

Fixed Bridges Constructed in Screwéd Sections.

A Method which Eliminates the Necessity for Paralleling
between the Bridge Supports.

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The idea of this method of construction suggested itself to me many years ago in connection with a broken bridge which I had to repair. As a method of repair, it was demonstrated by me at the meeting of the Swedish Dental Society on the 4th November 1925 and was afterwards published in its journal (No. 1, year 1926). Even then, however, I had realized the wider possibilities for the use of this method. I found that it was possible, by means of similar screw anchorages, to construct a large continuous fixed bridge in sections, in cases where the supporting teeth were far out of parallel. The above-mentioned article was concluded with the statement: "This method also affords extended facilities for constructing a fixed bridge in cases where it had previously been found necessary to resort to a removable construction, notably where paralleling between the supporting teeth could not be obtained. The bridge is then made in several sections with such "bars" inserted in the material and screwed together from the front side. Each part is cemented in the mouth separately, whereupon the sections are connected with one another in the manner above described. Not till then are the facings cemented and are beveled at the cutting edge in the usual way".

I considered that I had thus stated all that need be said about the method. But, as cases of complicated fractures in the body of the bridge were being referred to me in increasing numbers

and in all kinds of variations, and as I had regularly adopted this method myself as soon as the slightest doubt arose of obtaining paralleling between the bridge supports, I have, after much prompting, considered it warranted to give a renewed and more detailed account of my method.

As its technique is entirely based on, and practically coincides with, the method of repair, I must begin by giving a summary of the latter.

Let us suppose that a case has arisen like that shown in Fig. 1, and that a fracture has occurred between 1/1, but that the facings are intact. If the abutments on 3/3 are well made and have not worked loose from the roots owing to the fracture of the bridge

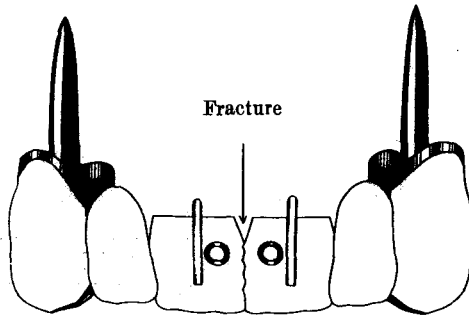


Fig. 1.

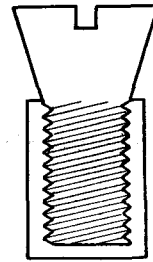


Fig. 2.

itself, or if the bridge in question forms an integral part of a larger bridge, it will be found desirable to fix the pieces to one another by screwing them together in some way, without having to remove the entire bridge from the mouth.

When, in 1923, the first repairs were made in this manner, I had to get my screws made by a watchmaker and to procure, through him, special drills and screw-cutting tools. Bryan's set of repairing tools was obviously unsuitable for my purpose, as the dimensions of the screws and screw-taps were too small to withstand the pressure of mastication. Shortly afterwards, however, *Haderup's screw* was brought to my notice: I adapted it for my method and used it for several years, as it enabled me, in most cases, to manage without special tools.

The procedure is briefly as follows. With a "Joe Dandy disc", a longitudinal groove is made in the facing from the labial surface across the tube in Steele's facing — (I have assumed that the bridge in question is provided with Steele's facings, as they seem

to be most frequently used; but the technique is essentially similar for platinum-pin facings). This groove is carried down through the porcelain until the gold in the tube shines through or is cautiously exposed. With an enamel chisel inserted into the groove, the two halves of the facing are then loosened by a gently rocking movement of the instrument. When the backing has been cleared from remnants of cement, a hole is drilled from the labial surface straight through the backing and the material behind it, as shown by Fig. 1. The drill is held at right angles to the plane of the backing (the diameter of this hole must be large enough to allow the screw to pass without binding —, whereupon the screw head is lowered as far as the thickness of the material permits.

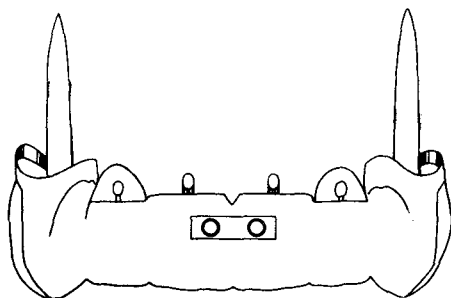


Fig. 3.

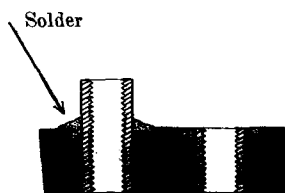


Fig. 4.

On the palatal surface a recess is now cut in both teeth, as shown by Fig. 3. This recess having been well oiled, one of the screws is screwed in from the labial surface into its cylinder, which is held on the palatal side and is tightened so that the latter is firmly fixed. The same procedure is now repeated with the other screw. Model wax is thereupon heated and is pressed palatally over the cylinders, so that the recess is filled; and, when the wax has cooled, the palatal outline is trimmed. The small cylinders then protrude from the wax, as shown in Fig. 4. A little groove is thereupon sunk in the wax round each cylinder (see Fig. 4). A small tray, fitting in between the two cuspid teeth, is now made out of tinfoil, filled with impression plaster and raised towards the palatal surface. When the plaster has hardened, the screws are first loosened from the labial surface, whereupon the tray is gently removed together with the wax inlay fixed in the plaster by the two protruding cylinders. The tinfoil is now removed, black-lead of suitable thickness is screwed up into the tubes, in order to prevent

the gold from flowing up into the threads, casting investment is brushed on the other wax surfaces, and casting proceeds in the usual manner.

When the casting has been made, hard solder is flowed round the tubes on the palatal surface of the inlay in the small grooves, as indicated by the arrow in Fig. 4.



Fig. 5.

The projecting part of the cylinders is ground off with a Joe Dandy disc, the inlay is laid in the niche filled with cement, whereupon the screws are tightened from the labial surface of the backings. When the cement has hardened, the screw heads which may possibly protrude from the recesses as well as the palatally projecting screw-ends are ground off, whereupon a couple of new Steele's facings are fitted on the backings, and all that remains is to bevel the cutting edge and finish.

This method can, of course, be modified to suit each individual case. If, for example, it is necessary, for some reason to utilize an additional tooth as a support for a previously existing fixed

bridge, this extension can be easily made in accordance with the method above described.

As Haderup's screw, in several ways, did not prove to be well-suited for my special purpose, I afterwards had a special screw made in "clasp alloy" (see fig. 2) as well as a set of tools containing drills, screw-taps and countersinks for the screw head. See Fig. 5.

In order to make clear the application of this method, I shall now proceed to describe some cases which have occurred in practice, beginning with a case of repair (The simplest case — the fracture of the bridge in the front part — has already been described and illustrated).

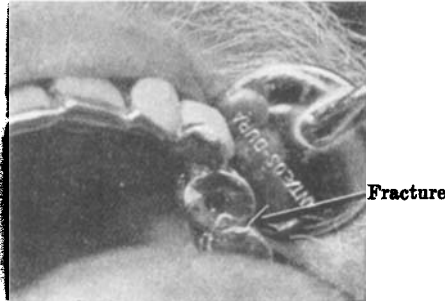


Fig. 6.

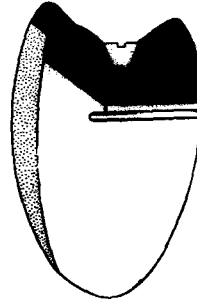


Fig. 7.

If a fracture of a bridge in the bicuspid or molar region occurs, as indicated by Fig. 6, and if this part is provided with ordinary buccal facings (Steele's or platinum), the repair will be relatively simple. A strong bar is then sunk in the occlusal surfaces in the vertical plane, and is anchored by means of two horizontally placed screws, which are inserted from the labial surface; from the same direction the threading is made by means of corresponding screw taps (a pointed foretap and a blunter after-tap).

Should the bridge be constructed with Trupontic, the repair will be more complicated, but can nevertheless be carried out, in the manner shown in Fig. 7.

In the application of this method, it is essential that the porcelain tooth should not be too short. With a Joe Dandy disc the respective porcelain teeth are broken, and the rims horizontally placed on the under side of the backing are ground off. — Only in cases where the backings are placed in such a way that these rims are perfectly parallel (which rarely happens), can they be

retained. The backings having been oiled, a bar is now modelled in wax (see the shaded part Fig. 7) and two new backings, with new Truportic teeth, are firmly embedded in it. These latter should be shorter by the thickness of the wax bar. It is also important that these bars and the Truportic teeth should be placed at least 1 mm. within the gold masticating surface (see Fig. 7). The advantage of this is that the porcelain surface (see the dotted part), restores the original aesthetic appearance of the teeth. When the bar has been cast in hard gold, it and the two occlusal surfaces are drilled through with a suitable drill, the screw head is sunk with the conical drill and the holes are threaded for the reception of the screws. Figs. 8 and 9.



Fig. 8.

The bar in place.



Fig. 9.

One facing in place.

A mishap which occurs not unfrequently is that a Steele's backing works loose from the cast gold of a pivoted tooth. This is due to a technical fault and can always be prevented by flowing the rear surface of the backing with 18 carat solder before the tooth is waxed. However if such a fracture has occurred to a tooth, serving as a support in a larger bridge, it is not necessary to scrap the entire bridge; but one will, of course, be confronted with an embarrassing situation, which, however, can be dealt with in the following manner:

The remaining part of the pivoted tooth is ground off at the top and labially-palatally so that a stump is left, of the shape indicated by the black part in Fig. 10. A new facing with a backing is prepared and is tested in the mouth, to ensure that it is in the right position. (This method of repair is indeed liable to the drawback that the porcelain facing may protrude somewhat beyond

the labial curvature, and that a millimeter or so of gold will be visible cervically. This inconvenience, however, weighs lightly in the balance, as against the necessity of reconstructing the entire bridge). An impression is taken in Kerr compound and a die is prepared, whereupon a cap is modelled in wax and cast in hard gold, see Fig. 10 (the shaded part) and Fig. 11 (finished casting). From the backing a hole is then drilled through the cap and through the massive tap, out through the palatal part of the cap. This hole is threaded with the screw-taps, whereupon the screw head is sunk in the material. The cap is now cemented into place, and the screw is tightened; finally, the facing is fixed with cement and the cutting edge beveled in the usual way.

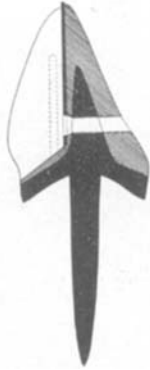


Fig. 10.



Fig. 11.

An intermediate position between repairs proper and the method of screw anchorages for fixed bridges is exemplified by the following two cases:

The first (Fig. 12) consists in a fixing splint for the temporary stabilization of a group of teeth during operation and healing, pending the arrangement of a permanent fixing. Two splints, fitting closely to the labial and palatal surfaces of the teeth in question, are moulded in a suitable alloy, e. g. Vitallium. In the wide v-shaped interproximal spaces, the two splints are held together by horizontally placed screws. If, as in the case illustrated, there is a missing tooth, a hanging facing can be arranged at the rim, one of the screws being passed through its backing. — Fig. 13. — In order to avoid the use of too many screws, the two rims may be united, as in this case, by a hinge at one end. This method may be adopted with advantage where, for financial

reasons, a cheap and simple fixing of pyorrhetic teeth is desirable: it gives a fixation which is superior to that of existing removable constructions.

The second case was one referred to me for maxillary articulation disturbances, which had arisen after the raising of the bite by insertion of two bridges in the molar-bicuspid region of the lower jaw. On analysis of the case, I found that the bridge on the right side should have been a millimeter or so higher. Presumably, owing to some error in the mounting of the models on the articulator, the compensating curve on this side had been placed too low, so that, when the teeth were closed, the lower jaw tipped, which in turn caused trouble in the corresponding temporomandibular joint. As the newly constructed bridges were other-

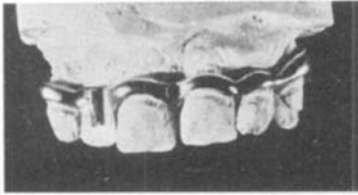


Fig. 12.

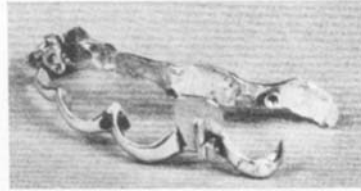


Fig. 13.

wise quite satisfactory and could not, of course, be removed without being destroyed, the screw anchorage in this case too proved to be the way of escape from the difficulty. A splint was modelled in wax, was cast in hard gold and fixed by a horizontally running screw, placed in the dummy. See Figs. 14 and 15, which render any further description superfluous.

I shall now proceed to describe the screw anchorage, as applied to fixed bridges. It is here that this method finds its most important and extensive application. It frees us completely from all the drawbacks and difficulties afforded by a fixed bridge construction in cases where it is impossible to obtain paralleling between the supporting teeth. Indeed, thanks to the screw anchorage, one need not worry at all about the problem of paralleling. What a relief this involves for the operator will be at once understood.

The method, however, affords two still more salient advantages. Firstly, one need never devitalize a tilted supporting tooth. Secondly, the grinding plane need not be placed in such wise that retention on the supporting tooth is imperfect, or that the

recognized "extension for prevention" principle is more or less violated. Each supporting tooth can be prepared with regard merely to its own requirements, without any deviation whatever from the ideal on the ground of lack of paralleling with the other supporting teeth. In cases where several pivoted teeth form part of the bridge, one need never widen the canals beyond the enlargement required for fitting in pivots of suitable dimensions. How often are we not otherwise compelled to make such enlargements

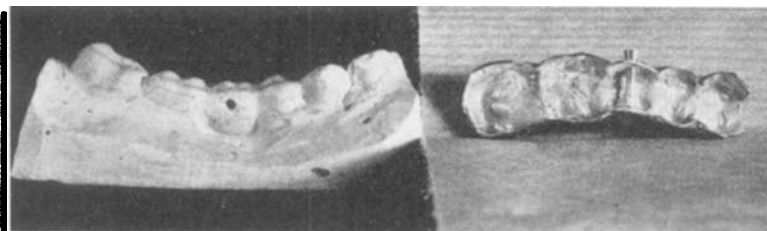


Fig. 14.

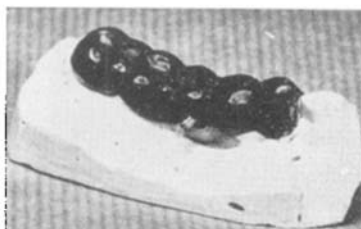


Fig. 15.

in cases of out-of-parallel roots, in order to allow the bridge to slip into place; and how often do we not find that the root has been so injured in this way that it will fracture sooner or later?

All the difficulties just enumerated can be avoided by the adoption of this method. All the bridge supports are prepared separately; as soon as one takes a "situation impression" of the whole jaw in plaster, one ascertains whether all the bridge supports are parallel with one another, or, if not, what groups of supporting teeth could be assembled in fixed sections; plans are then drawn up for suitable screw anchorages between these segments. These can, of course, be varied almost *ad infinitum*, and I shall confine myself in the following to giving a few examples of different types.

An additional advantage of this method is that, if financial or other difficulties seem to stand in the way of a large and complicated fixed bridge, it can nevertheless be constructed in the long run, by making merely one section to begin with, deferring the rest of the work to subsequent occasions. When a suitable screw anchorage has once been arranged in the section first cemented in the mouth, it is quite a simple matter afterwards to join the next section to it, so that they form a connected whole. In certain cases I have thus constructed large bridges in as many as six different stages in the course of several years, and have nevertheless attained a final result which had been viewed from the outset as the ideal solution.



Fig. 16.

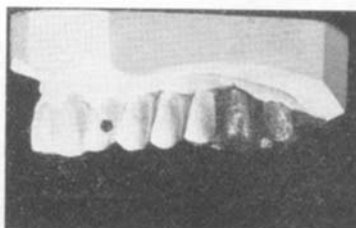


Fig. 17.

Two different main types of screw anchorages can be distinguished: those in the anterior teeth, which are comparatively simple, and those in the posterior parts.

The first-mentioned type will, of course, be required mainly where the anterior teeth are provided with artificial teeth, in which case the screw anchorage is executed in complete analogy with the previously described procedure for bridge repair.

The first case in which I resorted to this coupling of sections in the central part is illustrated in Fig. 16. It was executed 16 years ago and has worked very satisfactorily up to date.

This method, however, can also be used for anchoring a subsequently constructed bridge in a tooth provided e. g. with a 3/4 crown, Pinledge or a gold inlay with a pivot. A gold inlay is then inserted palatally through the existing gold construction into the dental substance, the screw being sunk in the labial surface of the tooth and threaded into the inlay. Due consideration must, of course, be paid, to the extension and direction of the pulp, if the tooth is vital. The screw head is covered with a silicate filling. A screw anchorage of this kind is shown in Fig. 17.

Fig. 18 illustrates a screw anchorage between $\underline{1|1}$, for prophylactic purposes. The original intention had been to construct a fixed bridge for $\underline{7|7}$. The $\underline{5}$ root was to be extracted on account of an infection which extended up towards the floor of the Antrum; but, as a root-tip construction had been designed, the extraction was deferred as long as possible. The right bridge was finished up to the median line, when an immediate surgical operation was rendered necessary by the marked aggravation of the inflammation in the Antrum, so that the patient had to be sent to a Rhinologist. This surgeon radically operated and removed not only $\underline{5}$ and $\underline{6}$, (the latter, in order to make a sufficient opening towards the Antrum), but also the entire mesial bone attachment for $\underline{7}$, which thus became a very dubious bridge support.



Fig. 18.



Fig. 19.

I decided to wait over the summer to give $\underline{7}$ a chance to tighten.

In the right bridge an attachment was then soldered on $\underline{6}$, a screw coupling was made between $\underline{1|1}$, after which the right bridge was permanently cemented. The left bridge from $\underline{1-4}$ was cemented merely temporarily and screwed together with the right one. When the autumn came, it was found that the time had arrived for extraction of $\underline{7}$. Thanks, however, to the screw anchorages, it was a fairly simple matter to loosen the left bridge, to solder an attachment distally on $\underline{4}$ and then to construct a removable denture. This case was dealt with about twelve years ago and the construction then adopted is working quite satisfactorily.

However, a mishap occurred which deserves to be mentioned. Owing to the extremely hard biting in this case and the marked tendency towards an interstitial movement of the teeth, one of the small screws, which had to be made unusually short (on ac-

count of the deep over-bite) had threaded itself up and had cracked the facing from within. The consequence was that several facings had to be changed before the real cause had been detected. Then, however, the matter was easily remedied. The hole was threaded with a coarser screw-tap, and a thicker screw was then screwed in (the threads of the former screw hole were almost worn out). Since then the screw anchorage has held.

An anchorage in the bicuspid is shown in Fig. 19. As paralleling could not be obtained between the posterior parts and the anterior teeth, the three bridges were constructed separately. As the two first bicuspid were deeply pressed down in the occlusion curve (this was a case of extreme overbite), whilst, on the other hand, a marked raising of the bite had to be carried out, the completed

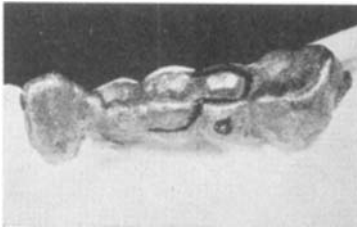


Fig. 20.

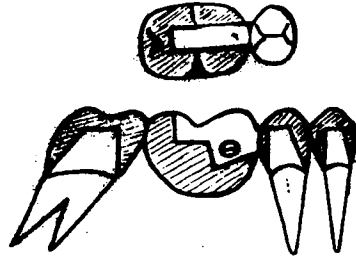


Fig. 21.

full-crowns on above-mentioned bicuspid had an occlusal surface of about 6 mm. in thickness. I availed myself of this situation, in that I sunk vertical bars in the occlusal surfaces of the crowns; these bars were then locked with horizontal screws. The screws thus ran entirely above the vital supports and lay in the thick gold. The front part was first cemented in place, after which the side bridges were fixed; the bars engaged in the bicuspid, and were then locked with the screws.

Fig. 20 shows the model of a case in which, owing to extremely tipped teeth, it would have been found impossible to construct a fixed bridge without devitalizing several supports and turning them at a sharp angle to the longitudinal axis of the tooth.

In this particular case the supports were prepared as advantageously as possible and without any risk of damaging the pulp; the coupling was then made internally in the hanging part of the bridge (see Fig. 21). This part was made in thick gold (Trupontic counter-indicated); in certain cases, however, it may, of course,

be buccally provided with a porcelain facing (Steele's or platinum). A strong vertical bar is sunk in the occlusal surface and is moreover made in a stepped shape, so that it directly bears the occlusal pressure. (see Fig. 21.) The entire construction is locked by a horizontal screw.

A similar, but still more extreme, case is shown in Figs. 22 to 25. As the span here is larger than in the preceding case and, as the longitudinal axes of the teeth were still more tilted, two screws were inserted through the vertical bar.

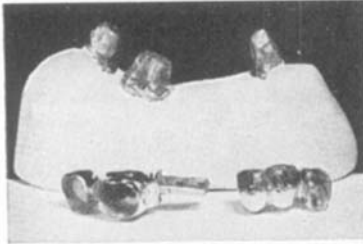


Fig. 22.

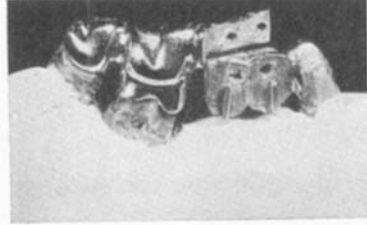


Fig. 23.

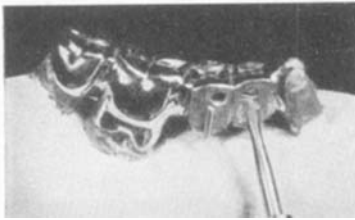


Fig. 24.

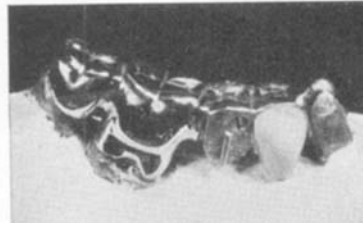


Fig. 25.

Finally, Figs. 26 to 30 do not show any new screw anchorages beyond those already described. They have, however, been included in order to illustrate a case where, thanks to this method of anchorage, it was possible to carry out such an extensive, and indeed revolutionary, reconstruction of the entire set of teeth in four stages in the course of three years. The patient, a female teacher, could never have afforded either the expense or the time to have this treatment carried out at once.

As it was, one stage was completed at a time: first the front part of the lower jaw; then the right side of that jaw, which was screwed together with the front part behind $\bar{3}$; thereupon the

right side of the upper jaw; and finally, as the last stage, the left side of jaw, with coupling behind 1.

Fig. 31 illustrates an entire upper-jaw bridge, where, in view of the extreme tilting of the six front teeth forwards and out-

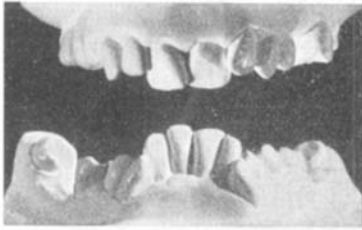


Fig. 26.

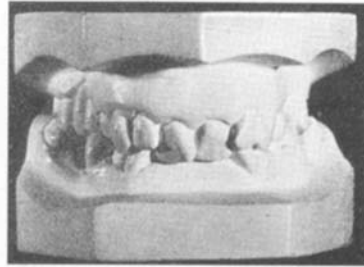


Fig. 27.

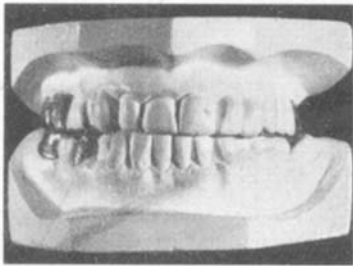


Fig. 28.



Fig. 29.

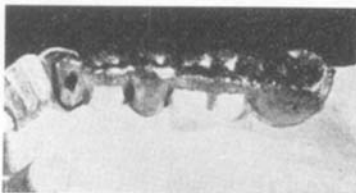


Fig. 30.

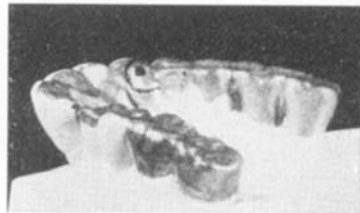


Fig. 31.

wards, it was out of the question to connect this section with the molar parts in a continuous fixed bridge. The anterior part in this case was therefore made separately, and the posterior parts were then anchored in the cuspid teeth by screws.

Having now reviewed the principal types of construction, this method is herewith submitted to my colleagues, in the hope that,

perhaps modified with the aid of their own imagination, they may find it of such great utility and derive as much gratification from it as the author has done for well-nigh twenty years.

Summary.

The author describes a method, practised by him for twenty years, of repairing and building fixed bridges by means of an ingenious coupling attachment.

The method was first used in effecting reparations on fixed bridges, without having to detach them from their supporting pillars. On account of the good results, the author also decided to use this method of uniting various sections of either splints or bridges by means of a bar and screw attachment. This method can also be used advantageously in restoring proper functional occlusion. The advantages of building bridges in sections enables in many cases the operator to preserve pulp vitality by avoiding the necessity of stringent parallelling.

The method is explained both with the help of cases observed for twenty years and instructive illustrations.

Zusammenfassung.

Der Verfasser beschreibt eine von ihm seit über 20 Jahren geübte Methode, Brückenglieder bzw. Brückensektionen durch Einlage versenkter und eingeschraubter Querbalken miteinander zu verbinden oder durch ähnliche Verschraubungen zu fixieren.

Das Verfahren wurde zunächst geübt, um Reparaturen an festen Brücken auszuführen, ohne sie von ihren Stützpfählern abnehmen zu müssen. Auf Grund der guten Resultate ging der Verfasser dazu über, diese Verschraubungsmethode auch bei parodontitischen Schienungen und zur Fixierung von Auflage-schienen zwecks Bissserhöhung, sowie vor allem zur sektionweisen Konstruktion festsitzender Brücken anzuwenden. Hierbei kann man auf die Forderung von parallelen Brückenpfählern verzichten, so dass man in vielen Fällen deren Devitalisierung oder mechanische Schwächung erspart. Ein ökonomischer Vorteil des Verfahrens liegt sowohl in der Arbeitsvereinfachung bei ungün-

stiger Topographie der Pfeilerzähne, als auch in der Möglichkeit, grössere Brückenarbeiten in auf längere Zeit verteilten Sektionen fertigstellen zu können.

Die Methode wird an Hand von teilweise seit 20 Jahren beobachteten Fällen sowie durch instruktive Abbildungen erläutert.

Résumé.

L'auteur décrit une technique qu'il a utilisée depuis plus de vingt ans pour coupler les sections d'un bridge au moyen de barres qu'il a insérées et fixées avec des vis ou pour les fixer au moyen de vissages semblables.

L'auteur a utilisé cette méthode premièrement pour réparer des bridges fixés sans les détacher de leur soutien. Les résultats obtenus l'ont encouragé à utiliser cette technique de fixation avec des vis non seulement quand il s'agissait de la fixation d'éclisses paradentiques et de l'application d'éclisses de redressement pour régulariser l'occlusion, mais avant tout quand il s'agissait de construire en section des bridges fixés. D'après l'auteur cette méthode épargnerait la construction des soutiens parallèles et éviterait, dans un grand nombre de cas, la dévitalisation ou l'affaiblissement mécanique. Quand il s'agit d'une défavorable topographie des dents de soutien, cette technique simplifierait le travail du dentiste et permettrait la construction des bridges en section, deux faits très avantageux du point de vue économique.

L'auteur appui cette méthode sur les résultats obtenus chez des individus suivis depuis plus de vingt ans et sur des illustrations instructives.

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