridge-piece.

Instead of soldering the outer ribbon O to the clamp-band nut N″, it is connected by a loop, L, caught over the clamp-band screw C. The end of this ribbon O may also be made like a fork (see E, E, Fig. D) and caught upon knobs (K, K) soldered to the sides of the nut (J).

Fig. F.

Fig. E. *Fig. G.* *Fig. H.* *Fig. J.* *Fig. K.* *Fig. L.*

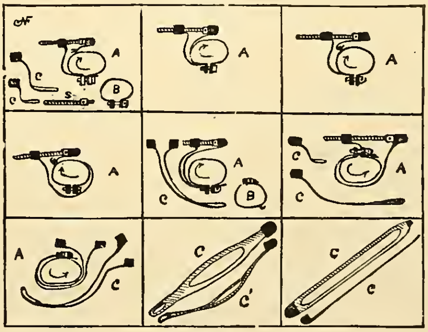

Fig. M.

Figs. E, F, G, H, I, J, K, L, M.—Various modifications of the concentric-loop mechanism (A).[1]

Figs. E, F, G, H, I, J, K, L, M, illustrate a group of other modifications of this triplex-acting mechanism. As will be seen, the principal difference in them lies in the length and form of the draught-ribbon C and in the locality

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[1] Published in the "Dental Cosmos," 1885.

Fig. 1286 represents a modification of the mechanism that was last described. This one, which is superior to it,

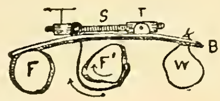

FIG. 1286.—Mechanism for turning teeth (A).[1]

is not duplex in action; it corrects by use of the principle of the wedge. One end of the bridge is fastened to an anchorage tooth by a broad ferule, F, and the other end by a wire or string, W. To one end of the ribbon is soldered another broad ferule, F′, to be cemented upon the tooth to be turned; to the other end is soldered a smooth-bore nut. In this nut plays the spindle extremity of a screw, S, the other ex-

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of their attachment to the bands. Had the bands B been simple closed ferules (having no screws) these mechanisms would have been more useful than they were. As the use of the quick-setting phosphate of zinc in dentistry was

Fig. N. *Fig. O.*

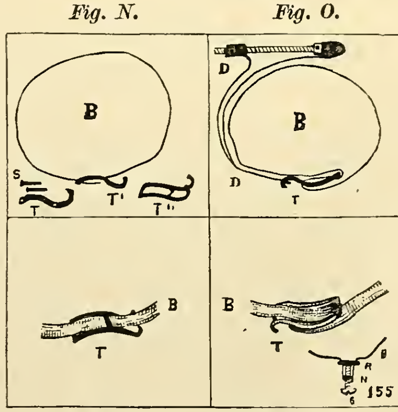

Fig. P. *Fig. Q.*

FIGS. N, O, P, Q.—Buckle-tightening Band (A).

not known at this time, the screw seemed to be the only means of tightly fixing a band upon a tooth.

Fig. E represents a machine of three detachable parts, C, C, S, B. The clamp-

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[1] Published, in principle, in the "Dental Cosmos," 1886.

tremity playing in the screw-cut nut T, that tilts upon a rivet between two gold ears soldered to the bridge B as shown.

Fig. 1287 illustrates the beginning of an operation for turning, and at the same time moving directly outward, two instanding upper laterals by the power of a screw.

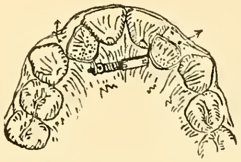

FIG. 1287.—Turning one lateral and moving outward another by a screw-jack.

FIG. 1288.—The Mechanism (A).

The mechanism (Fig. 1288) consists of a screw-jack, J, and two broad platinum ferules, F, F; one end of the jack is connected with the left ferule by a piece of flattened gold wire, S, the other end being held in place by a platinum-wire loop soldered to the lingual side of the ferule for the right lateral. These ferules are cemented upon the teeth with phosphate of zinc.

The jack, which was operated twice each day (with a

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band screw is located upon the lingual, while the triplex screw (as in other mechanisms) is upon the labial side of the tooth.

Fig. F represents a mechanism with all its parts soldered together, and Fig. G a similar mechanism with only one draught-ribbon soldered to the band, the other being caught upon a hook.

Fig. H represents another modification in which the draught-ribbon almost encircles the band to which it is soldered. This draught-band lies at one side of the clamp-band nut and screw, so as not to ride upon it.

Fig. I (the middle figure) represents a modification consisting of only two parts, C, B. Though the draught-ribbon is double, it acts as one. These are soldered to a platinum-wire loop to catch upon the band-nut.

Fig. J represents a modification similar to that represented by the middle figure.

Fig. K represents separately and unitedly the parts of another modification that is similar to that shown in the middle figure.

Fig. L represents two views of a peculiar form of longer draught-ribbon; all lever-key), bore upon the anterior part of the left lateral and upon the posterior part of the right lateral, turning them (by different degrees of force) in opposite directions, and at the same time, outward.

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others thus far described consist of straight ribbons, while this one is open in its middle part to permit it to rest upon both sides of the clamp-band screw and nut.

Fig. M represents two views of a similar double draught-ribbon, differing only in the length of the slot.

Figs. N, O represent a turner resembling that shown by Fig. E. The mechanisms not only turn the tooth, but force farther apart the adjacent ones.

Several years earlier, and long before the days of quick-setting cement, I devised the two buckle-tightening bands represented in Figs. N, O, P, Q. As great nicety of adjustment was required to insure success, they were abandoned for this purpose, but I am not sure that the principle cannot be taken advantage of for fitting a band around the neck of a tooth preparatory to crowning it.

Fig. R illustrates an old-style mechanism for moving into line a left upper lateral incisor. This is practicable only with teeth that are of such a form that it will not slip off. There are two modifications, viz., the single loop and the double (concentric) loop. The former draws upon a tooth in a way that will tend not only to slightly turn it (if the root be straight and cylindrical), but also to draw it laterally. The turning act, however, cannot be depended upon, because the ribbon will slip.

By turning the screw the threaded nut is forced farther away from the smooth-bore nut, causing the ribbon to draw through a slot in the bridge (Fig. S) and to pull upon the tooth to be moved.

FIG. R.—Turning Mechanism (A).

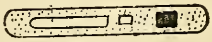

FIG. S.—The Bridge.

To prevent the bridge from sliding posteriorly along the surface of the cuspid a lug is soldered to its under surface to project between the lateral and cuspid. To aid in holding the entire mechanism in its proper place the extremities of the bridge are tied to the adjacent teeth by platinum wire. Instead of such wires I now use ferules cemented upon the anchor teeth.

Figs. T and U represent a complicated turning mechanism, practicable only in skilful hands. This mechanism (now obsolete with me) consists of a stiff bridge-piece, B, a gold ribbon, R, spring-arm, T, screw, C, and a sliding nut, S. The tooth is turned partly by the ribbon R and partly by the arm T. (See Fig. U.) ("Dental Cosmos," December, 1884.)

Fig. 1289 represents two screw-jacks that are often found useful for turning opposite instanding teeth outward to line. These jacks connect with the teeth by ferules.

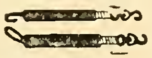

FIG. 1289.—Jacks for a similar purpose (A).

Fig. 1290 represents a turning mechanism that acts in a direct line. It consists of a broad ferule, an anchor clamp-band (having opposite nuts), a drag-screw with a swivel-lug, and a piece of small platinum wire. The ferule

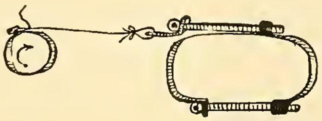

FIG. 1290.—Single draught-cord mechanism for turning a tooth (A).

is first cemented upon the tooth to be turned, and then the clamp-band is placed around two of the side teeth, after which the tooth to be turned is drawn upon by the platinum wire tightened by the swivel-screw. This mechanism is practicable for drawing upon the labial or upon the lingual side of the tooth.

The construction is as follows: One end of the arm T (strip of plate bent as in Fig. U) is soldered to the middle third of the bridge B (after the hook part has

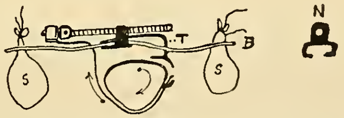

FIG. T.—A complicated mechanism for turning a central (A).

been projected through the slot) to bear upon the tooth to be turned when pressed upon by the sliding of the flange-nut N, S, caused by the turning of the screw C. One end of the ribbon R (one-sixteenth of an inch in breadth) is

Fig. 1291 illustrates the application of a mechanism for turning an obstinate upper left lateral.[1] The mechanism, shown in parts (Fig. 1292), consists of three clamp-bands, S′, C′, C″, and two gold draught-ribbons, B′, B″.

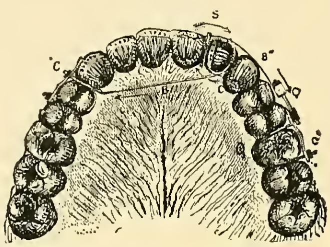

FIG. 1291.—Turning a stubborn lateral by an old-style counterbalancing mechanism (A).

One end of each draught-ribbon is firmly secured to the tooth to be turned, while the other ends are attached to the anchor-bands, one upon the left first molar, the other upon the right first bicuspid.

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attached by solder to the nut in which the spindle end of the screw plays; the other end is caught upon a hook soldered upon the ferule F as shown.

In applying the mechanism the ferule F is first cemented upon the tooth to

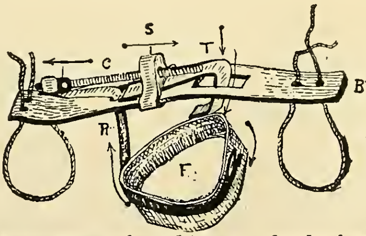

FIG. U.—The same mechanism enlarged to more clearly show its construction.[2]

be turned, and then the bridge-piece B is tied upon the adjacent teeth by strings, S, S. (Instead of strings I now anchor all such bridges by broad ferules; one is generally sufficient for a bridge.[3])

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[1] Published in the "Dental Cosmos," January, 1878.

[2] Published in March, 1886.

[3] A somewhat complicated class of little turning mechanisms, that may be interesting to some students, is represented by Figs. V, W, X. These mechan-

The attachments are made as follows: one end of each of the ribbons is caught over the nut s of the bands (see Figs. 1291–2), while one of the other ends is attached to the

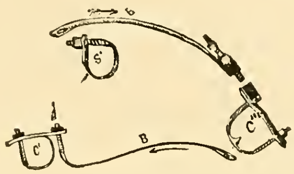

FIG. 1292.—Separated parts of the mechanism (A).

screw in the clamp-band bar c′, and the other to the screw Q. The draught upon the tooth to be turned is caused by tightening the two ribbons by these screws.

Instead of using a small clamp-band upon the tooth to

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isms were devised for slightly turning upper incisors. The mechanism marked V consists of four elements: a ferule, gold ribbon, crooked wire, and two nuts. The draught-screw projects through a hole in the flattened wire arm, and has upon it a square nut, while the other extremity (bent at right angles) has upon

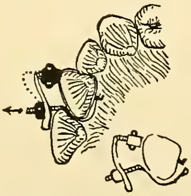

FIG. V.—Turning a left central (A).

FIG. W.—Turning a right lateral (A).

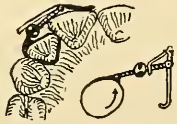

FIG. X.—Turning a right lateral (A).

it a tubular nut. To operate the machine the square nut is screwed down upon the arm; this lifts the medial side of the left central, and at the same time forces the globular nut upon the distal side of the tooth.

Fig. W represents a modification of this mechanism, differing only in the use of a screw instead of a tubular nut. In these mechanisms the globular nut and the screw are only aids to the lifting-screws.

Fig. X represents a walking-beam mechanism operated by a nut on a screw.

be turned, as in this case, I now use a broad ferule, cemented upon the tooth with phosphate of zinc, because such a cemented band is very much firmer. I also now prefer a longitudinal-screw clamp-band to the transverse-screw band. (See the upper part of the following figure.)

Fig. 1293 represents parts of two similar, but superior, mechanisms. (Corresponding letters indicate correspond-

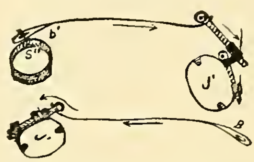

FIG. 1293.—Ribbons and longitudinal-screw clamp-band anchors (A).

ing parts.) The improvements lie in the use of longitudinal-screw clamp-bands, J′, J′, and in the use of ferules, S″.

A safe anchor for a draught-cord (metallic or rubber) is a gum-guard ring having a bar soldered to its buccal side. (See A in Fig. 295, Part VI., p. 339.)

The mechanism consists of a ferule, a stationary screw, a globular nut, and two pieces of wire (constituting the walking-beam). To the ferule is soldered on a tangent one end of the first-mentioned screw, and then the nut is added. A little ring soldered to one end of a piece of wire is then slid upon the screw, the other end of which is flattened and bored for a bolt, that rivets it between the bifurcated extremity of the walking-beam, which in turn is riveted between bifurcated extremities of the first-mentioned screw.

To operate the machine the walking-beam wire, which is placed nearly parallel to the screw, is made to change position by the globular nut being forced (along the screw) against the ring end of the shorter wire, causing the other end of it to rise and lift the longer wire so that it will assume a position at right angles to the screw. By this movement the free end of the longer wire bears upon the tooth adjacent to the one to be turned; this turns the latter. This mechanism is not as practicable as the others described.

CHAPTER CXXX.

IMMEDIATE PLACING OF UPPER INCISOR TEETH BY FORCEPS.—BY TRANSPLANTATION.—BY REPLANTATION.—IMPLANTATION.

THE WRENCHING PROCESS OLD, AND THE OPERATION SEVERE.—REPLANTATION ALSO AN OLD PROCESS.—VIEWS OF BERDMORE, BOURDET, HARRIS, TOMES, SMALL, AND PARÉ.—IMPLANTATION NEW, BUT QUESTIONABLE.

THERE are old plans for turning teeth, called the heroic, that are based upon immediate forcing of the teeth into their proper positions, by muscle and forceps. Berdmore, in 1748, and Bourdet, in 1786, both mention in their writings this forceps plan. The plan of instantaneously turning a tooth, or even moving an instanding tooth to line by the use of forceps, cannot in any sense be regarded as scientific, because it is not only dangerous to the life of the tooth, but unnecessarily painful.

The first part of such operations consists in placing one beak of straight forceps upon the lingual side of the tooth and the other upon the labial side (having first placed wood or hard rubber upon the labial side of the tooth); then, grasping the forceps firmly, the tooth is turned or lifted upon until it is righted.

Although the turning of a tooth by forceps is taking a greater risk of destroying the pulp than by any other plan, some cases have been successfully treated; this, however, is not offered as an argument in favor of the wrenching plan. Indeed I cannot commend under any circumstances this operation, for although some eminent authorities differ with me, I think that when instruments are necessary to move teeth, only those that can do the work gradually, and without mashing or breaking the socket-tissues, should be used.

In nearly all slower operations there is some liability of injury to the pulp, but the percentage of such results is so small that a dentist may live a lifetime without meeting one case in his practice; by the rapid processes the percentage of unfavorable results is so great that there seems to be reason for condemning them as unscientific. What I, however, have to say upon the forceps operation should not be regarded as wholly modern views, but also the views of the past, though this past time is not long ago. Most of my remarks will be quotations from other dentists, some of whom think that there are conditions making such operations advisable.

Of this heroic operation, sometimes called "torsion," Berdmore says: "The method is not . . . gentle, and consists in breaking the teeth into order by means of a strong pair of crooked pliers, after which the ligature is to be applied."

Bourdet says: "When an incisor is turned to one side, it must be put in the right position with forceps. If the patient does not wish to endure this operation, which is rather painful, the strip of plate is preferable to threads alone, for turning the tooth into place."

Harris (C. A.), in the first edition of his work, substantially reiterates the views of these earlier writers thus: "Some practitioners have recommended correction of this species of irregularity either by twisting the centrals suddenly around with a pair of forceps, or by extracting and immediately replacing them in proper position. . . . This is objectionable, because it leads to death of the pulp, and teeth so treated lose the peculiar animated appearance which characterizes healthy, living teeth."

This author further says: "This operation for turning teeth into their proper positions, which, as a general thing, is possible only with those having nearly round roots, consists in the selection of forceps that properly fit the tooth; and having carefully passed the beaks as high up under the gum as is feasible without flaring the edges of the socket, a strenuous, slow motion is applied until the tooth is wrenched into its place."[1]

Although a few modern authorities regard this operation as scientific, it is fortunate that it is not so regarded by the profession in general. The drawback is not only the liability of killing the pulp and discoloring the tooth, but, as a consequence, a permanent injury of the socket by alveolar abscess. To be sure, discoloration, in a measure if not entirely, may generally be prevented by removing the pulp immediately after the operation, and then filling the root; but the fact still remains that the vitality of such a tooth is not as vigorous as before the operation, and sooner or later the tooth will change its hue.

It is said by those who have experience in this process that the liability of killing the pulp largely depends upon the patient's age, and upon the distance necessary to turn the tooth; that in early life the pulp is less liable to die from the operation than if performed at a later period, because the root is not fully developed, and the foramen being very large, the pulp is not easily congested. How-

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[1] Harris's "Dental Surgery" (1839), p. 108.

ever this may be, the fact remains that if the pulp *does* die before complete development of the apical part of the root, the preservation of the tooth becomes very much more difficult than when the pulp dies after complete development of the root—a fact that should be taken as a sufficient offset against the successful operations.

While visiting one of our Western States, Dr. W. F. Lewis directed my attention to a case of an upper central which had been turned by forceps, that well serves as an illustration of the large percentage of results from operations of this kind.

Fig. 1294 represents the tooth as it appeared before the operation, and Fig. 1295 its appearance after the operation. When the tooth had been turned it was held in place by

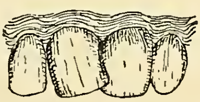

FIG. 1294.—Position of the tooth before the operation.

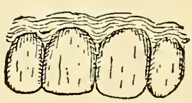

FIG. 1295.—Position of the tooth after the operation.

strings tied to the adjacent teeth. This dentist said that "no hemorrhage followed the operation," that "the gums were daily bathed with a solution of phenol sodique," that "apparently there was no inflammation in the socket," and that in two weeks the strings were removed, and the tooth being somewhat elongated, he ground it off even with its mate. When I saw the tooth, however, it had all the negative evidences of the pulp being dead; it was darker than its mate, and, although there was no abscess as yet, the shade indicated wasting of the pulp from slow death.

Mr. Small mentions the case of a boy about eight years of age, whose upper central was so far out of its proper place that the mesial surface faced the lip. Concerning the treatment he substantially says: "The tooth was carefully but firmly grasped by a pair of forceps, and then, pressing it toward the socket, the tooth was turned into its proper position. A week afterward," he says, "it was solidly fixed, and the boy could, by the sensation in the tooth, distinguish between heat and cold."[1] No discoloration following, and the gum appearing healthy, he inferred that the pulp had not been killed. Mr. Small regards such an operation as comparatively safe if performed before the patient is twelve years of age.

Mr. Tomes, in his work,[2] gives views upon this plan thus: "On the whole, the operation of immediate torsion is one which is only advisable when rectification by plates is not advisable; . . . the most opportune time for such forcible twisting of the tooth appears to be when the patient is about nine or ten years of age. At that period the teeth are fully erupted, but their sockets have not attained full strength." Mr. Tomes further says: "I have, however, successfully twisted the central incisors of a patient aged fifteen, and in several instances in patients aged thirteen; but, as a rule, it should be done at a much earlier age, for the sockets will become dense and unyielding, so much so that in several cases I have failed to move the teeth with any degree of force that seemed safe to apply, and have therefore been compelled to abandon the attempt.

"For this operation a pair of straight incisor forceps is recommended. To prevent injury of the enamel, a piece of lead foil should be interposed between the tooth's labial surface and the forceps. The tooth should then be firmly grasped at the edge of the gum, and steadily twisted in

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[1] Similar sensations are experienced from inflammation of the sockets.

[2] "Dental Surgery."

the desired direction until it is felt to yield. No attempt should be made to loosen it by twisting it in opposite directions. When the tooth is released it is apt to spring slightly backward. Such being the case, it is generally necessary to twist it further than into its normal position. Where the tooth has to be twisted (in a somewhat old subject) through a quarter of a circle, there will sometimes be considerable resistance." This eminent dentist mentions having in several instances obtained satisfactory results from turning the tooth only one-half the necessary distance, and leaving it a fortnight or three weeks, and then completing the operation. He says: "Although on the first occasion the resistance may have been very great, the tooth generally yields very readily to the second attempt. If, after the operation, there should be tenderness, or swelling over the socket, it is recommended that the gums be painted with tincture of iodine, and a leech applied."

The above remarks of Mr. Tomes are substantially supported by Dr. Beers, of Canada.

Teeth Turned by the Replantation Process.—The turning of a tooth by the process called "replantation," but which is only a slight modification of the "torsion" plan, and of another, but very old, operation called "transplantation," mentioned by Ambrose Paré (1579), has had its advocates. Transplantation was instituted in olden times as a means of substituting for a defective tooth a sound tooth taken from another living person. This practice for a time passed out of favor: first, because "vile diseases" were sometimes transmitted to the patient; second, because the sockets oftentimes became diseased (alveolar abscess). By replantation (extraction and returning) there is no danger of transmission of disease, but such operations are often followed, sooner or later, by abscess. When a tooth is taken from a healthy socket, and is immediately skilfully reset into its proper relation to the adjacent teeth, the tissues often act kindly, and the wound heals so rapidly that the process is thought by some operators to have advantages over the "torsion" plan (tooth not lifted from its socket).

The steps in the process of replantation are as follows: After the tooth has been carefully extracted and replaced, to see that it can be properly poised it is dropped into water at the temperature of from 98° to 100° Fahrenheit, then the socket is cleansed of all detached particles of socket-tissues and blood, and the pulp of the tooth removed, and the chamber plugged. This chamber is first cleansed with tepid water, dried, and moistened with some preserving drug, after which the foramen is solidly filled with gold foil, or, if the foramen is large, plugged with platinum or gold wire (rounded off smoothly at the apical end). The remaining part of the canal should be filled with phosphate of zinc or gutta-percha. When the tooth is ready to be returned to its socket, it is pushed firmly home, and then held there by a multiple cap, cemented into place with phosphate of zinc. The retainer should be worn until the tooth has become firm by physiological union of the socket-tissues with the cementum.

Implantation.—Correction by implantation is so similar to that by transplantation that it is hardly necessary to explain the process. The union of a foreign tooth in an artificial socket is not as lasting as desired, nor is the result by either operation as successful as that from replantation. The steps in the operation of implantation to correct deformity from a turned tooth are quite similar to those for other operations for implantation, where the teeth have been lost for a long time. For particulars see Part XIII., pp. 651–653.

LOWER INCISORS.

SECTION B....................DIVISION I.

CHAP. CXXXI. Turning Lower Incisors by Elastic Rubber.

CHAPTER CXXXI.

SECTION B................DIVISION I.

TURNING LOWER INCISORS BY ELASTIC RUBBER.

HOW TO MAKE SMALL RUBBER RINGS.—HOW TO MAKE SPACE.—A DOUBLE OPERATION BY AN ELASTIC-RUBBER RING IN COMBINATION WITH TWO FERULES.

MECHANISMS similar to those used for turning upper incisors are often practicable for turning lower incisors, but the lower incisors seldom require anything complicated. For turning these teeth elastic-rubber rings, if properly applied, are as practicable as anything, sometimes more so, because rubber can be made effective without being troublesome to the tongue.

Rings for this purpose vary in size from one-eighth to one-fourth of an inch in diameter. Those of the largest size can be found ready made in the market, and the smaller size may be cut from straw-size tubing; but the best rings for turning these small teeth are made from sheet-rubber. The centre hole is made by a common rubber dam-punch, the outer by a brass or steel tubing (of proper size), ground to an edge at one end, and made solid at the other end, to receive the blow of a mallet. A punch of this kind, with a gimlet-like handle, is more convenient to use. The rubber for this purpose should be new and tough, and from one-twentieth to one-sixteenth of an inch in thickness. This rubber can be found in stores where sheet-rubber goods, such as belting, etc., are kept for sale.

Lower incisors, as well as the upper, may be turned singly, or two may be turned at the same time. A single tooth is best turned by a lever-ferule acted upon by a rubber ring anchored to a distant tooth. Two teeth can generally be turned best by making one of the teeth serve as anchorage to the other.

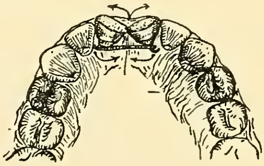


FIG. 1296.—Turning two lower incisor teeth at the same time by a rubber ring (A).

Fig. 1296 illustrates the beginning of an operation of this kind for turning two lower centrals, for a young woman about twenty years of age.

The mechanism used consisted of one rubber ring in combination with two gold ferules, each ferule having a small ring-like hook soldered upon the lingual side.

Between these hooks the rubber was stretched back and forth several times. The rubber was renewed once in three days, until the case was corrected.

When the teeth were corrected they were retained in place by the same ferules, soldered together, after the hooks were removed.

When lower incisors require to be turned, the irregularity is generally caused by overcrowding of the teeth. This was the cause in this case, but the crowding was so slight that the centrals turned easily, and remained stationary when corrected. Generally, however, the crowding is so great that if space is not given the teeth they will again become irregular. This extra room may be caused by widening the arch, or by extracting a first bicuspid on one or both sides of the arch; but I think that, as a rule, it is better practice to extract one of the incisors. These teeth being nearly of uniform size, the lost one is seldom missed. In fact, this plan, in the long run, has almost universally been found to be the most satisfactory, because it prevents recrowding of the incisors.

UPPER CUSPIDS.

SECTION C.................DIVISION I.

CHAP.	CXXXII.	Turning Upper Cuspids by Elastic Rubber.
"	CXXXIII.	" " " Spring-wire.
"	CXXXIV.	" " " Screw-acting Mechanisms.

CHAPTER CXXXII.

SECTION C.................DIVISION I.

TURNING UPPER CUSPIDS BY ELASTIC RUBBER.

TURNING CUSPIDS BY RUBBER RINGS.—TURNING A CUSPID AND LATERAL SIMULTANEOUSLY.—TURNING A CUSPID BY A LONG LEVER.—TURNING A CUSPID BY TWO LEVERS.—MODIFICATION OF THE SAME OPERATION.—TURNING A CUSPID BY SLIDING IT INTO A VACANT SOCKET.—TRACK MECHANISMS OPERATED BY RUBBER.—REMARKS UPON OPERATING BY OPPOSITELY ACTING DRAUGHTS FROM RUBBER.

CUSPID teeth are generally more difficult to turn than incisors. This is partly because it is more difficult to secure a firm hold upon them, and partly because of their longer roots and firmer socket-tissues; occasionally, however, it is because of flatness of the body of the roots, or the crookedness of their apical part.

We shall now consider the various plans of turning upper cuspids by instruments operated by rubber, and in later chapters those operated by springs and by screws. In these explanations the two mechanical principles used in turning cuspids by single and by double draught, sometimes called compensating-draught, will be considered. Of course the basal principle of turning cuspids is the same as that for turning other teeth—lever action.

For most cases the best engine of force for turning cuspids, like that for turning incisors, is probably elastic rubber, because it is less liable to crumble the cement under the ferule on the tooth to be turned than is spring-wire or the screw. There are stubborn cases (of cuspids), however, that will not yield so readily to rubber as to screws; but screws require the highest skill to use them.

The first and most important step in these cases is the securing of a very firm hold upon the crown of the tooth to be turned. At the present time this is best obtained by a ferule covering every available part of the crown. This is cemented upon the tooth by the best phosphate of zinc, applied while in a sticky condition.

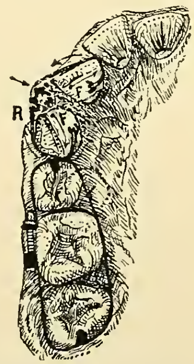


FIG. 1297.—Turning a cuspid and lateral by a rubber ring sprung over a block pier (A).

Fig. 1297 illustrates the part of a larger operation that required the turning of a cuspid and a lateral. The former condition and treatment of this case may be briefly given as follows: The right central, lateral, cuspid, and second bicuspid were irregular by being jumbled together. The two teeth that needed to be turned were corrected at the same time by an elastic-rubber ring stretched over a pier made of a block of wood, and anchored by hooks on ferules cemented upon the teeth to be turned. The first step in the operation was the extraction of the second bicuspid; the next was the drawing posteriorly the first bicuspid against the first molar (as shown in the figure), after which the cuspid was forced in the same direction by a wooden wedge, to make space in which to turn the lateral, which in its turn was also forced away from the central by another wedge. After all this was done the turning process above illustrated was commenced. To reiterate, a ferule, F, was first cemented upon the cuspid, and another, F, upon the lateral. Upon the labial side of these teeth there was placed a wooden block, upon which a very small, but strong, rubber ring, R, rested, after being first stretched and caught upon hooks soldered to the lingual sides of the ferules as shown. To increase the force to its proper degree the rubber was stretched three times from hook to hook.

The object of the block pier was to hold the middle part of the rubber strand sufficiently far above the teeth to cause a lifting force upon their more distant parts.

This lifting force was aided by a pressure oppositely acting by the block bearing upon the innermost parts of the teeth. The block was so formed that it spanned the space between the teeth and did not enter the space like a wedge. These teeth when corrected were held in place by two ferules soldered together.

Fig. 1298 illustrates the turning of a right upper cuspid by a rubber ring and a lever-ferule. This ring was first anchored upon a hook soldered to the lingual side of a clamp-band upon the second bicuspid and first molar (on the same side of the mouth); then it was stretched forward through an eye on the end of the lever, and back to the anchor-band, where it was caught again upon its hook.

The figure so clearly represents the form of the mechanism and its application that it is not necessary to dwell upon it further than to mention that in a large majority of such cases the lever need not be as long as this one.

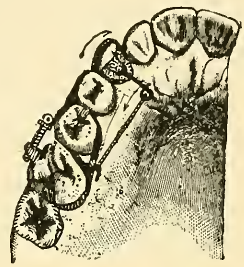


FIG. 1298.—Turning a cuspid by a rubber ring, a lever, and a clamp-band (A).

Fig. 1299 illustrates an operation for turning a stubborn right upper cuspid by means of rubber acting through four hooks as shown. This mechanism, which caused opposite and mutually aiding draughts upon the tooth, con-

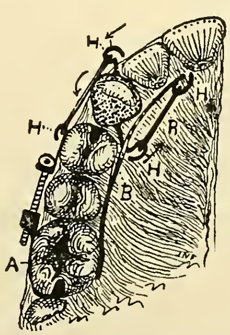


FIG. 1299.—Turning a cuspid by opposite draughts by rubber (A).

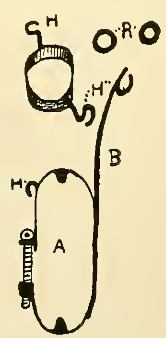


FIG. 1300.—A similar mechanism (A).

sisted of a two-arm ferule, two rubber rings, and an anchor clamp-band, having soldered to its buccal side a hook, H, and to the lingual side a piece of wire, B, of sufficient length to extend forward a short distance beyond the cuspid to be turned. The end of this wire was bent into the form of a hook, as was also the end of each arm of the cuspid-ferule. Figs. 1300 and 1301 represent similar mechanisms.

After the clamp-band had been bound upon the bicuspids and first molar, and the ferule cemented upon the cuspid, one of the rubber rings was caught upon the lingual hook H of the ferule, and stretched over the hook H on the end of the arm B, and then back to the former hook, upon which it was caught. On the labial side of the dental arch the other rubber ring was caught upon the hook H (soldered to the labial side of the cuspid-ferule), and then stretched posteriorly over the hook H on the buccal side of the clamp-band, then back to the former hook on the (labial) lever.

These two rings by acting evenly and oppositely upon the cuspid turned the tooth without moving it laterally. These forces also, by acting compensatingly upon the anchorage teeth, did not disturb them.

FIG. 1301.—Modification of the mechanism (A).

The levers on the ferule may have been longer than was necessary, but in this case they were used to easily overcome stubborn resistance to the tooth.

Two rubber rings were used in this case, but sometimes a single ring can be so stretched upon all the hooks that it will act exactly the same as two rings; this can be done where the rubber can pass over the teeth and not interfere with antagonism of the jaws.

Fig. 1302 illustrates an operation for turning a right upper cuspid in a direction reverse to that mentioned in the preceding case. The mechanism, though similar to the

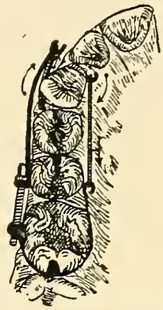


FIG. 1302.—Turning a stubborn right upper cuspid by opposite draughts by rubber (A).

one there illustrated, differed from it in that the long wire arm H was soldered to the buccal side of the clamp-band instead of the lingual. Upon the cuspid-ferule were soldered two short hooks, instead of two long hooks.

After the clamp-band had been applied to the second bicuspids and first molar, the ferule was applied and cemented upon the cuspid so that the hooks were located as shown; after this a small rubber ring was stretched from hook to hook on the labial side, and another upon the hooks on the lingual side. To cause sufficient force these rings were stretched back and forth until the tension was of the degree desired.[1]

Fig. 1303 illustrates an operation for the correction (by an elastic-rubber ring) of a slightly turned right upper cuspid in a jumbled arch. After extracting the first bicuspid

[1] The different parts of this mechanism are illustrated in principle in Fig. 297, Part VI., p. 341.

to make space and to make a path for the cuspid, the latter and the second bicuspid were drawn together by an elastic-rubber ring held upon them by two ferules, each having two hooks.

Upon the cuspid-ferule the hooks were soldered to the anterior part, and upon the other they were soldered to the posterior part. These enabled the rubber to be held within

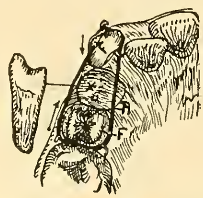


FIG. 1303.—Drawing a cuspid and a second bicuspid together by elastic rubber.

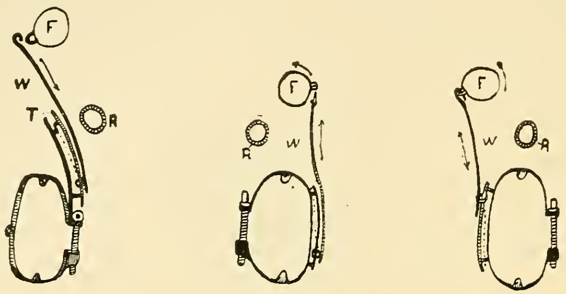
the interdental valleys. The turning lingually of the posterior part of the cuspid was caused by sliding upon the outer side of the vacant bicuspid socket.

The original position of the cuspid is not correctly shown in the figure. The posterior side was turned considerably farther outward. The arrow indicates the direction that the tooth turned while being corrected. The instanding lateral was subsequently drawn outward to line by a wire arm-ferule; the arms were rebent three times a week to keep up the force. (See Fig. 326, Part VII., p. 370.)

Figs. 1304, 1305, 1306, represent three modifications of track mechanisms for turning left upper cuspids by elastic-rubber rings. The two former are so constructed and applied to the teeth that the arms W lie along the buccal side of the arch, while the last one is so constructed and applied that the arm lies along the lingual side.

Each mechanism consists of a broad cuspid-ferule, F (shown edgewise), a rubber ring, R, and an anchor clamp-band having a sliding arm, W, combined as follows.

Each arm is connected loosely with its anchor-band. To the anchor clamp-band are soldered two wire posts. These posts are connected by a track made of a narrow strip of plate, on which slides (easily, yet snugly) a very small ferule



FIGS. 1304, 1305, 1306.—Track mechanisms operated by elastic rubber for turning cuspids (A).

of rectangular form. To this is soldered one end of the sliding arm W, which is operated by a rubber ring so attached to it and the track that it moves forward or backward as desired. The arm is prevented from turning over and out of its proper place by the rectangular ferule which fits the track. The dotted line represents the rubber, which may be anchored anteriorly or posteriorly upon the track.

When ready to apply the mechanism the ferule is first cemented upon the cuspid to be turned, and then the clamp-band is fastened to the posterior teeth on the same side of the arch. The free end of the arm W is formed hook-like if it is to draw upon the cuspid, and spear-like if it is to push upon it; either form when in use is caught into a ring on the ferule. The arm W is made to move forward by the rubber ring R being caught upon the rectangular track-ferule and the posterior end of the wire W, and then stretched and caught over the anterior end of the track. To reverse the action of the wire W the rubber attachments are reversed. To cause sufficient force this rubber is stretched more than once, from point to point. The arrows indicate the direction of movements of the different parts of each mechanism, and suggest the plan of attachment of the rubber. These little machines, when properly made, are as curious as they are effective.

CHAPTER CXXXIII.

TURNING UPPER CUSPIDS BY SPRING-METAL.

GENERAL REMARKS UPON ATTACHING SPRING-LEVERS TO TEETH. —OPERATION BY SUCH LEVERS, IN COMBINATION WITH A ROOF-PLATE.—CORRUGATED SPRING-HOOK MECHANISM FOR TURNING A CUSPID.—OPERATION BY TWO WIRE SPRINGS ANCHORED BY A CLAMP-BAND.

FOR more than a century efforts in a crude way have been made to turn teeth by elastic metal; but not until between 1865 and 1872 were operations performed upon a strictly philosophical basis. The advance made since that time, occasioned by the introduction of phosphate of zinc into dentistry, enabling the firm fixing of ferules upon teeth to be turned, has overcome the obstacles against the use of metallic springs, provided the exposed parts of the crowns have sufficient surface extent to enable the cement to give a firm grip. (Refer to Springs, in Index.)

Fig. 1307 illustrates the beginning of an operation by Dr. L. D. Shepard for turning by springs two upper cuspids. The mechanism consisted of a roof-plate and two gold caps, c, each having a wire lever, w, about the size of a pin and about half an inch in length. (See w, c, in the lower part of the figure.) In the anterior border of the roof-plate (which was of hard rubber) there was a groove, in which the ends of the levers were lodged when the teeth were being turned. In other words, the operation consisted in fitting the roof-plate within the dental arch, and then arranging and cementing the caps upon the cuspids so that

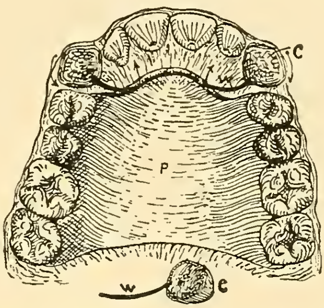


FIG. 1307.—Turning upper cuspids by levers and a roof-plate (Shepard).[1]

the levers pointed diagonally across the dental arch (in the direction of the opposite second bicuspids), after which they were sprung forward and caught into the groove in the plate.

When the force upon these levers became weakened by the turning of the cuspids the levers were rebent posteriorly (by the use of two pincers), so that when again sprung into the groove it caused a renewal of the wrenching force. This rebending of the levers was repeated as often as was necessary for the operation to properly progress, until the teeth were sufficiently turned.

The success of this plan greatly depends upon the degree of firmness of the plate, and that of the caps upon the teeth. If the plate be anchored to the side teeth by clamp-bands it would be much firmer than by the plan shown. In order that such lever-caps may be sufficiently firm they should be made to cover every available part of the crowns. For a

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[1] Drawn from the original.

thimble-cap or a simple broad ferule, platinum is superior to gold (even pure gold) because, being more pliable, it is more easily made to conform to the shape of the tooth; but it should be made sufficiently thick to prevent the lever from springing it loose.

Fig. 1308 represents a mechanism for turning a left upper cuspid by the pulling force of a wire spring. The mechanism consists of a broad cuspid-ferule, and an anchor clamp-

FIG. 1308.—A pulling-spring mechanism for turning a cuspid (A).

band. These are connected by a piece of stiff, corrugated wire. This is soldered to the anterior buccal part of the anchor. The wire arm, upon the end of which is a hook, projects as far forward as the cuspid to be turned, in order to catch into a ring soldered to the ferule cemented upon the cuspid.

When the ferule has been applied the clamp-band is secured upon the bicuspids and first molar; the spring

FIG. 1309.—A pushing-spring mechanism (A).

wire is then pulled forward until the hook is caught into the ring on the ferule. There it is left to do its work of turning the tooth. The drawing force is caused by the zigzag part of the wire arm. To keep up the force these curves are occasionally cramped smaller, by means of pincers.

Fig. 1309 represents a pushing-spring mechanism for turning a left upper cuspid. The spring-wire rests in a socket, W, connecting it by a staple to the ferule. This spring is anchored to the side teeth by a clamp-band similarly to the spring in the last-mentioned mechanism.

Fig. 1310 illustrates an operation for turning a left upper cuspid by two wire springs so arranged that they act oppositely upon the tooth. The entire mechanism consists of a clamp-band, B (having soldered to it the two pieces

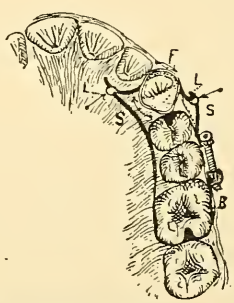

FIG. 1310.—Turning a cuspid by oppositely acting springs (A).

of spring-wire, S, S), and a broad platinum ferule, F, having soldered oppositely two platinum-wire levers, L, L. The free end of each lever is flattened, and bifurcated to hold the free extremities of the wire springs as shown.

These mutually acting springs are anchored to a clamp-band fastened upon the bicuspids and first molar. Before this is done, however, the ferule is so arranged upon the cuspid that these springs S, S will bear upon the ends of the levers L, L, in the direction desired.

This mechanism belongs to a class in which all the springs are anchored by clamp-bands. These mechanisms, by slight variations in form are practicable for turning in any direction either of the eight anterior teeth; indeed, the usefulness of the mechanisms by such variations is so various that they may be regarded as among the best for correcting stubborn teeth by elastic wire. The only point in which special care is necessary is to so adjust the power of the springs that the force will not be so great as to cause pain.[1]

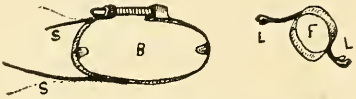

FIG. 1311.—Similar Mechanism (A).

Fig. 1311 represents a mechanism that is similar to the one represented by Fig. 1310.[2]

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1 Published in the "Brooklyn Medical Journal," July, 1888 (A).

2 For more extensive remarks upon the comparative value of springs, refer to Springs in Index.

CHAPTER CXXXIV.

TURNING UPPER CUSPIDS BY SCREWS.

GENERAL REMARKS.—OPERATIONS BY SCREWS IN COMBINATION WITH A ROOF-PLATE.—THE CONE-LEVER OPERATION.—OPERATION BY A LONG SCREW.—THE SCREW-JACK MECHANISM.—OPERATION BY AN IMPROVISED MECHANISM.—BY A TRANSPALATINE SCREW-JACK.—BY TWO TRANSPALATINE SCREW-JACKS.

THE use of screws for turning cuspids is not looked upon by many dentists with much favor at the present time. While there is some ground for this distrust, I think that there are some cases for which the screw might be used with great advantage in their treatment; indeed, I have had successes by it where I would not have so well succeeded without this agent.

Of several mechanisms devised for turning teeth, there is none more practicable for turning cuspids than that represented by Fig. 1257A, Chapter CXXVIII., which was devised for turning upper central incisors. In the operation where this mechanism was used the anchorage was the tooth adjacent to the one turned; but a mechanism, constructed upon the same principle, having the anchor placed upon a more distant tooth, is equally practicable, if the screw be made of sufficient length to extend from the tooth to be turned to the anchorage tooth or teeth.

The old-fashioned way of anchoring screws was to connect them with large plates; such anchors, however, are now generally regarded as greatly inferior to some form of gold or platinum band, which is less cumbersome to wear and less difficult to keep clean. Plates, however, have their uses, especially for cases where the anchorage teeth are few and scattering, or are not sufficiently firm individually to stand the necessary strain upon them.

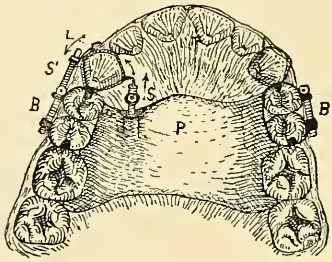

FIG. 1312.—Turning a cuspid by two screws in combination with a roof-plate.

Fig. 1312 illustrates the beginning of an operation for turning a stubborn right upper cuspid by intermittent force from screws. The mechanism (the metallic parts of which are represented by Fig. 1313) consists of a platinum ferule,

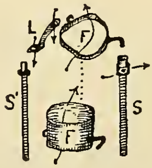

FIG. 1313.—Metallic parts of the mechanism (A).

F, having two gold-wire hooks, two screws, S, S′, and a hard-rubber roof-plate, P (having two anchor clamp-bands, B, B, to fasten it to the bicuspids).

First the plate was applied within the dental arch, and held there by the clamp-bands tightened upon the side teeth; and then the ferule was arranged and cemented upon the cuspid so that the lingual wire arm rested in the cup on the end of the lingual screw S, previously set into the anterior border of the plate. The next step was the placing of the screw S′ into the double nut on the buccal side of the right clamp-band in such a way that the lug L (made by soldering a smooth-bore nut at right angles to a short piece of thin gold ribbon) caught upon the labial hook of the ferule as shown.

The mechanism now being ready to be operated, this screw S′ was advanced into the double nut, until the ribbon was made taut upon the labial hook of the ferule. After this the other screw, S, was turned backward until the bottom of its cup bore gently against the end of the lever on the lingual side of the ferule; the cuspid was retightened upon every morning and evening. In doing this it was necessary to exercise caution in order to prevent loosening the ferule by crumbling the cement.

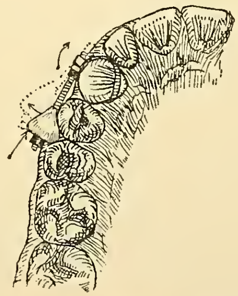

FIG. 1314.—Turning a cuspid by a cone-lever.[1]

Fig. 1314 illustrates a process of turning a right upper cuspid by a cone-nut and lever mechanism.

Fig. 1315 represents the mechanism, together with extra cone-nuts of different sizes. The mechanism consists of a

[1] Published in the "Dental Cosmos," May, 1885, p. 276.

clamp-ferule, B, screw, L, two loose nuts, N, N′, and a smooth-bore cone-nut, C. On one end of the band is a screw-cut nut, N″, and on its other end a smooth-bore nut. The nut N′ is a shifting support to the smooth-bore nut of the band. To tighten this band upon the cuspid to be turned the screw L is projected through the smooth-bore nut into the

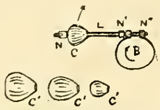

FIG. 1315.—The mechanism with a set of cone-nuts (A).

screw-cut nut N″ until the end of the screw is flush with the end of this nut; then the loose nut N′ is run up against the smooth-bore nut, forcing it toward the nut N″; thus by drawing the two band-nuts toward each other, the band (aided by cement) is made tight upon the cuspid.

When the band B (filled with cement) has been placed upon the tooth, the cone-nut is placed upon the screw, after which the nut N is applied and screwed against this cone-nut. If the lever is so placed that it will rest in contact with the bicuspids, and the cone lies with its largest diameter within the recess between the bicuspids, the nut N when turned against the cone will, by forcing it forward over the prominence of the first bicuspid, cause the lever (screw) to move outward from the bicuspid, thus lifting upon and turning the cuspid within the broad band.

To avoid frequent removal of the entire mechanism, to re-rest it for renewal of the force, is the object of the different sizes of cones. When the usefulness of one cone is spent it is replaced by a larger one. This mechanism was successful in every respect, but I used it only twice, because it had no advantages over some others that were simpler.

Fig. 1316 illustrates the turning of a left upper cuspid by the power of a screw. The mechanism consisted of a screw, S, a thin, broad platinum cuspid-ferule, F (having a ring upon its labial side), and an adjustable anchor, consisting of two ferules connected by two pieces of stiff plat-

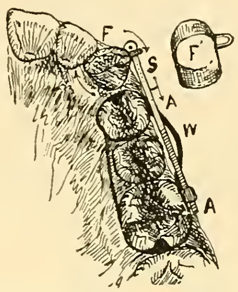

FIG. 1316.—Turning a cuspid by a long-screw and an adjustable anchor (A).

inum wire as shown. Upon one of these anchor-ferules was soldered a screw-cut nut. These anchor-bands were cemented upon the first bicuspid and first molar, leaving the second bicuspid within the wires. These bands, or ferules, were made of platinum, rolled very thin, so that

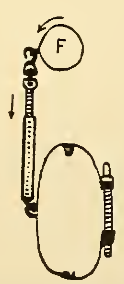

FIG. 1317.—Screw-jack mechanism for turning a cuspid (A).

they would not force the teeth to encroach upon the territory belonging to the cuspid. To operate the mechanism the screw S was projected through the ring on the cuspid-ferule, thence into the screw-cut nut on the rear ferule as shown. This excellent anchor is made adjustable by bending or curving the connecting wires more or less.

Fig. 1317 represents a mechanism which acts similarly to that represented by Fig. 1316. This consists of a clamp-band having attached to it a screw-jack that is connected by a swivel with a ferule, F, which, in use, is cemented upon the cuspid to be turned.

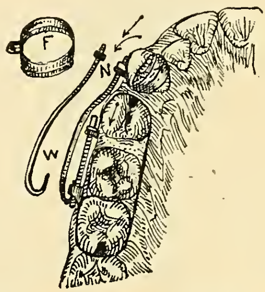

FIG. 1318.—Turning a cuspid by a long hook operated by a nut (A).

Fig. 1318 represents an operation for turning a right upper cuspid by a mechanism that became broken and was altered in repairing, before the operation was completed.

As the dental arch was already sufficiently large, and as there was not sufficient room for all the teeth, the second bicuspid was extracted, and the first bicuspid moved posteriorly one-half its diameter, to liberate the cramped remaining teeth. This movement of the bicuspid was made by a clamp-band anchored around the two anterior molars. At the close of this stage of the operation the cuspid was acted upon by additional parts. The entire mechanism consisted of a staple-ferule, F, a long screw, and a clamp-band.

When the operation began the ferule was cemented upon the cuspid with amalgam (the use of quick-setting phosphate of zinc as a cement in dentistry being then unknown to me), the ferule being first varnished with fir-balsam gum dissolved in chloroform, to prevent the amalgam injuring the gold. Through the staple of the ferule was then projected one extremity of the long screw which entered a double nut on the buccal side of the clamp-band. The tooth was acted upon by tightening this screw. For a time this worked well, but soon the threads in the (imperfect) nut became so worn that the screw failed to act. Not having time immediately to make a new nut, I discarded the screw and used the long hook w, which was improvised from a piece of wire that was screw-cut at one end. This hook was caught into the damaged nut, the other extremity being projected through the staple of the ferule, and confined there by a nut, N. The retightening of the nut twice a day turned the tooth. The prominence of the nut gave this sensitive patient some annoyance, but the operation was otherwise successful.[1]

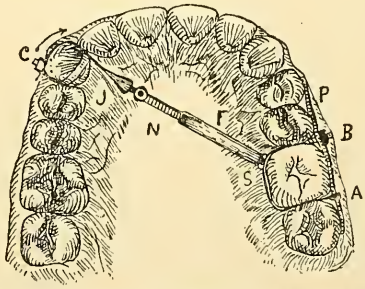

FIG. 1319.—Turning a stubborn cuspid by a swivel screw-jack (A).

Fig. 1319 illustrates an operation for turning and drawing to line an outstanding right upper cuspid for a woman twenty-five years of age, large in frame and of strong constitution. The alveolar process was hard, and the teeth remarkably firm in their sockets. While some cuspids can

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1 A modification of this mechanism for moving a cuspid posteriorly was published by the author five years later in the "Dental Cosmos," January, 1878, and February, 1879.

be moved by slight force, and effectually regulated by mechanisms as simple as a rubber ring, others require greater force, even to the full power of a screw-jack, strongly attached not only to the tooth to be turned, but firmly anchored to several teeth on the opposite side of the dental arch. This case belonged to the latter class.

A strong swivel screw-jack, N, made as represented in the figure, was applied diagonally across the arch, and anchored to a transverse-screw clamp-band, B, upon the first molar. One end of the loop S (around the molar) was held to the bar P by a little rectangular ferule, A, and the other end by a screw and nut as shown. The base of the jack was attached to this loop by a staple, while the other extremity of the jack was connected with the cuspid by a gold ribbon extending from the box-swivel J, and caught upon the nut C of a small clamp-band around this cuspid.[1]

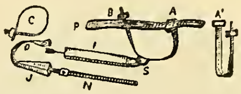

FIG. 1320.—Different parts of the mechanism (A).[2]

Fig. 1320 represents on a reduced scale the different parts of this mechanism. The barrel F of the screw-jack was rectangular in form, and made of thin plate. In one end of it was soldered a threaded nut, about one-eighth of an inch in thickness, for the jack-screw N. To the other end of the barrel was soldered a ring to attach it to a staple on the anchor-band.[3]

[1] This kind of anchor was published in the "Dental Cosmos," October, 1877, and June, 1878.

[2] The use of the band C in this operation took place before I knew of any quick-setting cement in dentistry. At the present time the simple broad ferule with phosphate-of-zinc cement furnishes a much stronger attachment.

[3] This transverse-screw variety of anchor-band I now seldom use; the longitudinal-screw variety, made as represented in dotted lines in Fig. 1323, being preferable.

When the mechanism had been applied the patient did most of the work of turning the tooth at her home. Still I saw her often, in order to be sure that the operation was progressing properly; but powerful as this mechanism was, its full strength was required, and even with that the cuspid did not move until the four anchor teeth had started from their normal positions. This drawback, however, was disregarded, and the application of its full force continued until the cuspid had been turned even beyond its proper position; this accomplished, the anchor teeth were given their liberty, when they soon returned to their former positions. The object of turning the cuspid beyond its proper position was to break somewhat its tendency to return. After all, however, the tooth showed a slight disposition to return to its outstanding place.

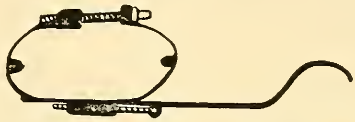

FIG. 1321.—Temporary retaining mechanism (A).

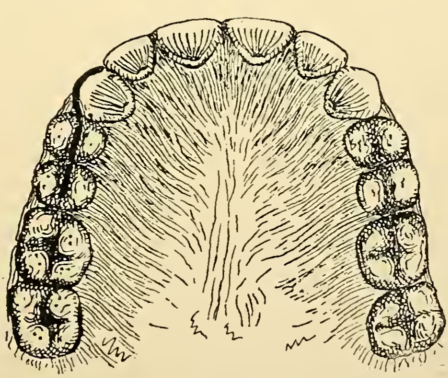

FIG. 1322.—Case with retaining-wire after completion of the operation.

This was temporarily prevented by an improvised mechanism (from the drawer), constructed as shown in Fig. 1321.

After several weeks this retainer was replaced by another, consisting of a wire so anchored into cavities in the bicuspids that it bore upon the labial side of the tooth as represented by Fig. 1322. This retainer was worn about two years without injury to the teeth and with no inconvenience to the patient. Although now six years since this wire was removed, the tooth remains in its proper position.

Fig. 1323 represents a box-swivel screw-jack similar to the one last described. The dotted lines represent an

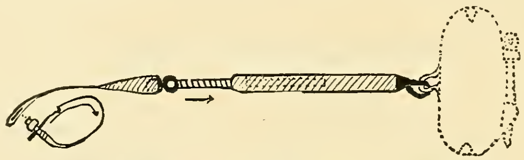

FIG. 1323.—Modification of the box-swivel screw-jack (A).

anchor clamp-band of the longitudinal-screw variety, which is superior to the transverse-screw variety.

Fig. 1324 illustrates the third stage of a large operation on the right side for a woman about twenty-one years of age. Before the first stage was begun the cuspid stood with its lingual side facing diagonally forward, the tooth nearly pointing through the gum over the lateral incisor.

The first step was extraction of the second bicuspid, and moving posteriorly the first bicuspid. To prevent the space between the first bicuspid and first molar from closing entirely, at the time the bicuspid was being moved a block was interposed between the teeth. This block c was attached to the clamp-band by means of a ring on one side and a flat hook upon the other.[1]

It would have been easier to have corrected the cuspid had it been allowed to remain until it had fully erupted; but as the patient could remain only a short time in the

[1] See Fig. 1040, p. 1082, another block-band operation.

city, the case required immediate treatment. The treatment of the cuspid was divided into two stages: first, drawing it posteriorly; second, turning it. The first stage was per-

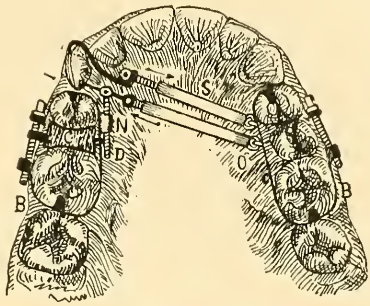

FIG. 1324.—Turning a partly erupted cuspid by two screw-jacks (third stage) (A).

formed by a hook caught into a pit made into the cuspid, and drawn upon by a screw connecting it with the buccal side of an anchor clamp-band, B, on the first bicuspid and molar. Later in the treatment the drawing-screw was transferred to a nut, N, on the lingual side of the same clamp-band.[1]

The second stage (turning), the one now to be considered, was accomplished by a somewhat cumbersome addition to the mechanism. This addition consisted of a spindle screw-jack, O, to push upon one side of the cuspid, and a swivel screw-jack, S, having a hook to draw upon the other side of the tooth. These jacks were anchored by staples to a longitudinal-screw clamp-band, fastened upon teeth of the opposite side of the dental arch. The construction of the screw-jacks is so clearly shown in the figure that it is not necessary further to explain them.

To lodge these jacks firmly upon the cuspid two small pits were drilled into the enamel, one in the labial surface,

[1] This stage is represented in Part XV., Chapter CVIII., pp. 1117, 1118.

near the anterior side of the tooth; the other in the lingual surface, near the posterior side. The clamp-band B, that had been used for drawing the cuspid posteriorly, was retained in use throughout the turning part of the operation. This was necessary in order to hold the bicuspid back, and also to aid in preventing the tongue from dislodging the end of the spindle of the pushing-jack O from the pit in the lingual side of the tooth; this spindle was steadied by being projected through the hole in the head of the screw D. After this jack was lodged, and the hook of the other jack, S, was caught into the pit in the labial side, they (jacks) were tightened upon the tooth, causing it to turn; at the same time they drew it into line.

During the process the draw-hook required several slight, peculiar changes in its form, in order to prevent it from bearing too hard against the lateral incisor. This interference (not easily explained) was occasioned by the changes in the position of the cuspid. By the time the cuspid had been turned sufficiently, its crown had become two-thirds exposed to view, by advance of its eruption.

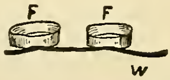

FIG. 1325.—The retaining mechanism.

Fig. 1325 represents the retaining mechanism used after the operation was completed. It consisted of two pure gold ferules, F, F, connected by a piece of platinum wire, W; these ferules were cemented upon the cuspid and bicuspid.

LOWER CUSPIDS.

SECTION C................DIVISION II.

CHAP. CXXXV. Turning Lower Cuspids by Elastic Rubber.
" CXXXVI. " " " " Screws.

CHAPTER CXXXV.

SECTION C. . . . . DIVISION II.

TURNING LOWER CUSPIDS BY ELASTIC RUBBER.

GENERAL REMARKS.—THE MECHANICAL PRINCIPLES USED IN TURNING UPPER CUSPIDS MAY BE APPLIED TO THE TURNING OF LOWER CUSPIDS.—OPERATION BY TWO ELASTIC-RUBBER RINGS IN COMBINATION WITH ANCHOR-FERULES.

ALTHOUGH the lower cuspids are often found to be turned out of their proper position, their correction is not often regarded to be as necessary as the turning of upper cuspids; indeed, the majority of such malposed cuspids in either jaw by many dentists are not thought to be necessary to be turned. I share this opinion in many cases, especially in those that can be made to look fairly well by the optical illusion treatment, *i. e.*, reshaping them by grinding. When, however, a sufficient change in the contour cannot be brought about by moderate grinding, the operation for turning the teeth by powerful mechanisms may become necessary.[1]

The best machines for turning lower cuspids are operated by rubber or by screws, in combination with some form of anchor-bands, upon teeth that are posterior to the teeth to be turned. Usually these are the molars, but sometimes they should be aided by the bicuspids. The best

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[1] For information upon grinding, see Part XII., p. 505.

principle of mechanical action to be used is the double-action. By this principle the force applied to the cuspid is twofold, while that upon the anchorage teeth is very slight, if any at all, because counterbalancing.

Fig. 1326 illustrates an operation for turning a right lower cuspid by one of the class of mechanisms acting by rubber. This simple mechanism, which is independently

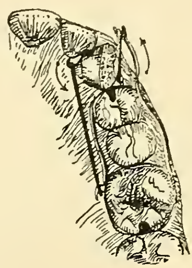

FIG. 1326.—Turning a lower cuspid by opposite forces from rubber (A).

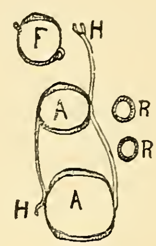

FIG. 1327.—The double-acting mechanism (A).

represented by Fig. 1327, consists of two elastic-rubber rings, R, R, a cuspid-ferule, F, having two hooks, and two anchor-ferules, A, A, connected by two stiff pieces of platinum wire as shown. These wires not only hold the ferules in their proper relation to each other, but also furnish hooks, H, H, for holding the rubber rings. All the metallic parts of the mechanism are platinum.

To apply the mechanism one of the anchor-ferules was cemented upon the first bicuspid and the other upon the first molar; the third ferule, F, was cemented upon the cuspid to be turned. When the cement had hardened the rubber rings were stretched from the hooks on this ferule to those on the anchor-wires as shown in Fig. 1326. To cause strong force the rubber rings were stretched several times from hook to hook. These rubbers not only aided each other in turning the cuspid, but they acted oppositely and compensatingly upon the anchorage teeth, and did not disturb them in any way. Had the force been single (in one direction), as would have been the case had only one rubber ring been used, the force upon the anchorage teeth would have been distinctly shown in the tendency of these teeth to move in that direction; *i. e.*, if the rubber had been applied upon the buccal side of the teeth the direction of the force would have been posteriorly, while had the rubber been applied to the lingual side the direction would have been anteriorly.

Rising of Anchorage Teeth.—While upon the subject of the effect of force upon anchorage teeth, it may be well to mention another point. I refer to the question, Why do anchorage teeth sometimes rise in their sockets? The answer is, because the dentist fails to apply the engine of force (that acts in only one direction) in the right place on the anchor. A rule may be stated thus: drawing forces should act *from* the anterior part of the band embracing anchorage teeth, while pushing forces should act *upon* the posterior part. In other words, drawing-engines should be attached to the anterior parts of anchor-bands, while pushing-engines should be attached to the posterior parts of the bands; moreover, the attachment of engines of force to the posterior parts of anchors should be made close to the gum margins of the bands, and attachments to the anterior parts of anchor-bands should be made on a straight line between the point of draught upon the tooth to be turned and the posterior gum margin of the band. Rising of teeth in their sockets, and consequent failure of operations, are often due to the lack of comprehension and application of this important mechanical principle.

CHAPTER CXXXVI.

TURNING LOWER CUSPIDS BY SCREWS.

OPERATION BY TWO SCREW-JACKS ACTING OPPOSITELY AT THE SAME TIME UPON A CUSPID.—ONE OBJECT OF ACTING COMPENSATINGLY IS NOT TO DISTURB THE ANCHORAGE TEETH.

THE conditions that are favorable for the best use of screws in turning single cuspids are not often found, nor is it often necessary to resort to screws for turning these teeth; still there have been cases that seemed impossible to correct without them. In the majority of cases elastic-rubber rings are not only effective, but easier to apply and less liable to crumble the cement between the ferule and the tooth to be turned.

Fig. 1328 illustrates an operation for turning a stubborn lower cuspid for a woman about twenty-five years of age. As the mechanism used is somewhat difficult to make, this operation is recommended only in cases where great power is necessary and the conditions are favorable for applying the mechanism. In this case the cuspid stood with its labial surface facing posteriorly. Besides the unusual hardness of the socket-tissues and evident crookedness of the root of the tooth, the line of antagonism in the middle of the sides of the arch was greatly curved downward, this part being so far below the level of the grinding surface of the cuspid and third molar as to render any drawing force liable to raise the anchorage teeth in their sockets. Therefore the question to settle in devising a mechanism was, how to contrive it so that it would turn the cuspid without raising the molars.

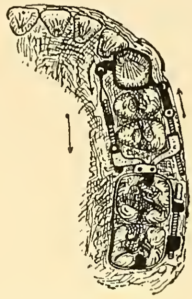

FIG. 1328.—Turning a lower cuspid by two screw-jacks acting compensatingly (A).

Fig. 1329, illustrating, side view, this case, not only shows this curve in the line of side teeth, but also shows an advantageous condition, and one that was taken advantage of to prevent this rising of the teeth. This favorable condition was a space in the arch, made by loss of the first molar

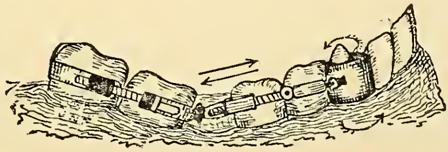

FIG. 1329.—Side view, showing the sag (enlarged).

(which occurred in early life), permitting of the application in the best place of opposing or compensating forces. It should not be inferred, however, that, had no space been found, no compensating forces could have been applied. (See Figs. 1339, 1340, p. 1399, Chapter CXXXVII.)

The mechanism used in this case consisted of a pushing-jack and a pulling-jack so combined with a clamp-band anchor (for the molars) that the posterior ends of the screw-jacks acted oppositely upon a single point upon the anterior end of the anchor-band. One jack was applied upon the buccal side of the dental arch, and the other upon the lingual side. The posterior ends of the jacks curved toward each other, and joined hinge-like in the space between the second and the first molar. This hinge consisted in riveting the shanks between two ears soldered to the anterior end of the anchor-band. The anterior ends of the

FIG. 1330.—The ferule and its attachment (A).

jacks were attached to the cuspid by two staples, one being soldered to the buccal side, and the other to the lingual. Into these staples were caught rings, one having upon it a socket, the other a nut, as shown in Fig. 1330.

After cementing the ferule upon the cuspid, and after the anchor-band, with its jacks riveted to it, had been fastened upon the molars, the lingual jack (pulling-jack) was attached to the lingual side of the ferule by running the end of the screw into the nut (threaded) attached to the lingual staple on the ferule. The jack (pushing-jack) upon the labial side was attached by running the spindle of the screw into the socket attached to the labial staple on the ferule.

The curved arms on the posterior ends of the jacks worked so easily upon the rivet between the ears of the clamp-band that the opposite forces upon the anchor-band acted gently from and against the common point, and therefore prevented either raising or sinking of the anchorage teeth. In other words, the lifting force by the draw-jack was offset by the depressing force of the pushing-jack.

The screw-jacks were carefully operated twice a day by a lever-key inserted into holes in the bulbs of the jack-screws. This care was necessary in order to avoid crumbling of the cement within the broad cuspid-ferule.

BICUSPIDS.

Section D......................Division I.

Chap. CXXXVII. Turning Bicuspids by Elastic Rubber.
" CXXXVIII. " " " Screw-acting Mechanisms.

CHAPTER CXXXVII.

SECTION D..................DIVISION I.

TURNING BICUSPIDS BY ELASTIC RUBBER.

BEST MECHANISMS ARE SKELETON IN FORM AND ARE OF GOLD AND ELASTIC RUBBER.—INSTRUMENTS FOR PLACING RUBBER RINGS.—HOW TO APPROXIMATELY ADJUST FORCE TO KEEP THE TISSUE-CHANGES WITHIN PHYSIOLOGICAL LIMITS.—OPERATION BY OPPOSITE DRAUGHTS UPON THE TOOTH TO BE TURNED.—OPERATION BY SINGLE DRAUGHT.

BICUSPIDS may be turned by mechanisms constructed upon plans similar to some of those that are used for turning cuspids. The best mechanisms for turning such teeth are not the large and clumsy kinds called plates, but the delicate and skeleton kinds. The best anchors are of gold, but cheaper materials, such as German silver or similar alloys, are practicable. As the mechanisms used for turning cuspids are equally practicable for turning bicuspids, little more need be said, upon those for the latter, than that which can be found in the preceding chapters, upon turning cuspids.

How to Adjust the Tension of Rubber Rings.—To apply a rubber ring easily it should not only have a steady anchor, but it should have its connections made philosophically, and the hooks so arranged that by a string or by some properly formed instrument the rubber can be easily stretched and caught upon them in any part of the mouth.

Of all instruments for placing rubber rings there are none in vogue that are superior to those represented by Fig. 1331. These may be made of new steel or brass, but equally useful ones can be made of old excavators. With

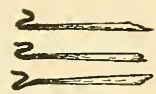

FIG. 1331.—Working extremities of instruments for placing rubber rings upon hooks on mechanisms (A).

two or three of these instruments the stretching and catching of rubber rings upon hooks, knobs, or screws in the most distant parts of the mouth is as easily accomplished as if in the nearest parts, and never require more than one minute, and generally not more than five seconds.

Sometimes the tension should be greater than can be obtained by stretching the ring directly from one hook to the other. To increase the tension of the rubber the hooks may be set farther apart, but in most cases it is better to stretch the same ring back and forth (from hook to hook)

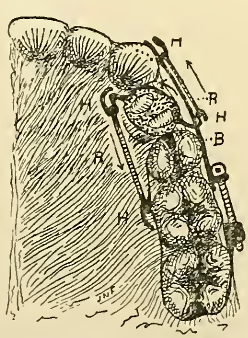

FIG. 1332.—Turning a bicuspid by oppositely acting forces by two rubber rings.

the number of times necessary for causing the desired degree of force. These rings may be so easily applied by the above-mentioned instruments that generally the patients can quickly renew them at their homes.

Fig. 1332 illustrates the beginning of an operation for turning a left upper first bicuspid by two elastic-rubber rings so caught upon the tooth that they aided each other, and at the same time so acted upon the anchor teeth that they were not disturbed. The metallic parts (Fig. 1333) consisted of a broad bicuspid-ferule having two lever-

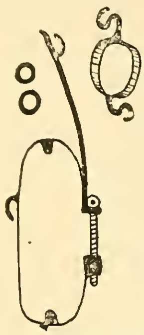

FIG. 1333.—The Mechanism (A).

FIG. 1334.—The metallic parts of a similar mechanism (A).

hooks, H, H (Fig. 1332) soldered oppositely, and an anchor clamp-band, B, having a buccal wire arm projecting forward from its anterior part. On the end of this arm (which lay along the labial side of the cuspid) there was a hook, and on the lingual side of the clamp-band another. Upon these four hooks the stretched rubber rings, R, R, were arranged and caught as shown in the figure.

This mechanism was not only easily operated, but the forces were so manageable that it was not difficult to conduct the operation so that the socket-tissue changes were approximately confined within physiological limits.[1]

Fig. 1334 represents the metallic parts of a similar mechanism.

Fig. 1335 illustrates an operation for turning a left upper

[1] This mechanism is the sàme in kind as the one represented by Figs. 291–296, pp. 335–340, in Part VI., for the turning of cuspids and bicuspids.

first bicuspid by a "package band" (rubber) anchored to a transpalatine screw-jack that was being used at the same time for widening the arch.

The turning part of the operation was as follows: the screw-jack and anchor-band being already arranged and fixed upon the side teeth as shown, a broad gold lever-ferule, F, was cemented upon the bicuspid, after which the

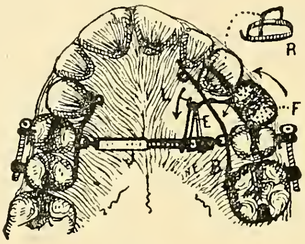

FIG. 1335.—Turning a bicuspid by a rubber "package band" anchored to a mechanism applied for widening the dental arch (A).

rubber E was first caught upon the lever L, soldered to the bicuspid-ferule, and thence stretched around the screw-jack J, and again over the lever-hook, and back around the jack to the same lever-hook, where it was caught and left there to do its work.

This rubber was renewed twice a week until the bicuspid had turned into its proper position. The lever-ferule was then removed and replaced by a double-arm ferule (not shown), the arms resting upon the lingual side of the adjacent teeth.

CHAPTER CXXXVIII.

TURNING UPPER BICUSPIDS BY SCREWS.—VARIOUS MECHANISMS ILLUSTRATED AND EXPLAINED.

TURNING A BICUSPID BY A GOLD RIBBON DRAWN UPON BY A SCREW PROJECTING THROUGH A BRIDGE.—OPERATION BY A SIMILAR MECHANISM.—TWO MUTUALLY ACTING SCREW-JACKS IN ONE MECHANISM.—A MODIFICATION OF THE SAME MECHANISM FOR TURNING A BICUSPID.—PROTOTYPES OF LATER MODERN MECHANISMS.

MECHANISMS for turning bicuspid teeth by screws, like those for similar operations upon other teeth, are not so easily made as mechanisms that act by elastic-rubber rings. Nevertheless screws are sometimes more effective, especially for patients who are more than thirty years of age, provided the teeth to be turned are so formed that a sufficiently firm grip upon them can be secured.

Fig. 1336 illustrates a process of turning a left upper instanding bicuspid by a bridge mechanism consisting of a strip of gold plate, U (Fig. 1337), a broad platinum bicuspid-ferule, F (having ears), and a gold ribbon, on one end of which was soldered a screw, S, having a nut. This ribbon was attached to the tooth to be turned by the ferule, the ribbon being soldered to the lingual side. The screw was connected with the bridge by being projected through a hole in its middle part. This bridge or anchor extended both ways from the tooth to be turned sufficiently to bear upon five teeth, to two of which the bridge was tied by platinum wire, w, w. The tooth was turned by tightening the nut upon the bridge.[1]

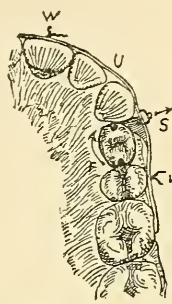

FIG. 1336.—Turning a left upper bicuspid by a bridge mechanism (A).

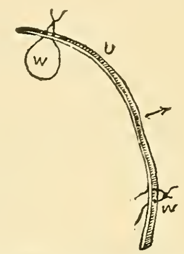

FIG. 1337.—The Bridge (old).

Fig. 1338 represents a bridge mechanism, improved from the one represented by Fig. 1336. The improvement lies in the anchoring the bridge-piece by a ferule instead of wires.

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[1] Fig. A represents one of my oldest mechanisms, published in the "Dental Cosmos," March, 1878. This one, however, is a modification of one of my still earlier mechanisms, also published in the same journal the same year. The

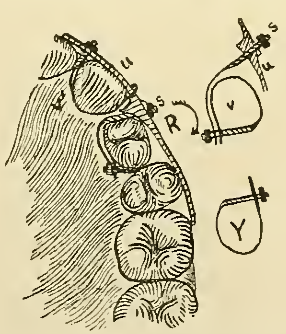

FIG. A.—A prototype bridge mechanism (A).

active parts of this mechanism are represented in detail at the right of the figure. The entire mechanism is seen in position for turning the left upper first bicuspid in the direction indicated by an arrow.

Fig. 1339 represents a mechanism that was applied diagonally across the upper dental arch for turning and drawing to line a stubborn outstanding right upper bicuspid. It consisted of a broad bicuspid-ferule, a push-jack, and a draw-jack anchored by a stiff, U-shape strip of plate, attached to one of my old-style transverse-screw clamp-bands formed as represented in the figure. The draw-jack

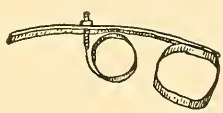

FIG. 1338.—An improved bridge mechanism (A).

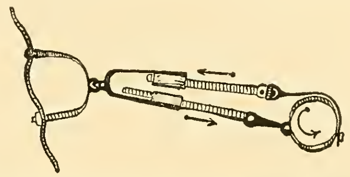

FIG. 1339.—A double transpalatine screw-jack mechanism for turning an upper bicuspid tooth (A).

was connected with the bicuspid-ferule by a thin gold ribbon caught upon a little knob on the labial side of the ferule. The push-jack was attached to the ferule by the spindle-screw resting in a staple soldered to the opposite side of the ferule. The force of the two jacks was applied very gently in order that the cement under the ferule might remain intact. As the two forces upon the anchorage acted opposite to each other, it was not disturbed.

This mechanism is complicated; therefore it cannot be recommended, except in cases where great power is neces-

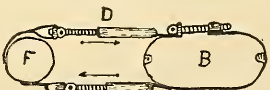

FIG. 1340.—Double-acting bicuspid turner (A).

sary; even then, the degree of the force being liable to exceed the firmness of the cement between the ferule and the tooth to be turned, there remains the question of expediency.

Fig. 1340 represents a similar mechanism for turning a right upper first bicuspid. This is also equally practicable for turning a cuspid in either jaw. It consists of a push screw-jack, P, a draw screw-jack, D, a broad bicuspid-ferule, F, and a molar clamp-band, B (for an anchor). As the effect of the jacks upon the anchorage is compensating, they do not disturb it. In use the mechanism is anchored to the same side of the dental arch in which the tooth to be turned is situated. It is operated by turning the jack-screws within the barrels of the screw-jack.

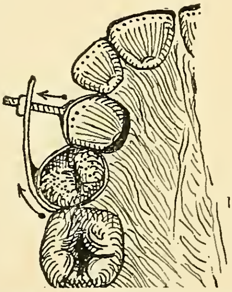

FIG. 1341.—Turning a bicuspid and correcting a cuspid (A).

Fig. 1341 illustrates the turning of a lone upper bicuspid by a lever-ferule acted upon by a screw. In this case (a young woman), the adjacent cuspid being instanding, I took advantage of the opportunity to perform the double operation of correcting both teeth simultaneously. The mechanism consisted simply of a lever-ferule for the bicuspid and a screw-ferule for the cuspid. These were arranged and cemented upon the teeth as shown. The screw projected through the lever and was tightened upon by a nut that bore upon its buccal side, thus acting mutually upon the cuspid and bicuspid. As this case has already been explained in Part XV., Chapter CIV., p. 1066 (upon moving of cuspids by screws), it is not necessary to further dwell upon it here.

PART XVII.

Minor Operations.

Elevation of Teeth in their Sockets, and Lowering of Teeth in their Sockets, by Various Mechanisms.

CLASSIFICATION OF OPERATIONS.

Section A....................Elevation of Upper Incisors.

Section B....................Elevation of Lower Incisors.

Section C....................Elevation of Upper Cuspids.

Section D....................Elevation of Bicuspids.

Section E....................Lowering of the Teeth.

UPPER INCISORS.

SECTION A....................DIVISION I.

CHAP. CXXXIX. Elevation of Upper Incisors singly by Elastic Rubber.

" CXL. " " " " Metallic Springs.

" CXLI. " " " collectively by Plate Mechanisms Acting by Screws.

" CXLII. " " " by Skeleton Mechanisms Operated by Screws.

" CXLIII. " " " simultaneously by Metallic Screws.

CHAPTER CXXXIX.

SECTION A . . . . DIVISION I.

ELEVATION OF UPPER INCISORS SINGLY BY ELASTIC RUBBER.

GENERAL REMARKS UPON ELEVATION VS. LOWERING OF TEETH. —GENERAL REMARKS UPON ARRESTED AND EXCESSIVE ERUPTION.—REMARKS UPON THE PHILOSOPHY OF APPLYING ELASTIC RUBBER.—VARIOUS MECHANISMS.—OPERATION OF ELEVATING AN INCISOR BY STRINGS.—BY STRINGS IN COMBINATION WITH RUBBER RINGS.—BY SHEET-RUBBER.—BY RUBBER RINGS AND FERULES.

THE operation denominated "elevation" (sometimes erroneously called "elongation") of the teeth is simply moving the teeth a short distance from the bottom of their sockets without destroying the dental pulp, or so loosening the teeth that they will not fall out. Of the teeth of the two jaws, the upper are oftener operated upon than the lower. These operations, like all operations for correction of irregularities of the teeth, may be properly or improperly performed, and the case for treatment may be judiciously or injudiciously selected. The safest plan of operation is by the use of the screw, because the movement of the teeth can be kept under control. As it is true, however, that teeth can (by experts) be safely elevated with strings, elastic rubber, or metallic springs, this work would not be complete were these classes of operations not considered; therefore the different kinds of operations will be explained. In so doing, not only will the various operations in vogue be treated, but also several that are entirely new.[1]

Conditions in which operations may be advisable are various. Some are where the teeth have failed to erupt sufficiently for their ends to be on line with the ends of adjacent teeth of the same jaw, and others are where teeth have not erupted sufficiently to antagonize with opposite teeth, conditions quite different from those found where a few teeth have erupted too far, and thus have prevented proper antagonism with the majority.

The failure of complete eruption of teeth may result from retarded or suspended development, or from mechanical interference. The teeth may be caught and held fast between the adjacent teeth, or they may fail to erupt sufficiently because the points of the cusps antagonize with the points of the cusps of opposite teeth, instead of interlocking with one another.

Any tooth in the mouth may be too short, but the upper laterals, cuspids, and the lower second bicuspids are oftener so than any other teeth. Those that are too long are generally the lower incisors and the posterior molars, but occasionally the upper bicuspids are so; these, however, are generally only apparently too long, occasioned by an excessive alveolar ridge or malformation of the jawbone. (See Fig. 598, p. 597, Part XII.)

There are two treatments for so correcting "tall" teeth that they will permit proper antagonism of the remaining teeth: one is denominated "depression" and the other

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[1] The mechanisms devised by the author are indicated by the letter A at the end of the inscription.

"shortening." One is the sinking of the teeth in their sockets; the other, grinding them shorter. As the grinding process has been considered at length in Part XII. and will be further dwelt upon in Part XIX. (upon correction of protruding teeth), it will not be enlarged upon here.

Although excessive eruption is the opposite of arrested eruption, both may have a similar cause—interference by the adjacent teeth; in one case the teeth are held back by the crowding of the adjacent teeth upon them, and in the other they are forced beyond by the crowns of the adjacent teeth getting under their prominent parts. Such teeth generally have small necks with crowns formed similarly to a pear.

Another cause of starting of teeth is wedging and regulating them, but this may not arise from improper management or faulty mechanisms. It is, however, well to be on guard. The correction of such teeth, as a rule, is accomplished by removing the cause; the effects of wedging are not immediate.

To elevate to the proper plane, by mechanical means, an arrested tooth that has become permanently fixed has been thought difficult, because often the form and shortness of its exposed part are not sufficient to hold the mechanisms. But since phosphate of zinc has become known to be an excellent cement for holding ferules upon teeth this opinion is not now entertained.

The most important point in operations for elevating teeth is ability to so control the movement of the teeth that the rate will not cause death of the pulp by too rapid stretching of the nutrient tracks at the ends of the root or roots. All mechanisms operated by elastic materials, such as rubber or metallic springs, should be closely watched by the operator, as well as by the patient, in order that the rate of movement be sufficiently slow. This point is so important, I will reiterate: in elevating teeth there is seldom any hard tissue to overcome, and none at all unless the root is crooked or bulb-like in form. Divergence of the roots, however, sometimes retards an operation. While malformed roots show considerable resistance, straight roots, when once started from their fastness in their sockets, move so easily that harm from springs is only avoided by great care.

To retain elevated upper teeth in their proper places their weight may be regarded as an aid, but with lower teeth their weight may be disadvantageous. However this may be, the fact remains that the tendency of elevated teeth to return to their former places unless held by extraneous things is so strong that their weight cannot be depended upon.

To contrive suitable mechanisms for elevating teeth in all cases may not be easy, but in the majority of them it is not difficult. Of the various mechanisms that have been devised, some are simple and others complicated, some operate by continuous force and others by intermittent. The chief cause of failure complained of by some persons who have attempted this class of cases is the same as that in other classes, a dislike of the trouble that is necessary for constructing the best mechanisms. Instead of regarding it as a duty to the patient, it is looked upon not only as too difficult, but too expensive, forgetting that the better the machine the less the trouble and the less time it requires to operate it.

In treating the subject of elevation of teeth, we shall begin with operations by the use of strings and elastic rubber, and then proceed to the use of metallic springs, and finally to that of screws. Some of the plans, especially those that require elastic rubber or metallic springs, are not to be recommended so highly as others; but they will be presented if for no other purpose than for education, through comparison with others that operate by screws, illustrated and explained in Chapters CXLII. and CXLV.

Fig. 1342 illustrates an operation by Dr. A. N. Chapman for drawing down an arrested left lateral by a mechanism

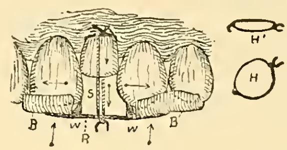

FIG. 1342.—Elevating a delinquent upper lateral by a string and bridge (Chapman).

that he devised in 1879. The mechanism (several modifications of which have since been devised and put forth and claimed by other persons) consisted of the following parts: a string, S, platinum wire, H, two saddles, B, B, and a bridge-wire, R, connecting the saddles. The two saddles were made of platinum plate bent so as to fit over the ends of the teeth adjacent to the one to be elevated. These were connected by a wire, which had a hook in the middle.

The platinum wire H was first drawn tightly around the neck of the lateral, and the extremities twisted together to constitute a lug upon the labial side of the tooth (see H, H′, at the right of the figure), and then, having placed the bridge upon the ends of the adjacent teeth, the arrested lateral was moved down by the string S being caught upon the wire lug and the hook under it, and then drawn gently taut and tied. The string was retightened slightly once in one or two days. When the tooth had been elevated sufficiently, the same mechanism was used to retain the tooth in its new position until it became fairly firm in the socket.[1]

Figs. 1343 and 1344 represent the case of a girl twelve years of age, who came under my care in the spring of

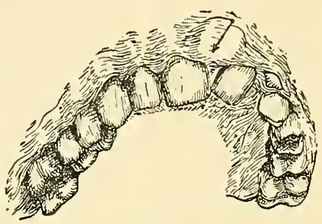

FIG. 1343.—Anterior view of the case before the operation.

1864. At six years of age the deciduous upper centrals were extracted, at the same time, by one of the believers in "extraction by pairs." The father said that after this act

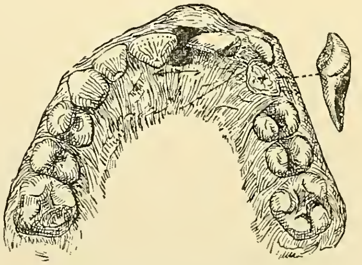

FIG. 1344.—First step in the first stage of the operation.

all the incisors excepting one soon made their appearance; the delinquent was the left central. Six years later, and soon after the patient called upon me, this delinquent tooth

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[1] The plan of retaining such a tooth in place by cementing it into a multiple ferule made to embrace also the two adjacent teeth, substantially explained in Part VII., pp. 365, 390–392, is also practicable. Such a mechanism, however, is inferior to a smaller one resembling an arm-ferule, the arms being bent like hooks. (See Fig. 1364.)

showed signs of approaching eruption by fulness of the gum over the place of the left central. The form of this prominence indicated that the tooth was poised diagonally to its proper position. An examination made through the gum by a needle-probe proved this diagnosis to be correct.[1] (See arrow in Fig. 1343.)

Some of the other teeth had drifted from their proper places; the left lateral had fully developed and stood inclined so far to the right that its medial corner was in contact with the right central, and the left deciduous cuspid was pressing against this lateral. The two laterals and the right central were also inclined posteriorly, like the teeth of a fish.

The first step in the treatment, which was by an old and well-known plan, was to make way for the new (adult) cuspid by extracting the left deciduous cuspid; the next step was to move the adult inclined lateral to the left to make room for the delinquent central. This movement was partly accomplished by forcing a small block of elastic rubber between this lateral and the right central. (See Fig. 1344.)

To move these instanding teeth (left lateral and right central) anteriorly so that they would be upon the esthetic line, and also to aid in keeping the block of rubber between the central and lateral, a strip of plate having a row of holes was placed along the outside of the dental arch and anchored with strings to the bicuspids. This served as an anchorage for rubber rings that were attached to the teeth to be moved. One rubber ring drew upon the left lateral and one upon the right central and lateral, but the latter

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[1] Without intending to advocate the theory of "extraction by pairs," it is probable that had this deciduous tooth been retained the question might have arisen, "Was this irregularity caused by the presence of the deciduous tooth?"

ring was not applied until after the left lateral had first been moved nearly to its proper place.

After this lateral had been moved out of the way of the delinquent central, which was then wholly above the long strip of plate, a small part of the alveolar process below it (the strip) and to the right of the unerupted tooth was dissected away to make a place for tying to it (the unerupted tooth) another rubber ring. The space between the lateral and right central now being sufficiently wide to accommodate the delinquent tooth, it was easily drawn to

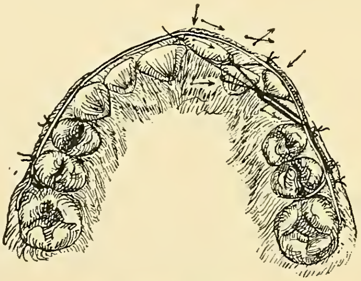

FIG. 1345.—Middle part of the second stage.

the left by this rubber, which was tied to the tooth by a linen thread. Fig. 1345 illustrates the case at this time, with the rubber and thread applied.

When the central had been swayed to the left and had moved down sufficiently to be behind the long strip of plate, the latter was taken off and the tooth pulled farther down by a rubber ring stretched, by a string, over the lateral and caught upon the first molar. (See Fig. 1346.)

After the central had been drawn nearly to its proper place the rubber rings were taken off the teeth, and the strip of plate again applied to retain all the teeth in their proper places. Fig. 1347 illustrates the case at this time. The teeth having been held for several days by this splint, it (the splint) was removed and replaced by an ordinary hard-rubber finger-plate and worn for several months.[1]

Owing to the eruption of the delinquent central upon a higher plane than that of its mate, the upper part of the

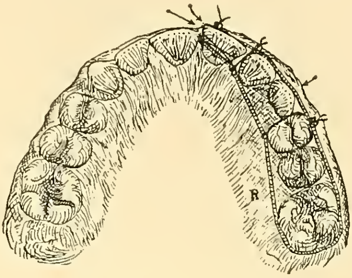

FIG. 1346.—Last part of the second stage.

crown continued to remain exposed higher than the corresponding part of the right central.

After the case was completed the patient moved out of town and I did not again see her for nearly twenty years. At that time the position of the tooth was found to have remained as it was left in her girlhood. The upper part

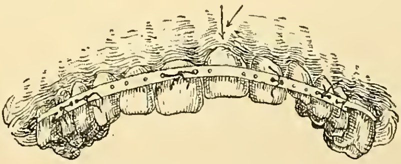

FIG. 1347.—The teeth temporarily retained by the reapplication of the strip of plate.

of the crown of the left central was also still exposed higher than that part of its mate, thus causing a slight disfigurement all these years. The patient returning, I bal-

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[1] The full period of time used for this case was about eight weeks, or probably twice as long as I would now need.

anced the upper margins of the centrals by cutting away a small piece of the gum over the right central, but this was not done sufficiently to expose the root of the tooth.

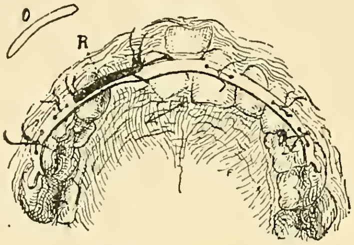

FIG. 1347A.—A similar case.

Fig. 1347A represents a similar case. The left central was fully erupted, and the right central partly; the right upper lateral having drifted upon the territory of the unerupted central, and the right cuspid being overdue, a similar treatment was successful. The first step was the separation of the right lateral from the left central. Afterward the extremities of a long-band (or strip) were tied to the deciduous molars and the right central. To the part of the long-band over the first molar was tied, first, an elastic-rubber ring, and then by another string the ring fastened to the malposed right lateral. This rubber moved the tooth within a week to its proper place. The left deciduous cuspid, considerably worn, was extracted to make room for its successor.

To hold all the teeth in their proper positions, a roof-plate having two short gold fingers was applied. The main object of these fingers was to keep open the space under the central, to permit it to grow farther down.

The mechanisms used in these operations, although regarded in those days as orthodox, would hardly be so regarded now. In it, however, there were some of the best mechanical principles, the long-band and the rubber ring. Had the long-strip been a wire with hook-rings soldered to it and clamp-bands to anchor the wire to the side teeth, the mechanism would have been fully up to date.

In 1864 Dr. George T. Barker explained before his class in the Pennsylvania College of Dental Surgery one of the cheapest and simplest (though not the best) plans of elevating teeth. The operation (Fig. 1348) consisted in

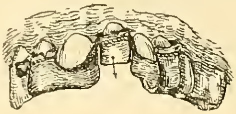

FIG. 1348.—Elevating teeth (Barker).

stretching thin sheet-rubber over the tooth to be elevated, tying it tight around the neck of the tooth, and then drawing the remaining part of the rubber over the ends of the adjacent teeth and tying it to the necks of other teeth. To tie rubber to the necks of these teeth, however, is not without its drawbacks, for there is not only the danger of elevating the delinquent tooth too rapidly and too far, but also the anchorage teeth; therefore this plan is not at the present

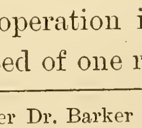

FIG. 1349.—Elevating a central (Winder).

time held in favor.[1] Several years later Professor R. B. Winder suggested an operation illustrated by Fig. 1349. The mechanism consisted of one rubber ring, R, and three

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[1] Twenty years or more after Dr. Barker explained this plan (he did not claim it as original) the same operation in principle was brought forward as new by Dr. Herbst.

thin platinum ferules, F, each having a hook soldered to it as represented edgewise in B, the form of one of the anchor-ferules. One of these ferules was cemented upon the tooth to be elevated and one on each adjacent tooth (without cement). The rubber ring was stretched over these hooks on the ferules as shown.

By either of the plans illustrated by Figs. 1348 and 1349 the tendency of the draught of the rubber to move the two outside teeth toward the one to be elevated is a drawback. Any force that would draw the adjacent teeth toward the delinquent tooth would tend to cramp it and thus interfere with liberty of its action.

A better mechanism consists of one rubber ring and three ferules, the middle one having a long platinum wire soldered transversely across its labial side, close to the upper border. Each end of this wire is bent into the form of a hook, and upon each of the outer ferules there is soldered a small hook.

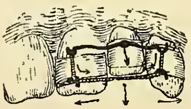

FIG. 1350.—Plan of elevating a lateral by one rubber ring (A).

Fig. 1350 illustrates this mechanism. The rubber is first caught upon one of the hooks of the wire, thence it is stretched through the hook of the ferule on the nearest tooth adjacent to the one to be elevated, thence through the hook of the ferule on the opposite adjacent tooth, and caught upon the hook on the other end of the long-wire.

Fig. 1351 shows the form of this wire and its relation to the middle ferule.[1]

[1] For details concerning the making of ordinary ferules, see Part VIII., pp. 427–429.

If the teeth adjacent to the one to be elevated already crowd upon the middle tooth, this mechanism with a wire no longer than here represented would not be at all practicable, because the pressure upon the "short tooth"

FIG. 1351.—The middle ferule with arms (A).

would be increased by the draught of the rubber. But if the wire should be made longer, so that the hooks would be farther apart, the draught could not draw the adjacent teeth against the short tooth, but, on the contrary, would tend to liberate it by moving the adjacent teeth away from it.

FIG. 1352.—Showing the effect of rubber acting from a properly proportioned wire.

Fig. 1352, representing a mechanism with the rubber shown in black alongside the wire, so clearly shows the philosophy of this act, it needs no further explanation. The original position of the outer ferules is represented by dotted lines, and the direction of the force upon the ferule is indicated by arrows.

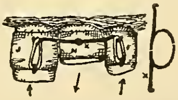

FIG. 1353.—Two rubber rings no advantage over one.

It may be thought that two rubber rings would be as practicable as one ring. This might be true in some cases if the rings were very small; but rings cut from the smallest tube found in the market would be so large that they would appear as represented in Fig. 1353. Even if rings could be made sufficiently small, they would not have any advantage over a single ring of larger size applied as shown in Fig. 1350.

Fig. 1354 illustrates an applied mechanism for drawing down a left upper lateral. This modification of the Chapman mechanism is operated by a small rubber ring punched from thick sheet-rubber by home-made punches.

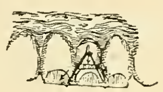

FIG. 1354.—Elevating a lateral by a modification of the Chapman mechanism.

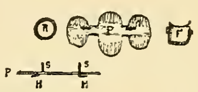

FIG. 1355.—The different parts of the mechanism (A).

Fig. 1355 represents the different parts of the machine. This modification differs from that of Dr. Chapman in that the bridge-piece is cut (as shown in P) from one piece of gold plate, and strengthened in its narrowest parts by solder. This saddle, which has two wire hooks, S, S, is completed by bending the six ears over the ends of the teeth, thus forming three troughs. To aid in attachment of the rubber ring R upon the middle tooth is the object of a thin ferule, F, with one hook on the labial side and one on the lingual.

When the lateral had been drawn down so that it was in contact with the middle saddle, this mechanism automatically ceased to act further upon the tooth. To prevent the triple saddle from sliding sidewise, and also to aid in forcing the central and the cuspid farther apart (to liberate the crowded delinquent lateral), there was soldered at right angles to the upright ears the same kind of wire (flattened) that formed the hooks. By the bearing of these ears against the approximal surfaces of the adjacent teeth, when the bridge-piece was drawn upon by the rubber, they were forced farther apart.

Where the neck of the delinquent tooth is sufficiently small for platinum wire to be bound tightly around it and not crowd against the adjacent teeth, it (wire) is better than ferules, because it interferes less with the progress of the operation.

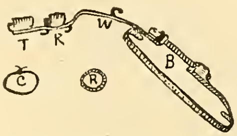

FIG. 1356.—Mechanism for elevating a front upper tooth by an elastic-rubber ring (A).

Fig. 1356 represents a mechanism devised for drawing down an arrested left upper lateral. This consists of a platinum-wire collar, C, rubber ring, R, and a clamp-band, B, having soldered to its anterior part a wire arm, W, upon which are troughs and hooks. This arm extends forward beyond the tooth to be elevated, and rests by a saddle, T, upon the next tooth.

To apply the mechanism, the platinum wire C is first bound around the neck of the lateral to be elevated; then the clamp-band is applied and tightened around the first and second molars (of the left side of the arch), leaving the wire arm to project along the labial surfaces of the teeth to the cuspid, where it curves inward and behind the arch, thence along under the delinquent lateral to the left central, upon the edge of which the saddle T rests. Upon the knot of the wire collar C on the delinquent tooth is now caught the rubber ring, which is then drawn over the anterior hook and caught upon the hook nearest to the clamp-band.[1]

[1] Instead of a screw clamp-band, a ferule-anchor, cemented upon the anchorage teeth is sometimes superior, because less clumsy.

CHAPTER CXL.

ELEVATION OF UPPER INCISORS SINGLY BY METALLIC SPRINGS.

GENERAL REMARKS UPON SPRING MECHANISMS.—SKELETON-SPRING MECHANISMS.—TROUGH-SPRING.—ALL-WIRE ELEVATORS.—PLAIN AND COILED-WIRE SPRINGS IN COMBINATION WITH CLAMP-BANDS.—HAIR-PIN SPRING MECHANISMS.—ILLUSTRATION OF VARIOUS OPERATIONS BY THE DIFFERENT KINDS OF MACHINES.

IN careful hands metallic springs may be successfully used for elevating teeth that are not too tightly bound between adjacent teeth; but, like elastic rubber, such springs should be seen often by the operator in order to prevent them (springs) from moving the teeth too rapidly.

The metallic spring is now generally attached to a small base anchored to teeth adjacent to the one to be elevated. The old style of base was a large box-plate or a plain plate tied to the teeth by strings or fixed by clasps; but now such bases are seldom used. The small bases, such as delicate troughs, ferules, caps, and clamp-bands, are better anchors. The springs are attached to the tooth or teeth to be elevated by means of hooks, wires, or staples, and are held in place by the ferules or caps.

Fig. 1357 illustrates an operation for elevating a central by a mechanism consisting of a gold-wire spring, one end of which was soldered to a trough (made of gold plate) of sufficient length to rest upon the ends of the neighboring teeth.

The spring of this somewhat cumbersome mechanism was connected with the tooth to be elevated by a hook on a ferule cemented upon the delinquent tooth. The trough,

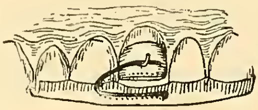

FIG. 1357.—Drawing a lateral down by a single spring soldered to a trough (A).

having phosphate-of-zinc cement in one extremity, rested against the ends of these teeth. The wire sprung upward and was caught upon the hook on the ferule.

The object of having cement in one extremity of the trough is to aid in holding the trough steady upon and preventing it from tilting on the teeth. The other extremity is left free of cement to permit lateral movement of the remaining teeth, should more room be necessary for the delinquent tooth to move down. In cases where the arrested tooth is not tightly crowded upon by the adjacent teeth, the ends of the trough may be made cup-like to better retain the cement. Besides serving as an anchor, the trough guides the short lateral into its proper place, and when there, prevents the tooth from moving any farther. This trough interferes with antagonism.

This is a practicable mechanism in skilful hands, but in careless hands it is unsafe. To avoid too strong draught upon the delinquent tooth, the tension of the spring should not only be very delicate, but it should be examined often. In view of other and better mechanisms (illustrated in this work), I cannot recommend this one for general use.

If a piece of platinum wire the size of a pin be previously soldered to the lingual or to the labial surface of the ferule, it may serve as a retainer by bending the ends of it into the form of hooks, and catching them over the adjacent teeth. This wire may not be used in regulating.

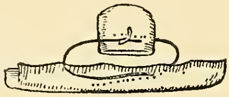

FIG. 1358.—A similar mechanism having two springs (A).

Fig. 1358 represents a mechanism that is similar to the one last described, but it has two wire springs instead of one. In use the second spring is caught upon a hook (not shown) soldered to the lingual side of the ferule. The object of two springs is to balance the draught upon the arrested tooth. To prevent the trough from sliding along the anchorage teeth, it has two thin upright partitions, (not shown) which project upward between the teeth.

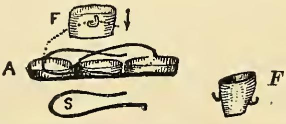

FIG. 1359.—The cup-trough spring mechanism (A).

In Fig. 1359, A represents a cup modification of the mechanism illustrated by Fig. 1358. Instead of a trough for anchor, there are three gold cups, arranged upon and soldered to a nearly straight piece of wire about the size of a small pin. In the same figure F, F represent two views of a ferule to be cemented upon the delinquent tooth. Upon the hooks of this ferule the two springs S are caught; these springs are attached by solder to the anchor. The office of the middle cup is to catch the delinquent tooth when it has moved down sufficiently, and thus prevent it from moving any farther. When the mechanism is applied the outside cups may or may not be cemented upon the teeth adjacent to the one to be elevated.

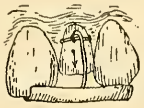

FIG. 1360.—Elevating a lateral incisor by a modification of the trough mechanism (A).

Fig. 1360 represents the case of an arrested left upper lateral incisor being operated upon by a wire hook-like spring anchored by a trough bridge-piece that rests upon the ends of teeth adjacent to the one to be elevated. Having first fixed a platinum-wire collar around the neck of the tooth to be elevated (by twisting the extremities of the wire together), the trough, to which one end of the hook-spring is soldered, is firmly held against the ends of the cuspid and central by one hand, while the hook is caught upon the wire collar by the other hand, after which it is left there to do its work; the spring draws upon the tooth and moves it until it (the tooth) reaches the bottom of the trough, which arrests it in its progress and holds it stationary. In order that the tooth may not move too rapidly, this spring is made very weak in tension.

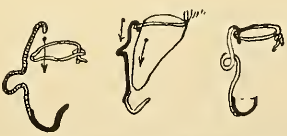

FIG. 1361.—Side view of three forms of hook-spring mechanisms for elevating teeth (A).

Fig. 1361 represents side views of three forms of the wire-hook spring; all are similar in form, each consisting of a delicate gold wire, a piece of platinum wire, and a gold trough. These wire springs differ from those previously described, in having a small curve in the middle part. Although the life of such a spring is longer, I cannot advocate it as having advantages over a plainer form, for, as a rule, the simpler the spring the safer it is.

To apply one of these mechanisms, the platinum wire is twisted around the neck of the short tooth, after which the trough is placed upon the ends of the teeth adjacent to it, and the hook of the spring lifted and caught upon the collar-wire, and left there to do its work. In order that the delinquent tooth may not move too rapidly, the power of this spring also must be weak. These mechanisms may properly be regarded as superior to those previously illustrated in this chapter, because less clumsy; all, however, interfere with antagonism.

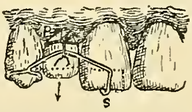

FIG. 1362.—Elevating a right lateral by a wire mechanism.

Fig. 1362 illustrates a plan of elevating a right upper lateral by an all-wire mechanism. It is made of a piece of steel wire, S, and a piece of platinum wire, B.

One extremity of this steel wire is bent so as to form a ring to ride upon the cusp of the cuspid, while the other

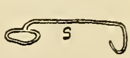

FIG. 1363.—The spring of the all-wire mechanism (A).

extremity is bent like a hook to catch over the end of the central (Fig. 1363). The ring and hook serve as anchors to the middle part of the wire constituting the spring.

To apply it the middle of this spring is sprung upward and tied to the knot on the wire collar encircling the tooth. As soon as the latter is drawn down sufficiently far the spring loosens and falls off, leaving the tooth free to return to its former place; therefore it is necessary to hold the tooth stationary by some kind of retainer, when corrected. This mechanism is not very firm.

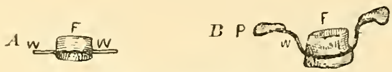

FIG. 1364.—The Retainer (A).

In Fig. 1364, *A* is intended to represent this retainer. It consisted of a gold arm-ferule, F, W. The extremities of the wire (which were longer than here represented) were flattened and bent like a hook to catch upon the ends of the two adjacent teeth. *B* represents the form in use.

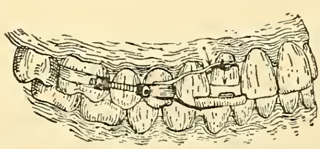

FIG. 1365.—Elevating a right upper lateral by a wire spring in combination with a clamp-band anchor (A).

Fig. 1365 illustrates the beginning of an operation for drawing down an arrested right upper lateral by a wire spring anchored to the side teeth by a clamp-band. The machine consisted of a clamp-band, a piece of platinum wire, and two pieces of gold wire, combined as follows: from the anterior part of the anchor-band there projected the two gold wires, one above the other, the upper one acting as a spring, the lower one as a support; upon the end of the lower arm was soldered a saddle, made of gold plate, to rest upon the cuspid and central; these, together with a small piece of platinum wire, constituted the machine. Before applying the larger parts, the platinum wire was twisted around the neck of the short lateral, and knotted by twisting its extremities together; this twisted part was then formed like a short hook projecting from the labial side of the tooth. The clamp-band (anchor to the spring) was then fixed upon the right upper bicuspids and first molar, the lower and longer arm with its saddle being left to rest upon the central and cuspid as shown.

The short arrested lateral was moved downward by force from the upper wire, which was caught upon the hook made by the twisted ends of the platinum wire. The object of the lower wire was to support the upper wire and also to prevent the latter from acting like a lever upon the bicuspids within the anchor-band, which otherwise would have tended to force these teeth (bicuspids) into their sockets. The object of the saddle on the lower wire was not only to hold the wire upon the ends of the cuspid and central, but to catch the moving lateral and arrest it when descended sufficiently to be on line.

This mechanism is simple and practicable, provided the spring is not too powerful; if the force be too powerful it will move the tooth downward too rapidly. In view of improvements represented by the next figure, and others

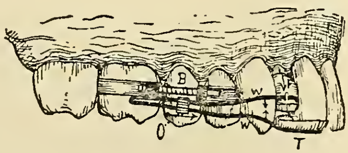

FIG. 1366.—Elevating an arrested lateral by a hair-pin spring and a sliding ferule (A).

in the following chapter, this mechanism may be regarded more as a primary lesson upon the construction of the best class of elevators than as advocating wire springs.

Fig. 1366 illustrates the beginning of an operation for elevating a right upper lateral by a wire spring, the force being gauged by a sliding-ferule. This improvement upon the mechanism last described is slightly more complicated, but its management is easy and its operation safer. The details of its construction and operation are as follows:

The anchor to the spring W, the form of which is that of a hair-pin, is a clamp-band, B. Upon the lower surface of the posterior nut of this band is soldered the elbow part of the spring; this is done after having slid over the elbow the small ferule as shown. Upon the end of the lower arm of the spring is soldered a trough, T (made of plate), bent to saddle and rest upon the end of the right central. This saddle also extends posteriorly sufficiently to catch the lateral when it shall have moved down to line. The extremity of the upper arm of the wire (which is the true spring) is caught upon a hook soldered upon a thin platinum ferule, F, cemented upon this lateral. The force of the spring is gauged by sliding anteriorly the little oval ferule, O, upon the two wire arms.

The ease of management of this mechanism depends upon the wire arms being true and smooth, but not so smooth as to be too slippery for holding the ferule steady.

Although this elevator is an improvement upon the one last described, it cannot be regarded as being equal to another and similar one, that operates by a screw. This one, called the "excelsior elevator," will be illustrated in the following chapter.

CHAPTER CXLI.

ELEVATING SEVERAL UPPER INCISORS COLLECTIVELY BY PLATE MECHANISMS ACTING BY SCREWS.

GENERAL REMARKS.—THE ELEVATION OF ONE TOOTH EASIER THAN THAT OF SEVERAL.—THE LATTER IS POSSIBLE, BUT ONLY EXPERTS SHOULD MAKE THE ATTEMPT.—THE CLOCK-SPRING MECHANISM MODIFIED.—SCREW-ADJUSTING MECHANISMS.

IN the preceding chapters different plans of operations for elevating teeth singly were considered. There now remains the difficult and somewhat risky operation of elevating several teeth simultaneously. The operation is seldom attempted, because it is difficult to properly fix the mechanisms upon the teeth, and because it is by no means easy to hold several teeth stationary, after being corrected, until they can become firmly set. If such teeth are not held steady for several weeks, and sometimes several months, they are sure to fall back into their former places. There are cases, however, in which the teeth continue to "elongate," after the operation, by gravitation—their own weight.[1] In other words, it may be said that while a single arrested tooth (among several fully erupted teeth) may be elevated comparatively easy, and also held a long

[1] Multiple caps or trough-like interdental splints are probably the best things for retaining several teeth in their places. Concerning interdental splints see Part VII., pp. 390–392.

time in the new position without much difficulty, to elevate simultaneously three or four teeth and retain them there is not easy; therefore no one should undertake it without being fully alive to the subject.

Elevating by Plates.—The plan of elevating teeth by tying them to roof-plates has been tried; but while incisors can occasionally be elevated by such rickety things, the accumulation of fragments of food among the strings and between the plate and the palate, together with the fact that pressure of the plate upon the gums in close proximity to the teeth sometimes aggravates the case so greatly as to prevent free circulation of the blood, renders such mechanisms of very questionable value.

What is said regarding collections of food under plates and among strings also applies (in a less degree) to plates in combination with screws or anything else.

In constructing regulating mechanisms for elevating teeth, as well as for other operations, I must reiterate that which has more than once been implied in this work, that the studied practice of economy in the cost of mechanisms, merely to leave greater profit to the operator, is poor policy,

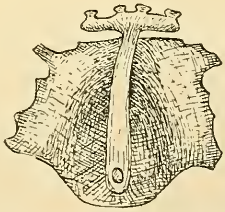

FIG. 1367.—The original clock-spring mechanism for elevating upper incisors (Matteson).

and should never enter any of the calculations; as my aim is to stimulate zeal for proper skill, neither parsimony nor laziness will be encouraged.

Fig. 1367 represents a plate mechanism, devised by Dr.

E. A. Matteson, for elevating upper incisors by continued force; if managed very carefully this mechanism (known as the "clock-spring plate") is said to be practicable. It has two parts, a flat metallic spring and a hard-rubber plate. The plate is so formed that it will closely fit the hard part of the roof of the mouth and the necks of the upper teeth, the spring (made from one extremity of a clock-spring) having on the anterior extremity a cross-piece with four tooth-like projections, of the form shown in the figure. The plate is inserted within the dental arch, then the incisors to be elevated are tied by strings to the projections. The tying is done while the spring is sprung against the plate. The draught upon the teeth is caused by liberation of the spring. If the teeth are carefully tied to the spring there is no doubt but that three or four teeth may be elevated at one time. In the use of such a spring, however, great care must be exercised in adjusting the tension, in order that the teeth shall not be elevated too far. This plate is fixed to the teeth with strings.

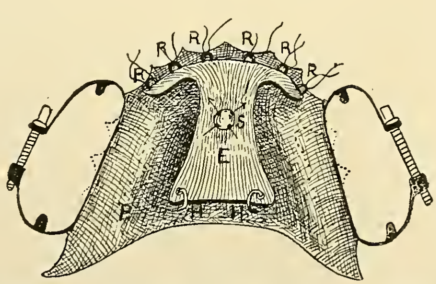

FIG. 1368.—Adjustable spring elevating mechanism for upper incisors. Modification of the Matteson machine (A).

Figs. 1368 and 1369 illustrate an improved modification of the Matteson machine for elevating upper front teeth. The improvements consist, first, in the continued force exerted by the spring, being controlled by a screw, s; second, in the addition to the hard-rubber plate, P, of two clamp-bands, to anchor the machine to the side teeth.

In the figures H, H represent closely fitting staple-hinges, that fasten the elevating part E to the roof-plate P; R represents several wire rings soldered to the anterior edge of the part E. These rings are connected with other rings on ferules cemented upon the teeth to be elevated.

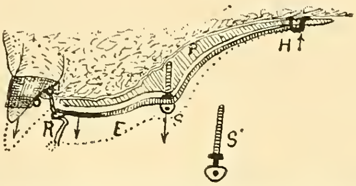

FIG. 1369.—Sectional view, showing the relation between the adjusting part and the spring and plate (A).

The part E is so formed and fastened to the plate P that the force exerted is like that of a spring; the extent of the spring action is governed, however, by the screw S, so related to the spring that it permits the latter to move only a short distance at a time before the head of the screw will stop it. If the staple-hinges be made so that the part E will be rigidly confined, the force of the mechanism will thus be converted from continued to intermittent. (See Figs. 1378 and 1379, also Figs. 1391 and 1392.)

Instead of using strings to fix the part E to the teeth to be elevated, the little rings soldered to the anterior border of the part E may be used to catch under hooks soldered to the lingual surfaces of the ferules cemented upon the teeth to be elevated.

CHAPTER CXLII.

ELEVATION OF UPPER INCISORS BY SKELETON MECHANISMS OPERATED BY SCREWS.

OPERATIONS BY THE EXCELSIOR ELEVATOR.—DESCRIPTION OF THE MACHINE.—OPERATION BY A MODIFICATION OF THE SAME.—BY BRIDGE MECHANISMS.

FOR elevating teeth there are no mechanisms that compare with those that operate by screws. If properly made they can be accurately controlled, and can operate upon the teeth to be elevated so that the socket-tissue changes will be physiological. The author has devised several modifications of this kind of mechanism, but only the best of them will here be explained. Gold and platinum are the best materials, but German silver serves the purpose fairly well.

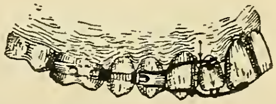

FIG. 1370.—Elevating and moving forward a "short lateral" by the excelsior elevator, acting by a screw (A).

Fig. 1370 illustrates the beginning of an operation for drawing downward and forward at the same time an arrested, instanding, right upper lateral by a mechanism that acted by one little screw.

Fig. 1371 represents the parts of this the best mechanism yet devised for elevating teeth. It consists of a clamp-band, C, having two wire arms, the upper one having a hole through it for a screw, S, the lower one having a nut soldered to it for the same screw. On the end of this (lower) arm is also a trough, B, and a V-shape guide-piece, A, made

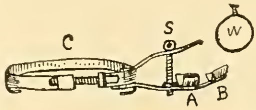

FIG. 1371.—The excelsior mechanism (A).

of plate. For lodgment of the upper arm there is a piece of small platinum wire, W, which in use is bound around the neck of the lateral to be elevated. The V-piece A is to guide the lateral outward to line, and at the same time prevent it from moving too far downward.

In applying this machine the platinum wire is first bound around the neck of the tooth to be elevated, leaving the twisted extremities on the labial side of the tooth for future use. The clamp-band is then placed upon the two right upper bicuspids and first molar. This permits the two wire arms to extend anteriorly, the upper one to rest upon the twisted knot of the wire on the lateral; the lower one (by means of the trough B soldered to the end) rests upon the lower end of the right central (leaving the guide A directly beneath the lateral, but not in contact with it).

To operate the machine the two arms are made to approach each other by the little screw S (above referred to). This screw is tightened by a lever-key caught into a hole in the head of the screw. By means of this screw the arm, resting upon the wire knot, painlessly draws the lateral downward until it is in contact with the bottom of the trough A on the other arm.

As before implied, the object of this trough-piece is not only to prevent the instanding (short) tooth from being forced too far downward, but also to guide it forward, so that it will be on the line of the arch. The time used to correct this tooth was about three days. The patient performed most of the operation without calling at the office. Generally two days is the time used to correct such a case; but there are cases for which one day is sufficient.

FIG. 1372.—A trough for turning a short incisor while it is being elevated (A). (*Enlarged.*)

Fig. 1372 represents a guide-trough used in turning an arrested lateral incisor while being forced downward by a mechanism like the one last described (Fig. 1371). This trough, which is made of plate, is soldered to the lower arm of the mechanism, and is placed directly under the short tooth. I regard this trough as one of the best elements in this mechanism yet devised, for turning the tooth at the same time that it is being elevated. The entire mechanism being very small and simple, and easily managed by the patient at his home, renders it superior to all others.

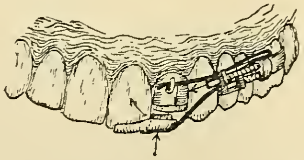

FIG. 1373.—Elevating an arrested lateral by a mechanism operated by a screw (A).

Fig. 1373 illustrates the beginning of an operation for elevating an arrested left upper lateral by a hair-pin-form wire, anchored by a clamp-band and operated by a sliding-shoe moved by a screw placed longitudinally with the wire and acting from behind the shoe. In construction this mechanism is in several respects similar to that illustrated by Fig. 1366, in the preceding chapter, the difference being that a screw instead of the hand is used to push the sliding-band or shoe along the arms of the wire.

The anchor of this mechanism, shown independently by Fig. 1374, consisted of a longitudinal screw clamp-band, B.

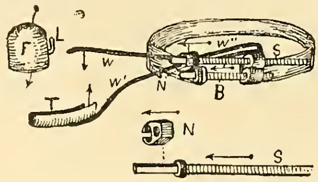

FIG. 1374.—The modified hair-pin mechanism (A).

To the posterior nut of this band was anchored by solder the bow W'' of the hair-pin wire. The other parts consisted of a ferule, F (for the short tooth), and the screw S to push the sliding-nut N along the wire W W'. (See N and S in the lower part of the figure.) Soldered to the end of the lower arm W' was a trough, T (made of gold plate).

To place the nut N on the wire (before it is soldered to the clamp-band), the arms W, W' are first sprung toward each other, and then this sliding-nut is pushed over the elbow part. The screw S, projected through the stationary nut on the band, is then, by moving it backward, made to enter a hole in the sliding-nut N.

When applying the mechanism to the teeth, the ferule F is first cemented upon the short tooth so as to leave the hook upon the labial side of the tooth; after this the clamp-band B is screwed upon the two left bicuspids and the first molar. Every part is adjusted carefully to the teeth.

The mechanism is operated by continuing the backward action of the screw S. The tooth is acted upon by the collar of this screw pushing against the nut N, moving it along the wires W, W′, causing these diverging arms to approach each other. Previously to this act, however, one of the wire arms is caught upon the hook on the ferule F and the other arm upon the end of the central beyond. The direction of these various forces is indicated by the arrows. Because the delinquent lateral moves more easily than the central, the operation is completed before the central can be injuriously started, or the socket made sensitive.

The long screw S is so poised upon the clamp-band that its movement is nearly parallel to the lower arm W′. This is necessary in order that the upper arm W shall more powerfully draw upon the delinquent tooth.

In this case the delinquent lateral was originally slightly cramped between the central and cuspid; to liberate it the arm W′ of the wire was so bent that the trough T rested upon one corner of the central only, thus slightly pressing it to the right and away from the short tooth.

This mechanism is somewhat difficult to construct; but if it is properly made and applied it is as easy to operate as the excelsior elevator, represented by Fig. 1371. The philosophy of the mechanism, however, is not as simple, therefore it cannot be regarded as its equal.

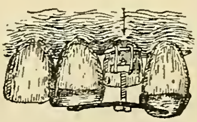

FIG. 1375.—Plan of elevating an upper lateral by a screw acting from a bridge (A).[1]

Fig. 1375 illustrates a plan of drawing down a right upper lateral to line by a modification of Chapman's mechanism. This machine, represented by Fig. 1376, consists of a

[1] Devised in 1879. Several years later substantially the same mechanism in general construction was devised by another dentist.

screw, S (projected through a bridge, B, thence into a threaded nut having hooks, H), soldered to a thin platinum ferule, F, and two gold hood-saddles, C, C, soldered to the ends of the bridge. To the middle part of this bridge is also fixed a small gold tube, R, through which projects the screw S.

Fig. 1376A represents a modification of the above mechanism. This is attached to the short tooth by a ferule, F.

FIGS. 1376, 1376A.—Modifications of the mechanism (A).

To apply the mechanism, the ferule is cemented upon the delinquent incisor, after which the bridge is placed in position, from central to cuspid. This is held in place by the screw S projecting through the bridge and into the nut soldered to the ferule, and tightened upon by a nut.

The advantage sought by the use of hood-shape saddles, C, C, instead of troughs or full caps, is to permit, if not to cause, if necessary, an increase of space by an outward movement of the two adjacent teeth, so that the delinquent lateral may more easily move down between them. The object in having the bridge curved is to place the head of the screw S out of the way of antagonism of the teeth.

This is a rickety and somewhat clumsy mechanism; but if delicately made and the ferule for the delinquent tooth be sufficiently firm, it is practicable; still, it is not equal to the excelsior machine. The chief annoyance to the patient is the head of the screw. The line of draught, also, is not true.

Fig. 1377 illustrates a process of drawing down a right upper lateral by a mechanism consisting of a single-tooth ferule (having soldered to it a screw), and an anchor-ferule (having an arm extending anteriorly and so formed that it will hook over the end of the right central). The application of this mechanism is illustrated in the figure.

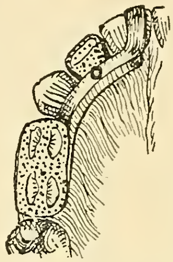

FIG. 1377.—Drawing down a lateral by a screw (A).

The philosophy of this somewhat clumsy machine is more clearly shown in an explanation (in another place) of a similar mechanism for elevating several teeth. (See Chapter CXLIII., Fig. 1381.)

Instead of a ferule for anchor, a clamp-band, embracing the two bicuspids and the first molar, is not only more delicate but easier to apply, and is less liable to cause pain.

CHAPTER CXLIII.

ELEVATING SEVERAL UPPER INCISORS SIMULTANEOUSLY BY MECHANISMS OPERATED BY SCREWS.

GENERAL REMARKS.—THE PUSHING-SCREW PLATE MECHANISM.—THE DRAWING-SCREW MECHANISM.

THE elevation of teeth in groups is not often advisable, because there are more difficulties to contend against than in the elevation of teeth individually. To assert, however, that elevation by groups is impossible would be erroneous; it is possible in the hands of experts. Whenever it is practicable to elevate several teeth collectively by mechanisms that operate by screws, the results are more satisfactory than with those that operate by elastic rubber or metallic springs, because by the screw the force and the rate of movement of the teeth can be kept under better control. To invent mechanisms that can be managed perfectly has been regarded as impossible; but the efforts that have been made to overcome difficulties have brought out several mechanisms that are fairly practicable in careful hands. The general outline of the best ones was suggested by Dr. Matteson's clock-spring mechanism, referred to in a preceding chapter (Fig. 1367); but, unlike that one, which acts by a spring, these operate by screws.

Fig. 1378 represents one of the mechanisms. It is designed for elevating front upper teeth, and differs from Dr. Matteson's machine in that, instead of a flat spring, a bow of stiff round wire, W, is used; this is operated by screws projecting through a connecting cross-bar into the plate.

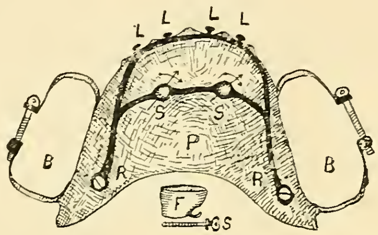

FIG. 1378.—Mechanism for elevating several upper incisors by screws (A).

Upon each end of the bow is soldered a small ring, R, for riveting it to the posterior part of the plate P (similar to Dr. Matteson's plan of fastening his spring). The anchor, a plate (P), is firmly held to the side teeth by clamp-bands, B, B. These are vulcanized to the border of the plate. The teeth are elevated by lifting the anterior part of the bow by collar-screws, S, S. The collar, which is soldered a little way below the head of the screw, pushes against the roof-plate side of the bow. The head of the screw, which is on the opposite side of the bow, is like a door-knob. To the anterior part of this wire bow W are soldered knobs, L, to which the delinquent teeth (feruled) are tied. The parts weakened by the holes in the bar for the screws are strengthened by flat rings soldered to the bar.

Fig. 1379 represents two sectional views of a similar plate and adjustable parts, showing their relation and application to the teeth and roof of the mouth. By turning the screws backward the bow is forced to move farther from the plate P, thus causing the rings L, on the anterior part of the bow, to draw upon the teeth which are fixed to them.[1] The rings L are fixed to the teeth by little hooks soldered to ferules cemented upon them. Such rings, made adjustable by crooked wire (see L in lower part of Fig. 1379), are caught into the ferule-hooks.

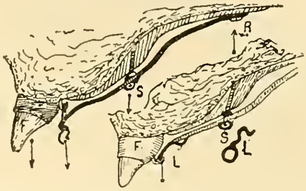

FIG. 1379.—Section views showing the application of the mechanism, also showing the form and the relation of screw and bow W to the plate P. The crooked adjustable wire and ring L are shown below the figure.

If this mechanism is properly made it is easily managed, and when carefully operated there is not much danger of moving the teeth too rapidly or too far.

Figs. 1380–1389 illustrate a plan for moving down

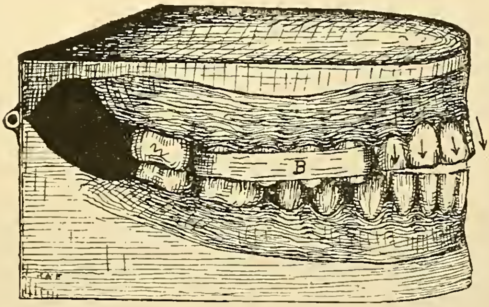

FIG. 1380.—Outside appearance when moving four upper incisors downward.

four upper incisors by a clumsy mechanism operated by screws that play through a stationary skeleton gold bow, anchored by ferules (or by clamp-bands) to the side teeth.

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[1] Small platinum wire is sometimes better than strings for tying the bow to the teeth, but rings, as represented in this figure, are better than either.

Fig. 1381 represents a palatine view of the mechanism applied, showing how the flat plate, w, is connected with the anchor-ferules and the front teeth.

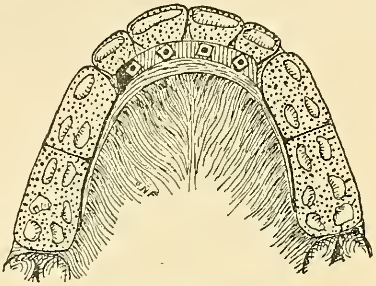
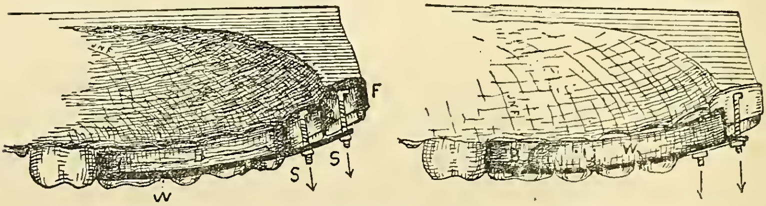


FIG. 1381.—Under view of the mechanism as applied (A).

Fig. 1382 represents a lingual view of the left half of the mechanism upon the teeth, showing the relation of the screws, s, bow-plate, B, plate, w, anchor-ferule and incisor-ferules, F.



FIGS. 1382, 1383.—Inside views of the mechanisms, showing the relation of the different parts to one another and to the teeth.

Fig. 1383 also represents the plate w (showing also the screws s) and how it is connected by solder to the upright plate, the two parts being at right angles to each other.[1]

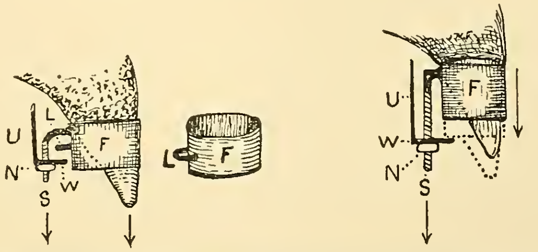
A large majority of the mechanisms represented in this work are so simple that they require little more than a single picture, but this one is too complicated to be easily understood without considerable explanation; therefore

[1] To more clearly understand these connections, refer to Figs. 1384, 1385.

I shall dwell upon it, although I do not regard the mechanism equal to the one last described.

On each side of the dental arch is an anchor consisting of a gold ferule, B (No. 32), that embraces the cuspid, two bicuspids, and first molar. To prevent the sides of the ferule from bending outward a partition, made of thin sheet-gold, extends from side to side. This rests between the bicuspid teeth.

Soldered to the lingual side of each of these ferule-anchors, and parallel with the plane, is a piece of moderately stiff gold plate, varying in width from one-eighth to one-fourth of an inch or more, corresponding with the length of the crowns of the teeth.



FIGS. 1384, 1385.—Section views, showing two forms of screws and the plan of constructing the anterior part of the mechanism (A).

In Figs. 1384 and 1835, U represents the stationary bow-plate, and its relation to the plate W and the screw part of the mechanism. The parts U and W are first made separately and then they are soldered at nearly right angles to each other, to strengthen and mutually support each other. To properly adjust these parts requires skill.

When applying the mechanism the ferules F are pushed as far upward upon the front teeth as possible, without injury to the gums. This is necessary in order to prevent, in a measure, the screws S and nuts N from irritating the tongue.

In the flat plate w, at a point directly behind each tooth to be moved, is a hole through which one of the screws s, connecting one of the ferules F, projects. One end of each screw, bent at right angles, is soldered to the upper part of the ferule. In forming these lingual screws they are so bent that the nuts N and the plate w will be sufficiently posterior to the teeth (incisors) not to interfere with the antagonism. After the mechanism is applied, the loose nuts N are placed upon the parts of the screws that project through the plate w. These nuts, by being tightened upon the plate w, draw upon the teeth and elevate them.

There are several points to be considered while constructing this kind of mechanism. The anterior parts should be in such relation to each other that they will permit the upper teeth to overhang in front of the lower. As the normal antagonism generally requires the upper incisors to so overhang about one-sixteenth of an inch (or more), the ends of these teeth should project through the ferules F sufficiently to allow such overhanging without the ferules coming in contact as they move down to the plate w. (See dotted line, Fig. 1385.)

When it is necessary to incline the crowns (cutting ends) anteriorly the screw s may be so bent that when drawn upon by the nuts N the teeth will be moved anteriorly as well as downward. In the lower part of Fig. 1386 the form of the screw that will aid in accomplishing this end is represented. The draught must be diagonally forward.

When all the parts have been tried and are found to be of proper size and form, they are removed and one by one are cemented upon the teeth. This is accomplished by half filling the ferule with phosphate of zinc (while in a sticky consistency), and then, having placed one finger upon one end of the ferule (to prevent the cement from being pushed out), it is forced home, and held there until the cement hardens.

To adjust the mechanism in the mouth requires thought. Unless all the parts are properly related, the screws on the ferules may not enter the holes in the plate. Oval holes will give a slight play, and thus permit adjustment of the screws. After each ferule, F, has been cemented upon

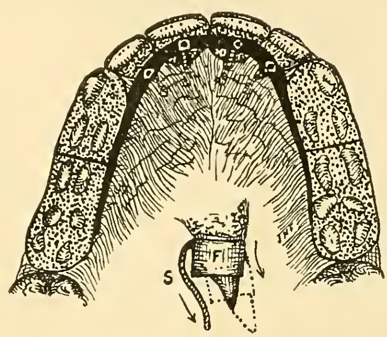


FIG. 1386.—Palatine view of the mechanism when ready to act.

its tooth the anchor-plate W may be taken off, if desired, without removing the ferule. In this careful way, all the parts may be correctly placed upon the teeth.

After these ferules are set the large anchor-ferules are then cemented upon the side teeth. If the cement bears upon the gums it should be pressed away from them, by an instrument applied between the gums and cement. For setting such a complicated mechanism the cement should not be of a kind to harden too quickly. Indeed the cemented ferule is so great a drawback that (preferring the clamp-band) I now seldom use this anchor.

When all the parts are adjusted and in readiness for work the remaining steps in the operation are comparatively easy; but, to reiterate, success depends upon having all the parts in accurate relation to one another.

To prevent the anchor-ferules B from sliding upward upon the cement (when hardened) and thereby injuring the gums, the antagonizing edges of the ferules are bent inward at right angles as shown in Fig. 1387, which represents the band (B′) cut into two parts.

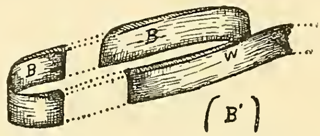


FIG. 1387.—Anchor-ferule, B, cut into two parts to show the overhanging edges (A).

The planes of the opposite sides of the anchor-ferules should be parallel to each other, so that they may be less liable to loosen by sliding in the direction of their smaller diameters.

Should this slipping occur in the direction of the gum, the edge of the ferule would cause pain and inflammation; if the ferule should move in the other direction the entire mechanism would loosen. The slipping of an anchor-ferule is generally first noticed by the crumbling of the cement.[1]

In constructing these ferules they should be sufficiently large to cause no pressure upon the teeth nor bind nor strain them in the least. If they are so small that they require to be forced upon the teeth, the unequal strain will cause irritation of the sockets, which in some cases would be so painful that no relief could be given except by removing the entire mechanism.

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[1] The author does not at present use the large anchor-ferule, but instead uses the clamp-band, or two single ferules soldered to the U-plate. One of these ferules is cemented upon a molar, the other upon a first bicuspid.

Should one of the small ferules F at any time slip off its tooth, it may be reset, provided it is possible to remove the old cement, by inserting new cement while the ferule is on the tooth.

To guard against this trouble, detachable screws may be used instead of stationary screws.

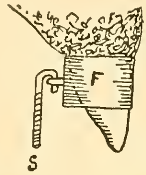


FIG. 1388.—Curved detachable screw (A).

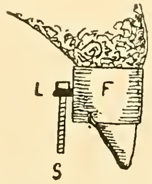


FIG. 1389.—Straight detachable screw (A).

Figs. 1388 and 1389 illustrate two forms of such detachable screws; one is hook-like, the other straight. When used they are caught into staples soldered to the ferule. The straight screw has a head, L, like that of an ordinary square-headed bolt.

Retaining Mechanism.—To retain the front teeth in place after they have been elevated, the same mechanism may be worn until a multiple cap (Desirabode splint) can be made. This splint should be of sufficient length (like the Hullihen splint) to be anchored to the bicuspids and first molars. (See Retaining-splints in Practical Suggestions, Part XX.)

Although I have gone into considerable detail in describing this mechanism, I cannot leave it without saying that although it is practicable in skilful hands, I cannot recommend it as being equal to any one of several other mechanisms described in this work. It is here introduced more as a lesson for students, for in the machine there are some valuable suggestions for encouragement of modifications, probably improvements.

LOWER INCISORS.

SECTION B. . . . . DIVISION I.

CHAP. CXLIV. Elevating Lower Incisors by Springs.
" CXLV. " " " " Screws.

CHAPTER CXLIV.

SECTION B. . . . . DIVISION I.

ELEVATING LOWER INCISORS BY SPRINGS.

GENERAL REMARKS UPON ELEVATING LOWER FRONT TEETH SINGLY AND IN GROUPS.—MECHANISMS OPERATED BY SPRINGS WITH PLATES.

ELEVATION of teeth in the lower jaw is not as frequently found necessary as in the upper, and if found an operation is generally regarded as too difficult; indeed, most patients think that arrested lower teeth are not very conspicuous, in fact, not noticeable at all. These impressions, however, are mainly erroneous.

Mechanisms for elevating lower teeth vary from those used in the upper; still, for moving lower incisors singly or *en masse* the principle is the same, the main difference being in the form of those parts that interfere with the tongue. As the preceding chapters treat of the construction of several similar mechanisms (mainly the skeleton kinds), and also show how they are applied to the teeth, it is not necessary to dwell again upon them. There are several other mechanisms, however, that were not mentioned; these will now be explained in detail. Some of them belong to the plate class and others to the skeleton.

Of mechanisms that act by free springs without checks little can be said in favor, because they are not controllable at will; but of the variety that can be controlled by checks or by screws more can be said. Either kind of engine generally has a strong base, consisting of a plate to rest upon the alveolar ridge, or upon the anterior side teeth, such as the cuspids or bicuspids. From this base projects the engine of force, whatever it may be. The lifting-spring is connected with the tooth to be elevated by a hook, or a knob soldered to a thin platinum ferule cemented upon that tooth. One plate mechanism for elevating lower incisors was devised by Dr. E. A. Matteson. It has a spring action, but this, like all spring elevators when used without checks, requires close watchfulness in order to prevent unfavorable results from too rapid movement of the tooth or teeth.

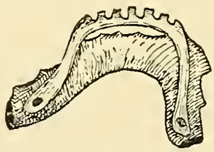


FIG. 1390.—Mechanism for elevating lower incisors (Matteson).

Fig. 1390 represents the mechanism that was designed for the elevation of more than one lower incisor, but it may be practicable for elevating a single tooth. It consists of a flat metallic spring fixed upon a hard-rubber U-plate constructed practically upon the same plan as the one represented by Fig. 1367, page 1431, designed for teeth of the upper jaw. The difference between these mechanisms is that in this one (Fig. 1390) the anchor-plate and the spring are of the form of the letter U, to prevent it from interfering with the freedom of the tongue.

The extremities of the spring are riveted tightly upon the posterior parts of the plate. The figure so clearly shows the form, construction, and the operation of this mechanism that it seems unnecessary to explain it further.

CHAPTER CXLV.

ELEVATION OF LOWER INCISORS BY SCREWS.

ELEVATING PLATE-MECHANISM THAT ACTS BY A SCREW.—SKELETON MECHANISMS FOR ELEVATING A SINGLE TOOTH.

IN the use of any mechanism, as before mentioned, it is important that the teeth shall not be elevated too rapidly or too far. To prevent such results, therefore, the active parts should be so made that they can be kept under perfect control. This is best accomplished by the screw.

Fig. 1391 represents one of my modifications of the Matteson mechanism, its aim being to meet this danger. The difference between the two mechanisms lies in additions

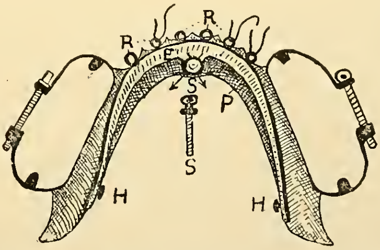


FIG. 1391.—Mechanism acting by a screw for elevating lower teeth. Modification of the Matteson mechanism (A).

and changes in form of the parts, especially those that exert force. By this improvement (Fig. 1391) the force applied to the teeth is delicate and intermittent instead of violent and continuous. The mechanism consists of parts as follows: a hard-rubber U-plate, P, to rest lightly upon the gums, two clamp-bands, a gold bow, E, and screw S. The latter plays in a hole in the anterior part of the bow E, which is made of a narrow strip of plate soldered to a gold wire snugly hinged at its ends to the plate P by rivets, H, H; to the anterior part of this bow there are also soldered several small wire rings for strings. All these different parts are so arranged that by turning the screw S backward the bow is raised from the plate, and with it the strings, which, being tied to the teeth gently, lift upon and slowly elevate them in their sockets. Upon each lower tooth to be elevated is cemented a ferule having soldered to it a little gold hook for attaching the tooth to the bow. By the use of this mechanism there is no danger of the teeth being raised too rapidly or too far. When they are corrected they are temporarily retained until the sensitiveness of the sockets subsides, when they are permanently retained by a wire extending through the little hooks of the ferules and then anchored through two tubes soldered to thin caps cemented upon the bicuspids.

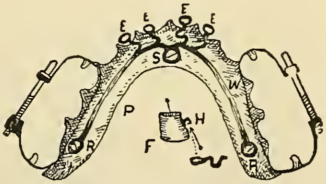


FIG. 1392.—Mechanism for elevating the lower incisors by a screw. Modification of the Matteson machine (A).

Fig. 1392 represents another modification of the Matteson mechanism (Fig. 1390). This one, which differs slightly from the last mechanism described, is made as follows: a hard-rubber U-shape plate, P (having two clamp-bands to anchor it to the side teeth), is first made to fit the lingual sides of the alveolar ridge to serve as a base to the engine of force, which consists of a piece of stiff gold wire, W, bent to the form of a bow, the ends of which are loosely riveted to the plate at the points R, R. To the anterior part of this bow are soldered four rings, E, that lift upon little hooks, H, on ferules, F, cemented upon the teeth to be elevated. These rings are made adjustable by being soldered to crooked wires. The lifting is caused by a lock-screw, S, that plays snugly in a short tube soldered to the anterior part of the bow. The screw turns in the plate. This mechanism is thought to be superior to the others mentioned, because lighter and less liable to collect *débris;* but while this may be said, none of them are safe except in the hands of experts.

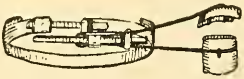


FIG. 1393.—Screw-acting mechanism for elevating a left lateral (A).

Fig. 1393 represents a "hair-pin" mechanism operated by a screw for elevating a right lower lateral. Fig. 1394 represents the different parts of this mechanism, which consist of a clamp-band, the hair-pin attachment, and a

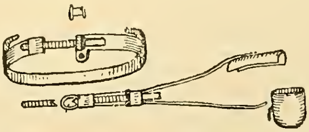


FIG. 1394.—The different parts of the mechanism (A).

ferule. The combination is similar to that of the mechanism represented by Fig. 1373, differing only in the plan of connecting the two parts. Instead of these parts being firmly attached to one another by solder, they are so joined by a rivet that the screw and arms have a slight play.

The wire arms are made to approach each other by a little sliding-band (shown in white) pushed along by the collar-screw (shown in black), the nib of which plays in it. The body of the screw turns in a nut soldered near the elbow of the wire.

ELEVATION OF UPPER CUSPIDS BY SPRINGS AND BY SCREWS.

SECTION C........................DIVISION I.

CHAP. CXLVI. Elevating Upper Cuspid Teeth by Coil-springs and by Plain Springs without Plates.

" CXLVII. Elevating Upper Cuspids by Screws, with and without Plates.

CHAPTER CXLVI.

SECTION C................DIVISION I.

ELEVATING UPPER CUSPIDS BY COILED AND BY PLAIN SPRINGS WITHOUT PLATES.

GENERAL REMARKS.—ELEVATING BY COILED SPRING-WIRE.—ELEVATING BY PLAIN SPRINGS.—OTHER MECHANISMS.

CUSPIDS seldom require to be elevated, but those that do are generally in the upper jaw. These cases are sometimes caused by being hedged about by adjacent teeth and yet are not off the line. There are other cases in which the cuspids are guided wrongly by other teeth; these cut through the gum considerably above and anterior or posterior to their normal places, inclining diagonally according to circumstances.

Operations for elevating cuspids are conducted upon the same general principles that operations for elevating incisors are conducted, the form of the mechanism varying to meet the requirements of the case. For attachment of the engines of force for elevating incisor teeth, ferules with little wire hooks soldered to them are always sufficient. But for cuspids that are just pointing through the gums these bands are not always sufficiently firm; pits, therefore, are sometimes made in the enamel, but pits should not be resorted to unless absolutely necessary. When, however, the form of the exposed part of the tooth or its position renders it incapable of retaining a cemented ferule sufficiently firm, a pit should be boldly but carefully made. A small gold plug is much less disfiguring than a very irregular cuspid. The best engine of force for elevating cuspids is the screw, but springs are sometimes used successfully.

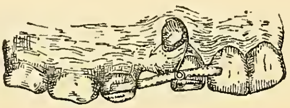


FIG. 1395.—Elevating a cuspid by a coiled wire spring (Talbot).[1]

Fig. 1395 illustrates the beginning of an operation by Dr. Talbot for moving a malposed right upper cuspid to its proper place. At the time the point of the cusp of this tooth appeared through the gum the first bicuspid was extracted. A platinum ferule was first fitted to the second bicuspid, and another to the lateral incisor. To these ferules a platinum bar was soldered; this extended along the labial surfaces and rested upon the central as shown. To this bar was soldered one end of a flattened tube for holding one extremity of a delicate spring having a coil. The arms of the spring (piano wire) were of equal length. The wire was so bent upon itself that when one extremity was projected into the flat tube the other extended posteriorly; but when it was sprung upward and caught upon the cuspid it swayed the crown downward and posteriorly.

When the tooth had moved sufficiently far back it still required to be drawn farther downward and lingually. This was done by a piano-wire spring, one end being vulcanized into a hard-rubber roof-plate, and in a position

[1] "Dental Cosmos," 1888.

that enabled its free extremity to be projected through the cuspid space in the dental arch and be tied to the neck of the tooth (cuspid), so that it drew upon it.

When springs are used to elevate teeth the patient should be seen often by the operator in order that the tooth shall not move too far.

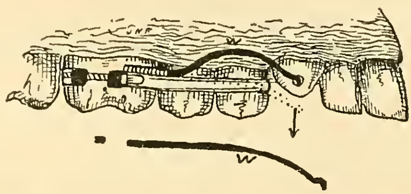


Fig. 1396.—Elevating a cuspid by a plain wire spring (A).

Fig. 1396 illustrates an operation for drawing down a right upper cuspid by a detachable plain wire spring, the spring being anchored to a clamp-band placed upon the bicuspids and first molar on the same side.

The posterior end of the spring w was made rectangular in order that it might rest firmly in its socket (similar in form), soldered to the buccal side of the clamp-band. The anterior end of this wire was bent hook-like, so that when it was sprung upward from the position of the dotted line it caught into a pit that had been drilled into the labial side of the cuspid.

To prevent the tooth from moving too far, a knob was soldered to the anterior end of the clamp-band, against which the spring could lodge when the tooth had moved the proper distance. This knob does not appear in the figure.

For elevating cuspids I make use of other mechanisms, that are superior in some respects to this one. These are constructed similarly to those for elevating incisors, varying only in the size of the anchor clamp-bands. (See Chapters CXXXIX.–CXL.)

CHAPTER CXLVII.

ELEVATING UPPER CUSPIDS BY SCREWS WITH AND WITHOUT PLATES.

OPERATION BY A SCREW IN COMBINATION WITH A LARGE ROOF-PLATE.—OPERATION BY SCREWS WITH SMALL ANCHOR-PLATES.—SKELETON LEVER MECHANISMS WITH BAND-ANCHORS.—ANCHORLESS LEVER MECHANISMS.—STATISTICS SHOWING RATES OF MOVEMENT OF A TOOTH WHILE BEING ELEVATED.

THE majority of screw-acting mechanisms for elevating cuspids are constructed similarly to screw-acting mechanisms for elevating incisors. They may be large and cumbersome, or small and delicate. As a rule, light skeleton mechanisms are preferable to those of the large plate class; the latter, however, are sometimes necessary. Beginning with large plates, we shall consider less clumsy ones, and finally close with skeleton mechanisms.

Fig. 1397 illustrates the beginning of an operation for elevating and moving to line an instanding right upper. cuspid by a large mechanism consisting of three parts: a plate, a screw, and a string. The operation was divided into two stages: first, moving the right bicuspids posteriorly to make space for the instanding cuspid; second, elevating and moving outward at the same time the cuspid, which was only about one-third erupted and was forcing the lateral into the anterior position.

The two bicuspids were in position inclining anteriorly, narrowing the space belonging to the cuspid. The first adult molar having been lost by decay, a space was left behind the bicuspids, which by the regulating process was closed by moving posteriorly the bicuspids.

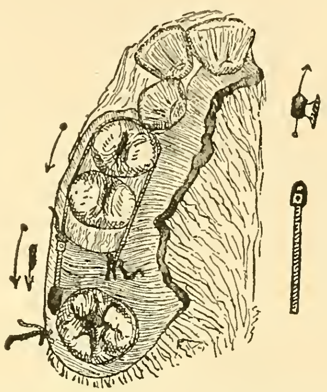


FIG. 1397.—Elevating an upper cuspid—the first step, making a path for the tooth (A).[1]

The anchor of this (one of my old-style mechanisms) was a plain hard-rubber roof-plate fastened to several side teeth. On the right it was attached by strings only, but on the left by a string and a thumb-screw (Fig. 1398). The screw played in a threaded hole in the plate and projected into a cavity in the buccal side of a left molar. The roof-plate had a bow (hard rubber) extending outside the bicuspids, and a narrow strip extending into the space between the bicuspids and second molar, a space that furnished the opportunity for moving the bicuspids.[2]

The teeth were drawn back by a linen string, one end being anchored to the plate at a point near the right second

[1] Published in "Dental Cosmos," June, 1879 (A).

[2] Because of similarity of operations explained in this chapter to those in chapters on Moving Laterally Partly Erupted Upper Cuspids (Part XV.), both should be read in connection.

molar. After the string had been extended forward around the first bicuspid and thence posteriorly, it was fastened to a screw in a gold nut vulcanized into the posterior part of the right buccal side of the plate as represented. To cause the necessary draught upon the bicuspids to move them, this screw was advanced posteriorly, thus tightening the string upon them. Having gained in this way the necessary room for accommodation of the cuspid and lateral incisor, this mechanism was replaced by a new but somewhat similar one, consisting of a plate with a cord extending from the outstanding lateral to a screw set into a nut vulcanized to the buccal side of the plate at a point near the right molar.

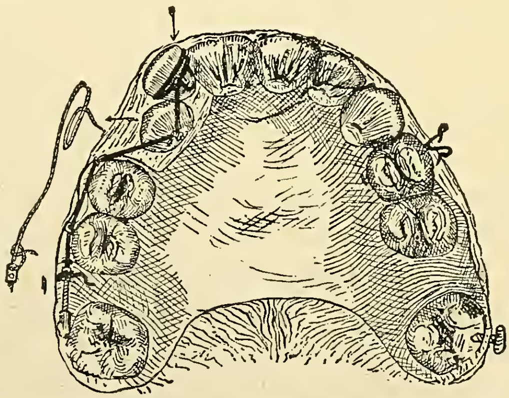


FIG. 1398.—Elevating and moving outward the cuspid (A).

Fig. 1398 illustrates the beginning of the second stage of the operation for elevating and moving outward the cuspid and at the same time moving lingually the lateral incisor by the new mechanism. This plate, like the former one, had a hard-rubber bow outside of the right bicuspids to hold these teeth in their new places. This bow had a groove to keep the string in its proper place when drawn taut between the lateral and the drag-screw.

The cuspid was moved outward by the string being caught under a little knob cemented into a pit made in the lingual side of the tooth. When this string was tightened it also lifted upon the cuspid, and elevated it at the same time that it was being moved outward. The same string, being attached to the lateral, also moved that tooth (lateral) lingually.

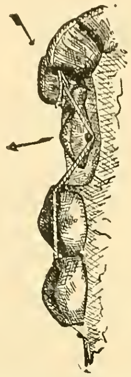


FIG. 1399.—Another view of the double-acting draught-string (A).

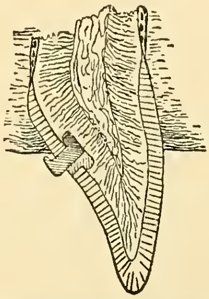


FIG. 1400.—Sectional view of the cuspid, showing anchorage of the knob (A).

Fig. 1399 illustrates a slightly different view at a little later time, when the string had been transferred from the groove in the bow to the sulci of the bicuspids, to increase the elevating force upon the cuspid. One extremity of the knob (which was formed like a foot) rested in an undercut in the side of the pit as represented in Fig. 1400. The extra space around this knob was plugged with plastic filling material.

After the cuspid had been moved into its proper place all the protruding part of this plug was ground away, leaving the remainder as a plug in the cavity until the tooth had become firm, when it was taken out and replaced by gold.[1]

[1] This operation, which was one of my earlier attempts, I would not now repeat in every detail. Instead of making a pit, I would now cement upon the cuspid a gold or platinum ferule having a little knob soldered to it. The

Small Plates.—Fig. 1401 illustrates a process of drawing down a partially erupted right upper cuspid (for an adult case) by a cheaply made mechanism consisting of a gold hook-screw and a small hard-rubber anchor-plate resting

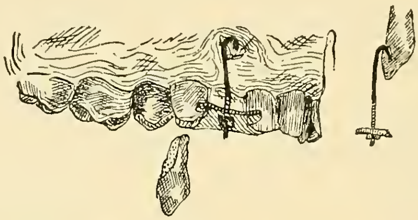


FIG. 1401.—Drawing down a cuspid by a screw in combination with a small hard-rubber plate (A).

(bridge-like) upon the ends of the adjacent teeth. The hook was first caught into a pit made in the labial side of the cuspid (see detached representation at right of the figure), after which the other end was projected through a hole in the bridge and tightened upon by a nut, N.

To make room for the cuspid it was necessary to move the lateral and bicuspid farther apart. This was accomplished by the bridge-piece being so formed that it bore wedge-like upon and between these teeth when tightened upon by the screw and nut.

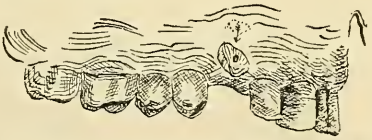


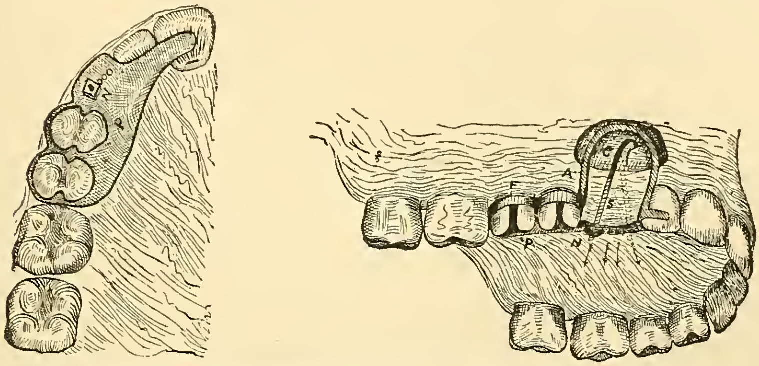
FIG. 1402.—Appearance of the case in the middle of the operation.

Fig. 1402 represents the case in the middle of the operation and at a time when the mechanism was taken off to make a large cup-like hole in the bridge-piece to permit

drawback in this operation was the difficulty in keeping the *débris* from collecting between the plate, teeth, and gums. Platinum wire or catgut would have been superior to strings.

the point of the cuspid to project farther down, thus enabling the mechanism to complete the operation.

Figs. 1403 and 1403A illustrate two views of a case that was similar to the one last explained, and treated by a similar mechanism. The figures show hard-rubber bridge-piece P and the nut N and a series of holes through the plate. The bridge was made with bands extending around the bicuspids; the anterior part of the plate projected forward and



Figs. 1403, 1403A.—Elevating a cuspid by a screw in combination with a small hard-rubber plate-anchor (A).

rested upon the right lateral and central. A gold bow, A, projected upward over the cuspid and rested upon a piece of felt. Through the bridge projected a screw, S, which hooked into a pit made into the arrested cuspid. This tooth was operated by this screw being tightened by the nut. These figures are presented mainly to show the form of the bridge. As this mechanism and its action are similar to one used in another operation, to be explained immediately, it will not be further dwelt upon.

Fig. 1404 illustrates the case of a woman about twenty-four years of age having an arrested right upper cuspid. The figure is drawn to represent the bone dissected away to show the position of the tooth. This operation is somewhat interesting in its being the first of its kind that was successfully performed; therefore it will be more fully presented.[1] The dotted line shows the track that the tooth took during the process of treatment. As the patient was several times absent from the city, this operation required longer time than it would have taken under more favorable circumstances. The operation was conducted so nearly in

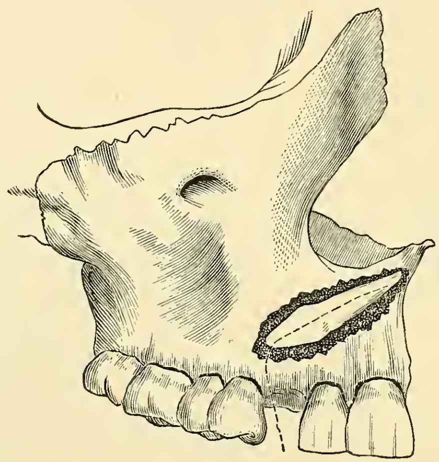


FIG. 1404.—A tooth drawn from an abnormal position in the depths of the jaw.

accordance with physiological functions of the tissues involved that I regard it as instructive in proving that a tooth may be painlessly drawn from an abnormal position in the depths of the jaw without necessarily destroying the nutritive tracts leading to the pulp of the tooth.[2]

This presentation is only a part of a larger operation; to give full details of the whole would embrace more than the elevation of a cuspid; therefore, as the other parts are irrelevant, they will be only briefly given. When

[1] The B—— case. Read by the author before the Brooklyn Dental Society, January 14, 1878; published in "Dental Cosmos," November, 1878, p. 605.

[2] For further evidence of this fact, see Fig. 1059, p. 1103.

the case first came to hand there were remaining in the arch two deciduous cuspids (discolored), but they were comparatively firm. The left adult cuspid having erupted between the deciduous cuspid and the left lateral, it so crowded the left lateral out of its proper place that the latter not only lapped over the adjacent central, but it had so far turned in its socket that its anterior approximal side faced anteriorly. On the opposite (right) side of the arch the adult cuspid (the one now under consideration) had not appeared through the gum, but high up under the lip there was a small prominence that indicated the presence of the tooth underneath.

First, the deciduous cuspids were extracted to liberate the overcrowded adult teeth. The left cuspid was then drawn posteriorly into its place (by a clamp-band) to make space for liberation of the turned left lateral. This tooth (lateral) was subsequently turned nearly to its proper place by a matrix-wrench.[1] A curve in the root of this lateral caused it to lap over the root of the central incisor, thus preventing it from fully turning to its proper place.

FIG. 1405.—Central and lateral before the operation.

FIG. 1406.—Relation of the teeth after the operation.

Figs. 1405 and 1406 represent the relation of these two roots before and after the operation.

In the lower jaw the left adult cuspid had erupted in the proper line, but it also stood between a deciduous cuspid and the adult lateral. This deciduous cuspid (like the other

[1] For description of the matrix-wrench, see Part VI., p. 344.

deciduous teeth mentioned) was of a darker hue than the adult teeth, but as its extraction would have left a space, this tooth was bleached and retained. All these previous operations having been completed, the operation upon the unerupted cuspid, twelve years overdue, was begun.

The Elevating Operation.—It was hoped that after extraction of the deciduous upper cuspid its delinquent successor would gradually move down through the gum and take its proper place with the adjacent teeth; but after waiting several months without any sign of a change of position I determined to compel the cuspid to move down and out. An incision was made into the tumor-like prominence under the lip, revealing thereby the point of the cusp of the delinquent tooth. It was found to be pointing diagonally through the outer plate of the alveolus at a place about five-eighths of an inch above a line drawn on a plane with the cutting edge of the lateral incisor. Cutting a small piece of the alveolar process away disclosed the exact position of the crown; it was lying about twenty-three degrees from a perpendicular line, the crown pointing in the direction of the angle between the ramus and the body of the lower jawbone. The tooth being fully developed, it was evident that that was the cause of its stationary condition. Besides being in a diagonal position, the tooth had turned on its long axis about forty-five degrees, so that if it were drawn down to line without turning it, the tooth would have stood sidewise to view.

Having dissected away the alveolar process sufficiently to expose the tooth, one-sixteenth of an inch in width, from the point of the cusp to the middle of the crown, a pit was drilled into this side of the tooth for a screw-hook to be caught into to draw the tooth to its proper place.

Fig. 1407 illustrates the beginning of the first stage of the elevation of the cuspid by a gold mechanism consisting of a bridge-piece, a screw-hook, and a nut. The bridge was so swaged that it rested along the lingual and labial walls of the bicuspids and lateral; it also rested lightly upon the gums. To this plate was soldered a stiff piece of round wire that curved upward and arched widely over the cuspid; it, however, rested upon the tooth as represented in the figure. Although some parts of this mechanism

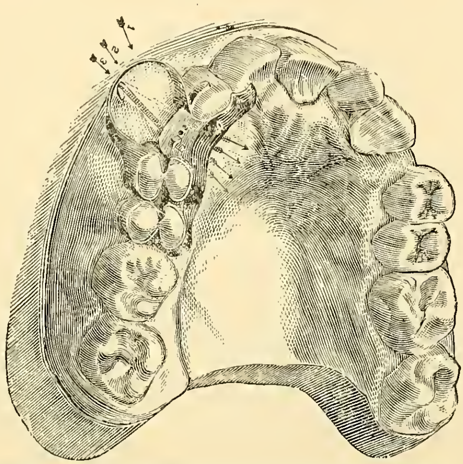


FIG. 1407.—First stage of the elevating operation (A).

fitted the gums and teeth, one part bridged over the interdental space and did not touch the gums. In other words, it spanned the space between the first bicuspid and the lateral, the bridge proper being on a plane with the ends of the teeth. In the middle part of this bridge there was a row of four holes for shifting the screw in different parts of the operation. The entire mechanism was held in place by hooking the screw into the pit in the cuspid and tightening it in place by the nut upon the lower side of the bridge. By this nut the screw was gradually drawn downward, pulling the tooth with it. The office of the arched wire over the tooth was to prevent the bridge from rocking when thus acted upon.[1]

The mechanism having been applied, a watch-key (fitting the nut) was given to the patient to slightly tighten it upon the tooth each morning and evening. As the patient was very intelligent, she kept (by my request) a record of the revolutions of the nut. This will be again referred to later in the form of a table.

The tooth gradually moved downward and posteriorly. (See dotted line, Fig. 1404.) The curve in the movement of the tooth was caused by shifting of the screw from one hole to another in the bridge. When the crown was brought in

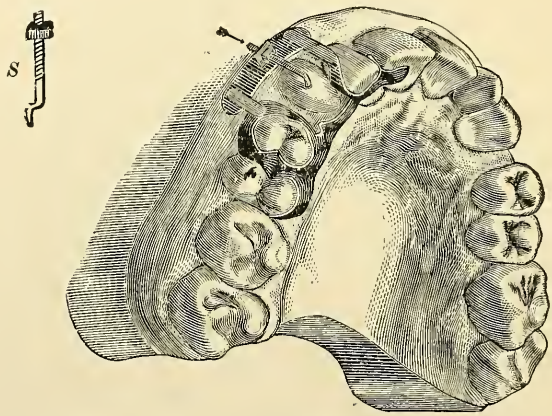


FIG. 1408.—The second elevating mechanism used (A).

contact with the bridge this mechanism was removed and replaced by another, which, instead of drawing upon the tooth from below, pushed downward upon it from above.

Fig. 1408 illustrates the case at this time with the new mechanism applied. The down-pushing screw acted by

[1] I have sometimes found it necessary to solder to the top of the wire arch a broad piece of plate, to hold a cushion (piano felting) between it and the gum, so as to protect the soft tissues from injury. This is only necessary where the wire arch cannot be made to rest directly upon the tooth.

a nut operated against a projection from a cross-piece (strip of plate) soldered to the ends of two standards projecting upward from a skeleton bridge-plate (gold) made somewhat similar to the one used in the first mechanism. Behind this cross-piece was a cushion made of piano felting (about one-half of an inch in width and one-eighth in thickness) to prevent injury to the gums. The lower end of the screw S was bent to form a double right angle to enable it to enter and rest securely in the pit in the tooth.

After the tooth had been moved downward sufficiently it still required to be slightly turned. The patient, however, was so satisfied with the improvement already made that the turning was postponed to enable her to take a trip; after which a long illness from fever and subsequent moving out of the city prevented taking up the case for so long a time that she got out of the notion and never had the tooth turned.

Skeleton Mechanisms.—Fig. 1409 illustrates an operation for the elevation of a right upper cuspid. The mechanism was formed and applied as follows: to a clamp-band, J, F

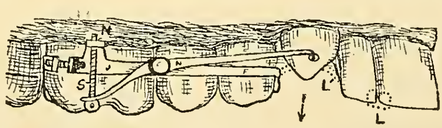


FIG. 1409.—Drawing down a cuspid by a lever operated by a screw (A).

(upon the two right upper bicuspids and first molar), was loosely riveted a lever, N, at a point "off against" the molar and second bicuspid. This lever was operated by a screw, S, that projected through a hole in its posterior or shorter arm, and caught into a nut, N, on the end of an upright piece, soldered to the upper side of the anchor-band as represented. When the screw S was advanced upward its globular head raised the posterior end of the lever and lowered its anterior end, which, being bent hook-like, caught into a pit in the cuspid, and drew the tooth down.

To prevent the bicuspids from being forced deeper into their sockets by reaction of the lever upon them, a resisting-arm was soldered to the anterior part of the band, and projected forward along the lingual side of the dental arch, and hooked upon the ends of the right central and lateral as represented in the figure by dotted lines, L, L. Although this mechanism seems simple to operate, it required careful management to make it accomplish the best results that it was capable of accomplishing.

Fig. 1410 illustrates an operation for drawing an arrested left upper cuspid down to line by levers operated by a screw.

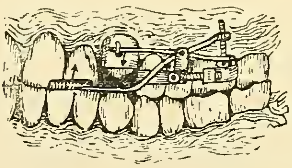


FIG. 1410.—Elevating a cuspid by scissor-like levers operated by a screw.

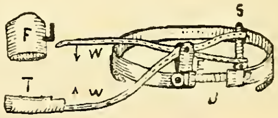


FIG. 1411.—The mechanism independent of the teeth (A).

Fig. 1411 represents the mechanism independent of the teeth. It consists of two levers, W, W (riveted together, midway), and a working-screw, S, a platinum ferule, F, and a gold clamp-band, B. These levers acted mutually like the two blades of a pair of scissors, and are hinged between ears, E, soldered upon the anterior nut of the anchor-band B. Upon the end of the lower lever there is a saddle-trough, T, to hold it upon the incisors. The levers W, W are operated by the screw S drawing the ends of the shorter arms toward each other. The screw-cut hole for the screw is in the upper lever.

In applying this mechanism the ferule is first cemented upon the cuspid with phosphate of zinc, after which the anchor-band is placed around the two left bicuspids and first molar. The levers are then so bent that the end of the upper arm rests in the hook on the ferule, the other arm being so formed that it rests upon the cutting edges of the lateral and central. The power is applied by turning the screw S upward; this not only causes the shorter arms of the levers to approach each other, but also causes the longer arms to do likewise. As the lower lever is held stationary the upper one moves downward, bringing the tooth with it.

Of course the force upon the lateral and central (by the lower arm) must necessarily be equal to that upon the cuspid, but, further than causing the sockets of the former to become slightly sensitive, little or no disturbance takes place. Even if these teeth should slightly sink into their sockets (which they are seldom found to do) they would soon return when liberated.

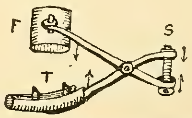


FIG. 1412.—Crane mechanism for elevating a cuspid (A).

Fig. 1412 represents a mechanism for elevating an upper central. This has no independent anchor, but of course it has an anchorage. The mechanism consists of a platinum ferule, F, gold saddle-trough, T, and two gold scissor-like levers hinged by a rivet and operated by a screw, S, which connect the ends of their shorter arms. Upon the end of the lower long arm is soldered the trough T, and upon the end of the upper long arm is soldered a small gold ring. The ferule F has an upright hook made of gold wire about the size of a pin, to connect the upper lever with the ferule. The lower one is loosely riveted to the trough T.

To apply this mechanism the ferule is first cemented upon the delinquent tooth with phosphate of zinc, after which the ring of the upper lever is caught upon the hook, while the trough on the end of the lower lever is caught upon the two adjacent teeth. The mechanism being ready to be operated, the screw S is turned so as to draw the short arms of the levers toward each other, and then the crane is swung under the lip out of sight. The upper lip and cheek hold this power-giving part comparatively steady between them and the gums.

To prevent the saddle-trough T from slipping along the ends of the teeth, two partitions are soldered transversely within it, which project upward between them. The success of this mechanism depends upon the firmness of the ferule F on the cuspid. To secure the greatest adhesion, all the visible part of the crown of the cuspid must be taken advantage of by the cement. The force should not be applied to the tooth until the cement has set very hard; even then the force should be applied very gently. I do not regard this mechanism equal to the one next to be described.

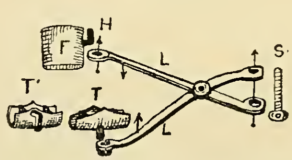


Fig. 1413.—Crane mechanism for elevating upper cuspids (A).

Fig. 1413 represents a crane mechanism that is similar to the one last described, but it has a much easier action. Like the other, the levers L, L are capable of swinging back and forth like a crane. One lever swings upon the upright hook H (on the ferule F), the other upon a downwardly projecting stud soldered to the lower side of the saddle-cup T. (The two patterns represented are too short.) The relation of these different parts of the machine is clearly shown in the figure.

In applying the mechanism the ferule is first so arranged and cemented upon the short tooth that the hook H projects upward and in front of its labial surface; then the trough is cemented upon the lateral and bicuspid. After the cement has set hard, the ring end of the upper long arm is caught upon the upright hook on the ferule, and at the same time the ring on the lower long arm is placed upon the pin that projects from the saddle-cup. The screw S is then placed in the rings on the ends of the short arms of the levers and turned until they are made to approach each other and cause the long arms to act upon the delinquent tooth. To change a trough into a saddle-cup partitions are made; these are to prevent it from sliding along the ends of the teeth adjacent to the one to be elevated. These partitions, which are made of thin plate about an eighth of an inch in breadth, are soldered transversely to the trough. In use these partitions not only project between the teeth, but crowd upon those adjacent to the one to be elevated in such a way that they will move away from the delinquent tooth. When the mechanism needs retightening the levers are swung outward like a crane from under the lip, the screw tightened, and then they are returned and left between the lip and cheek. To prevent these levers from irritating the soft tissues, every part is made very smooth, and the whole is curved to correspond with the contour of the gum.

Table Showing the Rate of Elevation of Teeth.[1]—As before mentioned in this treatise, I occasionally request patients to keep a record of the revolutions of nuts and screws, not only for scientific purposes, but to know whether or not the

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[1] See also Part IV., p. 160.

mechanism remains firm upon the teeth. When the machine works properly the rate of motion per day does not greatly vary. In the B—— case (Fig. 1404) the accounts of the movements were accurately kept from day to day, thus furnishing a complete table (excepting a few times when the patient forgot to record) covering a period of fifty days.

The table shows that there were nearly as many quarter-revolutions of the screw as there were half-revolutions, and that the range of distances that the tooth moved varied from $\frac{1}{160}$ to $\frac{2}{160}$ of an inch in every twelve hours, an average of about $\frac{7}{736}$ of an inch every twelve hours, or $\frac{7}{368}$ of an inch in a day. Some of the variations in the rates given are attributable to imperfections in the action of the mechanism. There are, however, legitimate variations when the working of a mechanism is perfect; these are tissue-variations. But further investigation will be necessary in order to fully explain all the causes of variations found in elevating teeth, as well as those found in the lateral movements of teeth. At present it seems probable that some of the variations were partly due to differences in the systemic conditions of patients as well as in the physiological action of the different tissues. However, the variation of rates, though greater in operations for elevating teeth than in operations for the lateral movement of teeth, has been sufficiently investigated to show that the same physiological law underlies both. It is also evident that this irregularity is no greater than we find throughout nature, all of which variations have causes that interfere with the laws sufficiently to prevent universal exactness in results. This statement, however, is not intended to give the impression that is advanced by some dentists (who have not studied the subject), that because nature is not exact there is no law.

TABLE SHOWING THE RATE OF MOVEMENT OF THE TOOTH EVERY TWELVE HOURS FOR NEARLY FIFTY DAYS.

ORDER OF DATES.	MORNING.		PARTS OF AN INCH.	EVENING.		PARTS OF AN INCH.
1st day	$\frac{1}{2}$	of revolution	$\frac{2}{160}$	$\frac{1}{4}$	of revolution	$\frac{1}{160}$
2d "	$\frac{1}{2}$	"	$\frac{2}{160}$	$\frac{1}{2}$	"	$\frac{2}{160}$
3d "	$\frac{1}{4}$	"	$\frac{1}{160}$	$\frac{1}{4}$	"	$\frac{1}{160}$
4th "	$\frac{1}{2}$	"	$\frac{2}{160}$	$\frac{1}{2}$	"	$\frac{2}{160}$
5th "	$\frac{1}{4}$	"	$\frac{1}{160}$	..		...
6th "	$\frac{1}{4}$	"	$\frac{1}{160}$	$\frac{1}{4}$	"	$\frac{1}{160}$
7th "	$\frac{1}{4}$	"	$\frac{1}{160}$	$\frac{1}{4}$	"	$\frac{1}{160}$
8th "	$\frac{1}{2}$	"	$\frac{2}{160}$	..		...
9th "	$\frac{1}{2}$	"	$\frac{2}{160}$	$\frac{1}{4}$	"	$\frac{1}{160}$
10th "	$\frac{1}{4}$	"	$\frac{1}{160}$	$\frac{1}{2}$	"	$\frac{2}{160}$
11th "	$\frac{1}{4}$	"	$\frac{1}{160}$	$\frac{1}{2}$	"	$\frac{2}{160}$
12th "	$\frac{1}{4}$	"	$\frac{1}{160}$	$\frac{1}{4}$	"	$\frac{1}{160}$
13th "	$\frac{1}{2}$	"	$\frac{2}{160}$	$\frac{1}{4}$	"	$\frac{1}{160}$
14th "	$\frac{1}{4}$	"	$\frac{1}{160}$	$\frac{1}{2}$	"	$\frac{2}{160}$
15th "	$\frac{1}{4}$	"	$\frac{1}{160}$	$\frac{1}{2}$	"	$\frac{2}{160}$
16th "	..		...	$\frac{1}{2}$	"	$\frac{2}{160}$
17th "	$\frac{1}{2}$	"	$\frac{2}{160}$	..		...
18th "	$\frac{1}{2}$	"	$\frac{2}{160}$	$\frac{1}{4}$	"	$\frac{1}{160}$
19th "	$\frac{1}{2}$	"	$\frac{2}{160}$	$\frac{1}{2}$	"	$\frac{2}{160}$
20th "	..		...	$\frac{1}{2}$	"	$\frac{2}{160}$
21st "	$\frac{1}{4}$	"	$\frac{1}{160}$	$\frac{1}{4}$	"	$\frac{1}{160}$
22d "	..		...	$\frac{1}{2}$	"	$\frac{2}{160}$
23d "	$\frac{1}{4}$	"	$\frac{1}{160}$	..		...
24th "	$\frac{1}{2}$	"	$\frac{2}{160}$	$\frac{1}{2}$	"	$\frac{2}{160}$
25th "	$\frac{1}{2}$	"	$\frac{1}{160}$	$\frac{1}{2}$	"	$\frac{2}{160}$
26th "	$\frac{1}{2}$	"	$\frac{2}{160}$	$\frac{1}{2}$	"	$\frac{2}{160}$
27th "	$\frac{1}{2}$	"	$\frac{2}{160}$	$\frac{1}{2}$	"	$\frac{2}{160}$
28th "	$\frac{1}{2}$	"	$\frac{2}{160}$	$\frac{1}{2}$	"	$\frac{2}{160}$
29th "	$\frac{1}{4}$	"	$\frac{1}{160}$	$\frac{1}{2}$	"	$\frac{2}{160}$
30th "	$\frac{1}{2}$	"	$\frac{2}{160}$	$\frac{1}{2}$	"	$\frac{2}{160}$
31st "	$\frac{1}{2}$	"	$\frac{2}{160}$	$\frac{1}{2}$	"	$\frac{2}{160}$
32d "	$\frac{1}{2}$	"	$\frac{2}{160}$	$\frac{1}{2}$	"	$\frac{2}{160}$
33d "	$\frac{1}{4}$	"	$\frac{1}{160}$	$\frac{1}{2}$	"	$\frac{2}{160}$
34th "	$\frac{1}{4}$	"	$\frac{1}{160}$	$\frac{1}{4}$	"	$\frac{1}{160}$

TABLE SHOWING THE RATE OF MOVEMENT OF THE TOOTH EVERY TWELVE HOURS FOR NEARLY FIFTY DAYS (*Continued*).

ORDER OF DATES.	MORNING.	PARTS OF AN INCH.	EVENING.	PARTS OF AN INCH.
35th day	$\frac{1}{4}$ of revolution	$\frac{1}{160}$	$\frac{1}{4}$ of revolution	$\frac{1}{160}$
36th "	$\frac{1}{2}$ "	$\frac{2}{160}$	$\frac{1}{4}$ "	$\frac{1}{160}$
37th "	$\frac{1}{4}$ "	$\frac{1}{160}$	$\frac{1}{2}$ "	$\frac{2}{160}$
38th "	$\frac{1}{2}$ "	$\frac{2}{160}$	$\frac{1}{2}$ "	$\frac{2}{160}$
39th "	$\frac{1}{2}$ "	$\frac{2}{160}$	$\frac{1}{4}$ "	$\frac{1}{160}$
40th "	$\frac{1}{4}$ "	$\frac{1}{160}$	$\frac{1}{4}$ "	$\frac{1}{160}$
41st "	$\frac{1}{4}$ "	$\frac{1}{160}$	$\frac{1}{2}$ "	$\frac{2}{160}$
42d "	$\frac{1}{4}$ "	$\frac{1}{160}$	$\frac{1}{4}$ "	$\frac{1}{160}$
43d "	..	...	$\frac{1}{2}$ "	$\frac{2}{160}$
44th "	$\frac{1}{4}$ "	$\frac{1}{160}$	$\frac{1}{2}$ "	$\frac{2}{160}$
45th "	$\frac{1}{2}$ "	$\frac{2}{160}$	$\frac{1}{4}$ "	$\frac{1}{160}$
46th "	$\frac{1}{4}$ "	$\frac{1}{160}$	$\frac{1}{4}$ "	$\frac{1}{160}$
47th "	$\frac{1}{4}$ "	$\frac{1}{160}$	$\frac{1}{2}$ "	$\frac{2}{160}$
48th "	$\frac{1}{4}$ "	$\frac{1}{160}$	$\frac{1}{4}$ "	$\frac{1}{160}$
49th "	$\frac{1}{4}$ "	$\frac{1}{160}$	$\frac{1}{4}$ "	$\frac{1}{160}$
50th "	$\frac{1}{2}$ "	$\frac{2}{160}$	$\frac{1}{2}$ "	$\frac{2}{160}$
No. of days, 50	No. of ¼ revolutions, 24 " ½ " 22	Approx. av. of rev. per 12 hrs. $\frac{17}{60}$	No. of ¼ revolutions, 19 " ½ " 27	Approx. av. of rev. per 12 hrs. $\frac{18}{60}$

BICUSPIDS.

Section D.....................Division I.

Chap.	CXLVIII.	Elevation	of Lower	Bicuspids	by	Elastic Rubber.
"	CXLIX.	"	"	"	"	Metallic Springs.
"	CL.	"	"	"	"	Screws.

CHAPTER CXLVIII.

SECTION D....................DIVISION I.

ELEVATION OF LOWER BICUSPIDS BY ELASTIC RUBBER.

OPERATIONS FOR ELEVATION OF BICUSPIDS BY RUBBER.

THE elevation of bicuspid teeth is not often attempted; yet of all the teeth in the dental arch probably there are none more frequently found arrested in their eruptive process. Of the two jaws this condition is oftener found in the lower than in the upper, and in both arches the second bicuspids are oftener so than the first. Why elevation of lower bicuspids is so seldom attempted is because the defects in the arrangement of these teeth are not very noticeable—not sufficiently so to stimulate patients to undergo the corrective operation. The second bicuspid generally comes forth after the eruption of the first adult molar and first bicuspid, and it is only a question of space whether this tooth erupts partly or fully. If the second deciduous molar has been missing too long, the first adult molar sometimes moves forward and stands partly upon the territory of this lost (deciduous) molar; this, by narrowing the space belonging to the second bicuspid, prevents its complete eruption.

Before deciding upon any plan of corrective treatment, the social and financial circumstances, as well as the feelings of the patient, should be considered in this class of cases, as in others. If the side teeth, the cuspids and the bicuspids, are greatly jumbled and the form of the face does not permit of the arch being enlarged, extraction of some tooth or teeth may sometimes be the best treatment. If the cuspid and first bicuspid are in their proper places, extraction of the arrested tooth is generally proper, but there are conditions calling for extraction of the first bicuspid. This is so when the cuspid inclines so far that it overlaps the lateral incisor, and the bicuspid inclines anteriorly considerably. By this plan the second bicuspid and cuspid will sometimes right themselves. But if the extraction of the first bicuspid would finally leave too wide

FIG. 1414.—Elevating a lower bicuspid by elastic rubber.

a space, some other kind of operation, conducted by the use of elastic rubber, metallic springs, or screws, might be preferable to extraction. Space is the main object.

Fig. 1414 illustrates a plan of operation for elevating a right lower second bicuspid by an elastic-rubber ring stretched and tied to the ends of a little gold trough (made

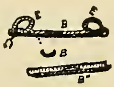

FIG. 1415.—The Mechanism (A).

of plate), serving as a bridge over the delinquent tooth. In Fig. 1415, representing the mechanism independently, E, E are the rubbers and B the bridge. In practice only one ring is used at a time; this one is stretched and tied to the ends of the bridge, after which the middle part of it is drawn through a hole in the middle of the bridge and caught upon a wire hook, S, cemented in a cavity in the tooth to be elevated.

Such a mechanism, though practicable when it does not interfere with antagonism, needs to be closely watched to prevent too rapid elevation of the tooth.

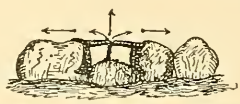

FIG. 1416.—Elevating a right lower second bicuspid by elastic rubber.

Fig. 1416 represents a similar operation upon a right lower second bicuspid by a similar mechanism. Fig. 1417 represents the metallic part of the mechanism; the length of the bridge corresponding nearly with the distance between the teeth adjacent to the delinquent tooth, it requires some force to place it there. The bridge is prevented

FIG. 1417.—Bridge for a single rubber ring (A).

from working too far down by a wire soldered to each end. These wires rest in the sulci of the adjacent teeth; they also serve as hooks upon which to catch the rubber ring. After it (the rubber) is thus caught, the middle part is drawn through a hole in the bridge (see dotted line) and caught upon a hook set in the crown of the delinquent tooth.

This modification is superior to the one last described, because it rests firmer upon the anchorage teeth and at the same time widens the space and liberates, somewhat, the tooth to be elevated.

To each end of this bridge, consisting of a narrow strip of gold plate of sufficient length to extend across the space over the delinquent tooth, is soldered a rectangular piece of plate bent so as to curve around the approximal wall of the adjacent crowns; they do not only fit closely, but when both are wedged against the adjacent teeth they push them farther apart if the form of the teeth will permit.

This mechanism is simple, and when the grip is firm it is practicable in cases where the antagonism of the teeth permits it to be worn. A rubber ring cut from the tubing would be too large. A proper size may be improvised by punching it from a thick piece of sheet-rubber. The hole may be punched by an ordinary coffer-dam punch, and the periphery cut by scissors, or it may be punched by a small tube sharpened at one end.

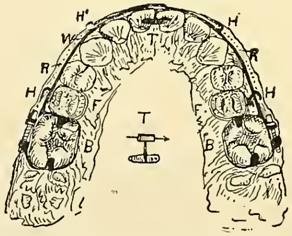

FIG. 1418.—The long-band-and-rubber plan of elevating lower bicuspids (A).

Fig. 1418 illustrates a plan of operation for elevating two second bicuspids by a long-band and two elastic-rubber rings. The rubbers draw over hooks soldered to the long-band, W, made of round gold wire, attached to a molar on each side by clamp-bands, B. The long-band is curved upward at points where the teeth to be elevated are situated, so that these parts will be out of the way of the "short tooth," also out of the way of the antagonizing teeth.

On the long-band at points over each tooth to be elevated are soldered the small hooks H, H. A little way anterior to these are soldered to the long-band other hooks, H′, H′. Over each of the former hooks plays one of the rubber rings previously caught upon little knobs, K, on thin ferules cemented upon the arrested teeth. The rubber on each side is made taut by drawing it over the hook H and stretching it forward and catching it upon the hook H′. These rubber rings are represented in the figures by dotted lines. (See also Fig. 1419, representing a side view.) To hold the anterior part of the long-band steady, a T-hook is soldered to it to catch upon the centrals as shown.

FIG. 1419.—Side view showing the application of the rubber ring to the tooth.

The only drawback to this plan is the increased crowding of the teeth caused by the thickness of the ferules and the clamp-bands between the teeth. To reduce this drawback to a minimum, the parts of the ferules and long-bands that lie in the approximal spaces are made thin, and are so formed that they will ride one above the other, thus presenting but one thickness. This mechanism is easily convertible to another, that will act intermittently, by using screws instead of elastic rubber. These screws are placed longitudinally with the wire long-band, and operate through smooth-bore nuts soldered to this wire, and threaded nuts soldered to the anchor-bands.

This machine, like any other, is impracticable if the pinch upon the arrested tooth, by crowding of those adjacent to it, is not sufficiently weakened to liberate the tooth.

CHAPTER CXLIX.

ELEVATION OF LOWER BICUSPIDS BY METALLIC SPRINGS IN COMBINATION WITH AND WITHOUT PLATES.

TWO OPERATIONS BY WIRE SPRINGS HAVING PLATE-ANCHORS.—OPERATIONS BY WIRE SPRINGS WITHOUT PLATES.

OF all mechanisms for elevating teeth, none are so risky as those in which the engines of force are metallic springs, because the action of such engines is often difficult to control. However, as there have been devised several kinds of mechanisms that operate by such springs, a description of some of the best will be presented, although the author hesitates to recommend them. In regard to the

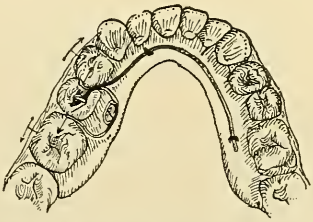

FIG. 1420.—Elevating a left lower second bicuspid by spring-wire.

relative value of the different kinds of springs, the reader is referred to the consideration of the subject of springs, in other parts of this work. (See Index.)

Fig. 1420 illustrates a plan of operation for elevating a left lower second bicuspid by a mechanism devised in 1885.[1]

[1] A similar mechanism was devised about this time by Drs. Talbot and Austin. (See Figs. 1422 and 1423.)

This clumsy and somewhat risky mechanism consists of two gold springs anchored to a U-shape hard-rubber plate fitted to the gums on the lingual side of the dental arch. Upon the right half of the plate is fixed one end of the longer wire spring, which extends anteriorly and along the arch to the opposite side, where it (the wire) curves upward over the tooth to be elevated and is caught into a staple cemented into a cavity made in the tooth. Fig. 1421,

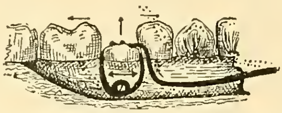

Fig. 1421.—Lingual side of the left half of the mechanism (A).

illustrating a side view of the same case, shows this curve in the wire. The dotted line represents the form before the free end is sprung into the staple. For forcing the adjacent teeth farther apart to liberate the delinquent tooth, another (curved) wire spring is so arranged upon the plate that the arms bear oppositely against the approximal sides of the adjacent teeth. This spring is riveted to the rubber plate by a strong platinum pin.[1]

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[1] This particular spring is similar in form to one used in an operation performed several years earlier by Dr. J. F. Austin. In mechanical principle the

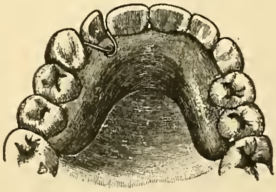


Fig. A.—Making room for a lateral incisor by a coiled spring (Austin).

springs of both mechanisms are but slight modifications of springs for widening spaces, published many years earlier by Sir John Tomes and by Mr. Morey.

Fig. A illustrates the operation by Dr. Austin for forcing farther apart an upper central and cuspid to make room for an irregular lateral.

Fig. 1422 illustrates the beginning of the first stage of an operation by Dr. Talbot.[1] The mechanism consisted of a hard-rubber plate, and a coil-spring made of steel piano-

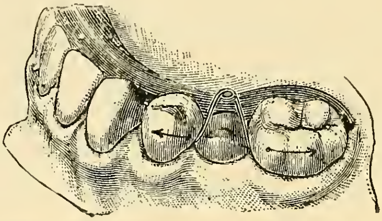


FIG. 1422.—First stage. Making space by an Austin coiled wire spring (Talbot).

wire. The application of this mechanism (designed simultaneously with, or perhaps earlier than, mine, and certainly later than a similar one devised by Dr. Austin) is so clearly illustrated that it requires but little further explanation.

The figure represents the spring in a position to force the first bicuspid and first molar farther apart to make more room for the arrested bicuspid.

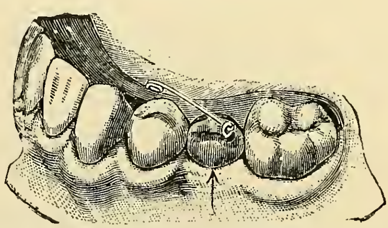


FIG. 1423.—Second stage. Elevating the bicuspid by a coiled wire spring.

Fig. 1423 represents a mechanism used for elevating the "short tooth," after sufficient room had been made. This is simply a modification of the one first presented, the main difference being in the spring, which is so arranged upon the plate that it causes a lifting force upon the delinquent tooth.

[1] Performed about 1867.

Fig. 1424 illustrates a somewhat risky operation for elevating a right lower second bicuspid by a mechanism consisting of a staple, s, and a very small elastic wire, w, having a hook upon its middle part. (See Fig. 1425.)

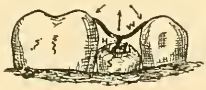


FIG. 1424.—Elevating a bicuspid by a wire-span spring.

To apply it the wire is placed so as to span the space and rest in the sulci of the teeth adjacent to the one to be elevated; its middle part is then sprung downward until the hook catches into the staple, previously cemented into a cavity in the tooth to be elevated.

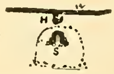


FIG. 1425.—The mechanism in detail (A).

This is a very small, simple mechanism, and when the sulci are sufficiently deep to hold the extremities of the bridge it is practicable. It should be closely watched, however, not only to note its action, but to prevent too rapid raising of the arrested tooth. To prevent the bridge-wire and hook from being swallowed if dislodged, the hook should be closed tightly upon the staple by pincers. Sometimes a loose S-form hook is practicable.

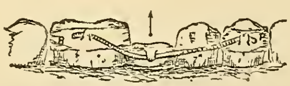


FIG. 1426.—Elevating a bicuspid by a wire side spring.

Fig. 1426 illustrates a process of raising a right lower second bicuspid by a metallic mechanism, the several parts of which are represented by Fig. 1427. These parts consist of a piece of steel wire, W, a gum-guard ring, P, and two thin ferules, B, R, one of which has ears. Each of these ferules has a hook-like appendage to hold the wire spring. The ferule R is first arranged upon and cemented to the

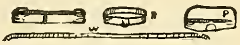
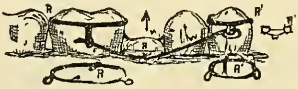


FIG. 1427.—The Mechanism (A).

delinquent tooth so that the ear-hook points downward. The other two ferules are cemented upon the adjacent teeth, the hooks pointing upward. After this cement (phosphate of zinc) has hardened the straight, delicate steel wire is sprung and caught into the three hooks on the sides of the bands (as shown in Fig. 1426), thus causing a force to be given to the middle tooth as indicated by the arrow.

The drawback to this mechanism is the crowding of the teeth by thickness of the three bands, which interferes somewhat with the liberty of action of the delinquent tooth. However, by fixing shoulders to the bands for the ends of the spring to push against the anchorage teeth they will move farther apart.



'FIG. 1428.—Elevating a bicuspid by an all-wire mechanism (A).

Fig. 1428 illustrates a plan of operation for elevating a left lower second bicuspid by a slight modification of the mechanism last represented. The object of the modification is to be rid of the crowding interference of the mechanism. The different parts are as follows: two gold-wire springs, W; two gold-wire rings, R, R′, having two eyes each; and one very thin platinum ferule, B, having two ears.

The application of this mechanism is similar to the one last explained. The ends of these lifting-springs may be soldered to the rings, similar to the attachment shown in the mechanism represented by the following figure. Sometimes the form of the crowns of the adjacent teeth will permit the two outer rings R, R to rest firmly upon them. The trouble that is liable to occur, however, by the use of this mechanism is dislodgment and too rapid raising of the tooth, requiring the operation to be closely watched.

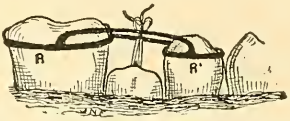


FIG. 1429.—Elevating a lower bicuspid by an arched wire spring.

Fig. 1429 illustrates a process of elevating an arrested right lower second bicuspid by a mechanism made entirely of round gold wire. It consists of two rings, R, R, and two arched spring-wires connected by a cross-wire.

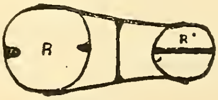


FIG. 1430.—Top view of the mechanism (A).

Fig. 1430 is a top view of this easily dislodged mechanism. To the middle of the cross-wire is tied the delinquent tooth by a string caught into a staple cemented into a cavity made in the tooth to be elevated. If it is not advisable to make a cavity, the hook may be soldered to a thin ferule, afterward cemented upon the tooth. When the neck of this tooth is much smaller than the crown the string may be tied around the tooth instead of using a hook or ferule. If the cross-wire interferes with antagonism of the opposite teeth, a thimble-crown (gold) may be worn upon some near-by tooth.

CHAPTER CL.

ELEVATION OF LOWER BICUSPIDS BY SCREWS.

OPERATIONS BY SCREWS IN COMBINATION WITH PLATES.—OPERATIONS BY SCREWS WITHOUT PLATES.

Of all the mechanisms for elevating teeth, none are so reliable and so free from doing harm as those that operate by screws, because they can be held under perfect control, not only by dentists, but also by the patients or some member of their families. These mechanisms differ widely in their construction. Some are cheap and others somewhat expensive. Although some few of the mechanisms require skill to make them, the results of their use are so satisfactory that it pays everybody concerned.

Fig. 1431 illustrates a process of elevating a left lower second bicuspid which did not erupt until late in life.

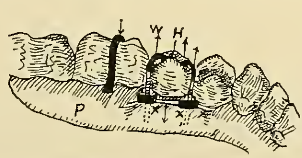


FIG. 1431.—Elevating a bicuspid by screws (A).

The mechanism consisted of a hard-rubber U-plate, P, a hook, H, and a screw-cut wire, W, bent as represented in Fig. 1432, and having upon each extremity a nut, X, X. These arms project into holes in a prominence on the plate, leaving the curved part of the wire over the top of the delinquent tooth to catch under the hook previously cemented into a cavity (made by decay) in the tooth. To operate the

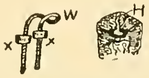


FIG. 1432.—Section showing the screws and the means of attachment to the tooth.

mechanism the nuts x, x are turned so that the curved wire lifts the hook and elevates the tooth. The plate is partly supported by a hook over the molar. The mechanism is practicable, but needlessly clumsy. I do not recommend it.

Fig. 1433 illustrates the plan of an operation for elevating a right lower second bicuspid by a screw-cut gold wire in combination with a hard-rubber plate resting upon the

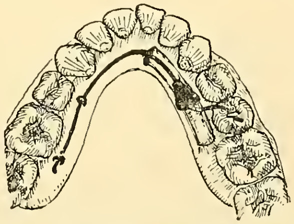


FIG. 1433.—Elevating a lower second bicuspid by a cone wedged upon a screw.

gums on the lingual side of the dental arch. The wire is anchored by staples to the left side of the plate; the other extremity, lying in a groove in the right side, curves upward over the delinquent tooth, and catches into a hook cemented in its crown as shown. To operate the mechanism a cone-shape nut is run along the threaded wire in the inclined groove. This groove descends anteriorly from the plane of the surface, posteriorly to nearly the full depth of the plate, and in such a way that the cone-nut raises the rear end of the wire and thereby elevates the tooth.

Fig. 1434 represents a side view of the case, showing the position of this cone-nut in the groove; it also shows the relation of the other parts. To prevent the plate from pressing too hard upon the soft tissues there are four ear-like lugs projecting over the teeth and bearing upon them

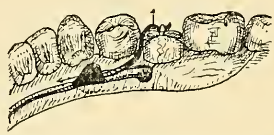


Fig. 1434.—Lingual side of the right half of the mechanism (A).

(not shown). This is a practicable mechanism, but it is not as valuable as some others to be explained later in this chapter; therefore it cannot be recommended.

Fig. 1435 represents a plan of lifting the left lower second bicuspid by a rising screw sliding in a trough. The mech-

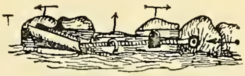


Fig. 1435.—Elevating a bicuspid by a horizontal screw (A).

anism consists of three ferules and the screw. Upon the lingual side of the anterior ferule is a threaded nut, that tilts upon a rivet connecting it with the buccal side of the ferule. Upon the same side of the next ferule is soldered a staple, and upon the same side of the third ferule is soldered in an inclined position the trough T.

The mechanism is operated by projecting the screw through the tilting-nut, thence through the staple on the middle ferule and into the lower end of the trough beyond. Continuing the advance of the screw, this end slides along up the trough, causing the middle of the screw to lift upon the middle ferule and elevate the tooth.

Fig. 1436 illustrates a side view and Fig. 1437 a top view of an operation for elevating a left lower second bicuspid by one of my older mechanisms, constructed as follows: through a threaded nut soldered to a single-tooth clamp-band on the tooth plays an upright screw, C, that bears upon

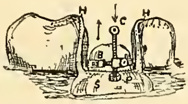


FIG. 1436.—Elevating a second bicuspid by a screw (A).

a small saddle, S, suspended by wire hooks, H, H, resting in the sulci of the adjacent teeth; the screw when operated is forced into a pit, P, made in the saddle. This is a practicable machine, but the saddle is liable to cause pain un-

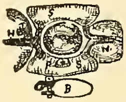


FIG. 1437.—Top view of the case.

less it rides almost clear of the gums. The object of the saddle is to steady the mechanism by contact with the sides of the adjacent teeth.

At the present time I do not use a saddle, nor do I use clamp-bands upon delinquent teeth; side wires, and a broad platinum ferule cemented upon the tooth, are superior. The ferule is superior because firmer and less bulky.

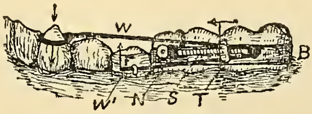


FIG. 1438.—Elevating a left lower bicuspid (A).

Fig. 1438 illustrates a plan of operation for elevating a left lower second bicuspid by a hair-pin mechanism. Fig. 1439, representing this machine, consists of a clamp-band, B, wire arms, W, W′, nut, N, ferule, F, and screw, S. Upon the buccal and plain side of the clamp-band is soldered the smooth-bore nut, N; through this the screw projects into a threaded moving nut, with two small rings soldered oppositely upon it. Through these rings slide the wire arms

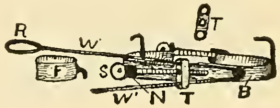


FIG. 1439.—The mechanism, independent of the teeth (A).

W, W′, the bow of which is riveted to the clamp-band. To apply the mechanism the thin platinum ferule F, having a hook soldered to it, is cemented upon the tooth to be elevated, after which the clamp-band is screwed snugly upon the neighboring molars, leaving the arm W′ to rest under the hook, while the other arm rests beyond, in the sulcus of the first bicuspid. This mechanism is operated by drawing the sliding nut anteriorly by turning the screw, causing the extremities of the arms W, W′ to approach each other, and thus elevating the tooth.

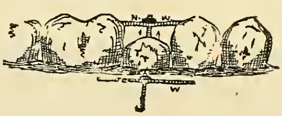


FIG. 1440.—Elevating a left lower bicuspid by a screw and bridge (A).

Fig. 1440 illustrates a plan of elevating a left lower second bicuspid by a mechanism consisting of a screw and a straight piece of wire, W, having a ring soldered to the middle part to strengthen it. The screw has a foot on one end and a nut upon the other. In use the foot is cemented into a cavity in the delinquent tooth. The bridge which spans over the tooth to be elevated rests upon the adjacent teeth, and serves for holding the screw, which when tightened upon by the nut elevates the tooth.

The object of cementing the screw into a cavity instead of using a ferule (cemented) upon it is to avoid increasing the bulk of the tooth. A very thin ferule can, however, sometimes be used without materially increasing the crowding. But neither ferule nor cavity is without faults.

One disadvantage of this mechanism is the difficulty of so applying it that the screw and nut will not interfere with the antagonism of the two dental arches. In fact it may be said that it is only practicable when the opposing tooth is missing.

Of all operations for the correction of irregular teeth those for the elevation of bicuspids are the least satisfactory because of the interference of the teeth of the opposite jaw and the teeth adjacent to those operated upon. Taking all these disadvantages into consideration, there is, perhaps, no operation more advisable than that of forcing the adjacent teeth away from the arrested tooth and holding them steady until nature elevates the middle one.

LOWERING THE TEETH.

SECTION E....................DIVISION I.

CHAP. CLI. Lowering Teeth in their Sockets by Application of Force.

CHAPTER CLI.

SECTION E.......................DIVISION I.

APPARENT SHORTENING OF TEETH BY FORCING THEM FARTHER INTO THEIR SOCKETS.

TEETH CAN BE FORCED DEEPER INTO THEIR SOCKETS, BUT IT MAY NOT ALWAYS BE WISE TO DO IT.—TIME NECESSARY FOR ITS ACCOMPLISHMENT VARIES.—HEALTHY AND UNHEALTHY SOCKETS.—TEETH THAT OUGHT TO BE LOWERED, AND THOSE THAT SHOULD NOT.—CAUSES OF "TOO LONG" TEETH.—OPERATION BY RUBBER DAM.—REFERENCE TO OTHER OPERATIONS BY SCREWS IN COMBINATION WITH AN INTERDENTAL SPLINT.—RETAINING TEETH AFTER THEY ARE CORRECTED.—SHORTENING TEETH BY GRINDING.—DANGER OF IRREGULARITY OF TEETH FROM IMPRUDENT WEDGING FOR GAINING SPACE.—CORRECTED IRREGULAR TEETH SHOULD NEVER BE WEDGED.

WHEN teeth erupt so far that they interfere with other teeth or are unsightly, they can be improved by shortening them by grinding, or by pressing them into their sockets. In Part XII. the advantages of correction of teeth by grinding was extensively considered, and in Part XIV. the subject was again discussed; therefore we will now consider only the question of sinking teeth deeper by force.

That a tooth can be forced into its socket, whether the socket is healthy or unhealthy, whether the tooth is in its proper relation to the outline of the alveolar ridge or has, from some cause, risen in its socket, no person versed in dentistry will deny; but whether the "shortening" of a tooth by forcing it farther into its socket is proper may be a question. The length of time necessary to lower teeth in their sockets depends somewhat upon the circumstances of the case. When the roots are not fully formed they can be depressed more easily than when they are fully developed. At this time the pulp canal is open at the ends like a tube, and the pulps, which are partly within and partly without the bony chamber, are large, soft, and yielding; the bony sockets are also more roomy, thus enabling the teeth when pressed upon to more easily sink into the sockets than would fully developed teeth in completed sockets that are not so roomy. While normally erupted teeth can be depressed in their sockets, whether healthy or diseased, it may not always be proper, because such lowered teeth are very liable to rise to their former positions. To sink or to press back a tooth that has been mechanically started from its socket, however, is quite a different matter from pressing a normally erupted tooth into a healthy socket, for such teeth can be easily made to remain there. But this depends somewhat upon the number of teeth operated upon, the greater the number the greater being the difficulty. In this chapter we shall confine our remarks to single-tooth cases, leaving the consideration of the question of sinking groups of teeth, especially the lower incisors, for Part XIX., Chapter CLXXIV.

Cases in which single teeth have started from their sockets are found to be as common as single teeth that normally erupt too far. Groups of teeth that stand high from excessive alveolar tissue are more common.

The "elongation" of single teeth may arise from hard blows; application of improper clasps; wrong application of force, in attempts at correction of irregularities of the teeth; and from too long wedging for separation of teeth to make it easier to fill cavities between them. The latter evil, however, may not show itself for months after the operation. Teeth that are wedged after having been turned in regulating them are very liable to be disturbed.[1]

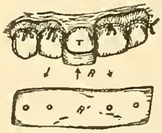


FIG. 1441.—Lowering a central by sheet-rubber (old plan).

Fig. 1441 illustrates an old plan of lowering a single tooth, the right upper central incisor. This was treated by a piece of sheet-rubber stretched over the tooth and tied with strings to the necks of the neighboring teeth as shown. The drawback of this plan is the liability and almost certainty of elevating the teeth adjacent to the one to be lowered, consequently this plan cannot be recommended.

Another plan of lowering a tooth is to use some kind of anchor that will firmly embrace several teeth, and then connecting the tooth with this anchorage by rubber.

A hard-rubber box-plate would serve well as an anchor, but a row of caps soldered together, or a long trough made of gold plate swaged to fit a considerable part of the dental arch, is superior. It should be cemented to teeth on each side of the one to be lowered. If the tooth be acted upon by a screw projecting through a bridge-like part, the

---

[1] It may be set down as a fact that it is risky to wedge a tooth (for filling) that has been moved to correct an irregularity.

result is more satisfactory than by elastic materials. In all these plans the force must, of course, be in the direction of the apex of the root.

A gripping hard-rubber box-plate fitting over all or nearly all the teeth excepting the one that is to be lowered, the plate being cut away around the tooth so as to leave only a bridge for a short gold screw to project through, would be a clumsy but practicable anchor, if it be firmly fixed upon the teeth.

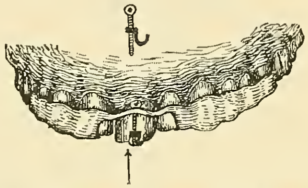


FIG. 1442.—Lowering a central by a screw (A).

Fig. 1442 illustrates an operation for lowering a left upper central by one of my favorite plans. The mechanism used in this case consists of two swaged troughs resembling splints, covering several teeth on each side as far back as the first molars. These troughs are connected by two stiff pieces of wire, through one of which projects a screw, upon which is a hook that is caught over the edge of the tooth to be depressed as shown. The tooth is acted upon by turning this screw by a lever-key placed in a hole in its spherical head. The figure shows this plan so plainly that it is not necessary to further explain it.

The anchor that consists of a row of cups, before referred to, connected by a wire or a narrow strip of plate (soldered), is sometimes preferable, because less clumsy. Single teeth may generally be retained in place by the same mechanisms.

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