

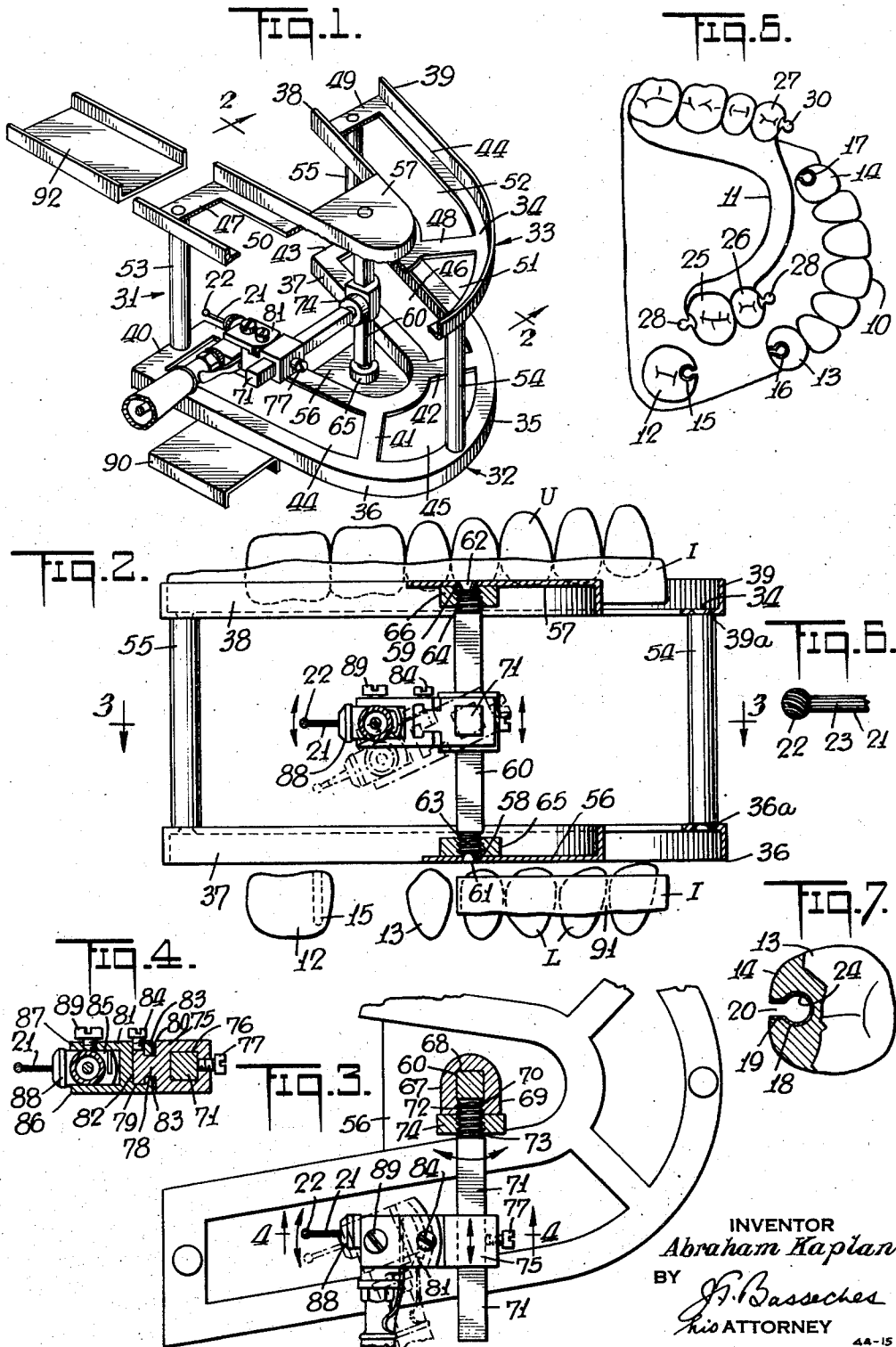
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DENTAL APPLIANCE

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DENTAL APPLIANCE

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6 Claims. (Cl. 32-67)

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This invention relates to a dental appliance and more particularly to an appliance for dental restorations or bridgework and like dental attachments which are removable or semi-removable, and coordinately to a new form of attachment or restoration.

Known to me is the provision of dental appliances for the production of bridgework, particularly removable bridgework or restorations, wherein two or more anchor or abutment teeth are prepared for the reception of inlays, from which inlays attachments are disposed cooperating with the restoration to provide the means for supporting the attachment or bridgework in position.

The precision necessary to provide this form of bridgework or dental attachment has discouraged its widespread adoption. The incidents of the production of this form of bridgework and the labor entailed are well known to the profession. The transposition of the impression as the working area, the necessity for using unusually large inlays, first as the anchor means for the attachment and secondly as the reinvestment of the inlays in the impression of the mouth, has resulted in discrepancies in the positioning of the inlays and/or the attachments and the resultant bridgework, to necessitate unusual labor, skill and precision in devising what on the surface may appear to be highly esthetic and effective restorations.

The elimination of the labor incident to the provision of these attachments or restorations suggests the direct alteration and preparation of the teeth in the patient's mouth. The attendant difficulties which have discouraged the practice lie in the unusual precision necessary in preparing the anchor teeth and the heretofore undevise attachment which made possible the direct preparation of the anchor teeth or abutment teeth with high fidelity of accuracy of two or more cavities which have parallel surfaces into which the cooperating male and female portions of the attachments may be disposed or removed. Contour or shape, as well as directional relationship in parallelism of the cooperating attachments comprising the female member or socket, or the male member or stem, are all vital considerations, which devices, as known to me, have failed to satisfy the requirements of adequate strength to resist the stresses of mastication, while fulfilling the requirement of both the accuracy to permit positioning or removal of the

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restoration with the maximum cosmetic and esthetic appearance.

My invention is predicated upon the observation that an ability to prepare the abutment teeth under conditions meeting the highly variable factor of available anchorage body in the anchor teeth, so that a direct preparation of these anchor teeth may be made in the mouth of the patient, would lead to a more universal adoption of this general form of restoration due to the labor which may be saved and the avoidance of the unusual element of skill and precision, not to speak of the elimination of multiple operations and excessively cumbersome inlays heretofore experienced in carrying out this form of bridgework.

My invention is further predicated upon the observation that adequate keying sockets may be formed in the abutment teeth by a spherical-headed burr or like drill to secure the proper shape of anchoring socket under a maximum number of situations confronting the operator in preparing the anchoring or abutment teeth for the reception of the anchoring abutments and for the directional position of the sockets to effect the inescapably essential relationship of parallelism between two or more of the anchoring sockets in order to secure the desirable location or removal of the restoration without binding or warping action in the use of a restoration of this character.

Accordingly, it is an object of my invention to provide an appliance for preparing anchor or abutment teeth whereby two or more sockets may be formed on the abutment or anchoring teeth in perfect parallelism, while meeting a wide degree of irregularity of operating conditions as well as the irregularity of available abutment or anchoring tooth surface to carry out with the adequate degree of rigidity the imposition of a restoration of the character herein contemplated. Coordinately my invention has for its object the provision of a dental appliance and resultant restoration and parts thereof which make for a highly esthetic and efficient restoration with the minimum amount of labor and expense.

To attain the foregoing objects and such further objects as may appear herein or be hereinafter pointed out, I make reference to the accompanying drawing forming a part hereof, in which:

Figure 1 is a perspective view of my appliance with portions broken away to disclose the details of construction;

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Figure 2 is a section taken on the line 2—2 of Figure 1, slightly enlarged;

Figure 3 is a fragmentary section taken on the line 3—3 of Figure 2;

Figure 4 is a section taken on the line 4—4 of Figure 3;

Figure 5 is a plan view of a removable restoration and cooperating jaw segment illustrating one embodiment of my invention;

Figure 6 is an enlarged fragmentary plan view of a burr used to practice one phase of my invention;

Figure 7 is a fragmentary sectional view of an abutment tooth prepared in accordance with my invention.

Making reference to the drawing as an aid to an understanding of my invention, it is contemplated by me to provide for a partial dental arch 10 a restoration 11. In this form I show a representative jaw having abutment or anchoring teeth 12, 13 and 14 for which the restoration is to be applied. For this purpose, in accordance with my invention, sockets 15, 16 and 17 are to be drilled in the anchor teeth 12, 13 and 14 respectively in the form which may be generally referred to as a keyhole slot, which in each case includes an enlarged section 18 generally cylindrical in shape and a restricted neck 19 terminating outwardly and proximally to the edentate space and forming the slot opening 20. Such drilling may be conveniently made by a burr 21 shown in Figure 6, which is provided with a substantially spherical head 22 and cylindrical shank 23, the surfaces of both the head 22 and the shank 23 being formed with cutting sections or abrading sections, either by forming toothed serration sections to provide the spherical and cylindrical contour, or imbedding abrasive material in a burr of this contour, such as diamond dust or Carborundum. The employment of a burr with such spheroidal head and cylindrical shank is particularly adaptable for my purposes, and for convenience I shall refer to a burr construction of this character as a "keyhole slot forming burr," intending thereby to encompass the functional attributes of this burr to provide a keyhole slot of the contour illustrated in Figure 7. This form of burr when employed with the axis of the shank of the burr angularly directed to the axis of the tooth, with a stroke running substantially in parallelism to the tooth axis, will serve to provide, in any angular position in which the shank overhangs the side wall of the tooth, a keyhole slot by a single stroke with slot opening proximally directed to the edentate space. The facility of this operation will emphasize the adaptability of the appliance hereafter to be described to prepare the restoration or bridge, including the formation of the anchoring slots on the abutment teeth directly in the mouth of the patient.

It is contemplated by me to provide an appliance which will assure the formation of the keyhole slots 15, 16 and 17 in perfect parallelism to each other directly within the mouth of the patient. Upon formation of the keyhole slots, each of which includes an enlarged portion 18 and the restricted neck 19 with the transverse slot 20 faced proximally to the edentate space, I then cement a metallic liner 24 in position. This liner, in cross-section, corresponds exactly to the keyhole slot and extends in depth to the previously prepared drill hole. The restoration 11 is formed with complementary artificial teeth 25, 26 and 27 provided with the proximal attach-

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ments 28, 29 and 30 respectively, which in cross-section correspond to the keyhole cross-section of the liner 24, the shanks of which attachments are embedded and supported in the teeth 25, 26, 27, as will be readily understood. The details of assembly for making the restoration 11 will be readily apparent to those skilled in the art, or as briefly hereafter described, and I shall now concern myself with an exemplification of the appliance for forming in parallelism the keyhole slots 15, 16 and 17 to which I have previously referred.

For this purpose there is provided a frame 31 in the form of a lower jaw engaging plate 32 and an upper jaw engaging plate 33, each of which is conveniently formed to take the contour of channels 34 and 35 respectively, and curved generally so as to conform to the upper jaw and lower jaw in configuration. These are formed with flanges 36 and 37 in the case of the lower jaw engaging plate 32, which flanges are downwardly directed, and with upstanding flanges 38 and 39 in the case of the upper jaw engaging plate 33. The lower jaw engaging plate 32 is provided with spaced webs 40, 41, 42 and 43, leaving a medial clearance portion 44, 45 and 46 through which the teeth are accessible, as will more clearly appear hereafter. The upper jaw engaging plate 33 may be similarly formed with cross-webs 47, 48 and 49, leaving clearance openings 50, 51 and 52 therebetween. (The upper jaw engaging plate 33 is shown broken away, but it will be understood that a cross-web may be included to have this portion symmetrically conform to the lower jaw engaging plate 32.)

The plates 32 and 33 are rigidly joined together by uprights 53, 54 and 55 respectively spaced to provide maximum working space and are connected to the webs 40, 47, 43, 49, and in the segmental web 36a and 39a by a suitable connection which, in the form illustrated, comprises upsetting the ends of the uprights in suitable orifices formed in the cross-webs and segmental webs mentioned.

The lower jaw engaging plate 32 and the upper jaw engaging plate 33 are formed axially with depressed and arched bases 56 and 57 respectively. The bases 56 and 57 are each formed with bearing orifices 58 and 59. Supported within the bearing orifices 58 and 59, I provide a vertical guide post 60 which is preferably square in cross-section and which is formed at its opposite ends 61 and 62 with riveted pivotal heads which enter in the orifices 58 and 59 respectively. Inwardly from the ends 61 and 62 the post 60 is provided with threaded necks 63 and 64 to receive the knurled lock nuts 65 and 66 which may bear against the bases 56 and 57 respectively. The vertical guide post 60 is thus arranged for pivotal movement within the orifices 58 and 59 by releasing the nuts 65 and 66, but may be put in predetermined locked position by tightening the lock nuts 65 and 66 which bear respectively against the inner surface of the bases 56 and 57 as above explained, for purposes which will appear more clearly as this description proceeds.

Upon the guide post 60 I provide a vertical slide 67 which is apertured at 68 in contour to receive the guide post 60 in keying, but slidable, relationship. A laterally disposed shoulder 69 is formed with a threaded drill hole 70 to receive the horizontal guide post 71, whose end 72 is threaded or otherwise pivotally mounted within the orifice 70. A threaded neck 73 is arranged to receive the lock nut 74. The horizontal guide post 71 may

thus pivot, but may be locked in predetermined pivotal position by the lock nut 74.

The horizontal guide post is arranged to mount a hand drill guide 75, and this has an orifice 76 conforming to the cross-section of the guide post 71, to be capable of keying engagement therewith while normally freely slidable thereon. A set screw 77, passing through the guide, is arranged to hold the hand drill guide in predetermined position along its length. The guide 75 is formed with a side branch 78 having a T-head 79 generally arcuate in configuration laterally, as will more clearly appear in Figure 3, thus outlining an arcuate track 80 to either side of the branch 78. A hand drill guide clamp 81 has a channel portion 82 forming fingers 83—83 entering behind the T-shaped head 79, and has complementary arcuate configuration to permit a pivotal movement of the clamp 81 on the neck 78. A set-screw 84 is availed of to hold the clamp 81 in predetermined arcuate position in relation to the hand drill guide 75 for purposes which will hereafter appear.

The guide clamp 81 is provided with a channel portion 85 defined by the branches 86 and 87, within which channel portion the head of a hand drill or hand piece 88 may be mounted and held in predetermined position by the set-screw 89, as will readily be apparent. The hand drill or hand piece 88 is arranged to have mounted therein a burr 21, preferably of the spherical shape and configuration illustrated in Figure 6, so as to extend the spherical burr head 22 and cylindrical shank 23 for purposes heretofore described.

With the assembly thus described, the appliance may be mounted for the operative preparation of the abutment teeth in the patient's mouth.

For this purpose due regard is given to whether teeth in the lower jaw or upper jaw are to be treated or prepared. In the illustration given, the appliance is positioned where intended for treatment of teeth in the lower jaw. Accordingly, the lower jaw engaging plate 32 is to be adjusted so as to dispose the vertical guide post generally co-axially with the axes of the teeth in the lower jaw, and for this purpose one or more trays 90 and 91 are provided, calculated to fit within the channels 36 and of a length not to interfere with the clearance slot 44 in the direction of the edentate space and abutment teeth and one or more trays 92 are provided to fit within the upper jaw engaging plate 33.

As a preliminary matter, trays 90, 91, 92, and such others as the nature of the arch of the lower jaw and upper jaw may demand, are fitted within the channels 36 and 37 at such points as to expose the abutment teeth 12, 13 and 14 in connection with the partial restoration of the character exemplified in Figure 5.

The trays are then filled with investment compound warmed or heated to plasticity. The entire appliance, carrying the trays with their individual quantity of investment compound I, is then inserted into the mouth of the patient. The entire appliance is then pressed down upon the arch of the lower jaw, in the example illustrated, by the fingers of the dentist or otherwise, the pressure being first only exerted upon the lower jaw engaging plate 32 to position the lower jaw engaging plate with the vertical guide post 60 co-axially with the axes of the teeth L of the lower jaw.

Cooling liquid, such as water, is then applied, as by a spray or jet, to the trays carried by the

lower jaw engaging plate to chill the investment compound and set the same in position, while still retaining the investment compound in the upper jaw engaging plate plastic. The patient is then permitted to bite down on the contra, or upper jaw engaging plate 33, to imbed the upper teeth U into the investment compound carried by the trays.

Chilling fluid, such as water, is then sprayed upon the investment compound also to set the investment compound carried by the upper jaw engaging plate 33. In this way the predetermined axial position of the vertical guide post 60 in respect of the lower jaw is not disturbed. Means may be used to lock the trays 90, 91 and 92 in the channels of the upper and lower plates, though this is not always necessary.

When the investment compound to both jaws has set, it will be apparent that the vertical guide post will be immobilized in respect of the teeth of the mouth, with the vertical guide post co-axially in respect of the axes of the teeth L of the lower jaw. In this position the operator then adjusts the hand drill to provide the drill holes, which in the example illustrated will be to provide a drill hole 15. Disengagement of the set-screws 65, 66, 74, 77 and 84 will permit the operator to adjust the burr at the proper angular position most effectively to drill the drill hole 15. Thereupon each of the setting elements 65, 66, 74, 77 and 84 are tightened, leaving no other movement possible than vertical slidable movement along the length of the guide post 60. The provision of a spherical-headed burr 22 and the adjustability of the hand drill at an angle which overlaps the teeth proximally to the edentate space with a cylindrical shank cutting portion on the burr makes possible the formation of the keyhole slot 15 which terminates in a restricted slot opening 20, as previously described, while assuring that the drill hole 15 is in parallelism to the vertical guide post 60. After accomplishing the first operation, it will be understood that by adjustment of the drill head on the drill guide a similar operation may be performed upon the abutment teeth 13 and 14 to provide the keyhole slots 16 and 17 respectively, in perfect parallelism with the drill hole 15, with a lateral opening proximally to the edentate space adjacent the teeth 13 and 14.

While I have shown and described the provision of a single drill hole in each of the abutment teeth, 12, 13 and 14, my appliance is susceptible of embodying one or more such drill holes conditioned upon the configuration of the abutment teeth and the available area, as will be readily appreciated by the skilled operator, and in this respect the drill holes may likewise be disposed to have the slot opening 20 terminate lingually, labially, buccally, as well as mesially or distally of the abutment tooth proximally of the edentate space, as well as having the entrant opening occlusally.

My construction is further characterized by the facility with which the entire appliance may be removed from the patient's mouth, as a release of the bite upon the appliance makes possible the removal of the appliance 33 while leaving the trays 90, 91 in contact with the teeth of the upper and lower jaw, leaving it as a comparatively simple operation to remove the trays from engagement with the investment compound and from the teeth engaging the latter.

It will be understood that while I have shown

and described an appliance suitable for engagement with the entire set of upper or lower teeth, convenience may dictate only a partial portion of the parts where a more limited section of the mouth requires treatment. Accordingly, while I have exemplified a construction which will meet a large number of situations, depending upon the location of the available abutment teeth, it will be understood that various forms and extensions of the lower jaw engaging plate and upper jaw engaging plate may be resorted to to meet other specific instances of treatment.

It will also be understood that while I have described and illustrated the use of the appliance by reference to the lower jaw, that for the treatment of teeth in the upper jaw adjustment of the vertical guide post 60 may be made by, firstly, duly locating the guide post 60 axially parallel to the axes of the teeth of the upper jaw, reversing the sequence previously described. Thus, for any given operation one jaw serves as the plane of reference and the contra jaw is used for fixation in the proper position, cooperating to hold the vertical guide post in accurate parallelism with the axes of the teeth of the jaw under treatment, the teeth last brought into imbedding relationship shaping themselves in the still plastic investment compound to effect the desirable location of the guide post 60 without disturbing the position thereof as determined by the first adjustment.

It will be further understood that after preparation of the drill holes 15, 16, 17, as the case may be, the liners 24 may be cemented in position to provide a wear-resistant surface without special casting operations, since sheet metal of uniform thickness may be employed and shaped to conform to the slot by very simple procedural details which assure accurate concentricity of the space defined by the interior surface of the liner and socket which it occupies. This assures a proper socket of a form to receive in more or less dove-tailing engagement the male portion pins 28 of similar nesting contour. There is then left for construction the restoration 11.

My method of preparing the abutment teeth by the manner shown and described, simplifies the completion of the restoration. For this purpose, the male portion pins 28 are inserted in position within the socket 20 in the mouth of the patient, exposing the affixing shanks which are integral with the pins adjacent the edentate proximal spaces of each of the abutment teeth 12, 13 and 14, which, in this case, will be three in number.

The operator then applies investment compound to make the impression of the arch and envelope the shanks of the male portion pins 28—28 and 30 in this compound. After setting of this impression material, the investment material is removed from the patient's mouth, carrying with it the male portion pins 28—28 and 30.

This assembly is thereafter availed of to complete the restoration by an operation which will be readily recognized as having been considerably simplified compared with prior practice where the determination of the location of the sockets or female portion in inlays to be transferred to the abutment teeth was accomplished outside of the patient's mouth, requiring the exercise of unusual skill, care and precision in the completion of the restoration.

My appliance, therefore, using particularly the expedient of a spherical-headed cylindrical shank burr, with provision for the vertical and angular guidance of the hand piece or drill, makes possible the direct preparation of the abutment teeth in

the mouth of the patient without the unusual labor heretofore found necessary in constructing restorations which heretofore involved extensive modification of the abutment structure to receive large and expensive inlays, the location of which, with the accuracy necessary to both fit the cavity to receive the inlays and the attachments to receive the restoration, involve so many factors of error as to make the installation of this otherwise esthetic type of restoration entail unusual expense to the patient and frequently beyond the reach of many who cannot afford the expense involved.

While I have shown as desirable an exemplified cavitation of abutment teeth with the sidewall slot terminating proximally of the edentate space and contemplate one, or more than one such drill holes in each abutment tooth axially in parallelism to each other and to the general axes of the teeth, it will be understood that the cavitating process may include forming the sidewall slot to terminate lingually, labially or buccally, as well as the exemplified messially and distally directed slot proximally of the edentate space, and for this purpose in the appended claims where I refer to a "cavity terminating proximally" I intend to include thereby all positions in which the sidewall terminating slot may be directed, including the messially and distally directed slots on the abutment teeth terminating proximally of the edentate space, as well as those terminating lingually, labially or buccally of said teeth, as circumstances and the inherent features of my restoration may deem it expedient.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent is:

1. In a dental device for preparing abutment teeth for mounting a removable restoration, a vertical guide post, means for mounting the vertical guide post in substantial parallelism with the axes of the teeth in the oral cavity between the contra jaws, means for radially pivoting said guide post, a radial arm, a guide on said vertical post for supporting said radial arm including means to fixedly hold said radial arm on said guide in predetermined angular position while permitting sliding movement in relation to said vertical guide, and pivot means on said radial arm to hold a hand drill piece to direct the cavitating burr angularly to form an anchoring slot having an opening terminating proximally of an abutment tooth and an entrant opening occlusally, the cavities so formed being in parallelism with each other upon guidance of said hand drill piece in operation upon said support, said supporting means for the vertical post including channelled arch-shaped plates medially open to expose the abutment teeth in the opening thereof, said plates being channelled to receive oppositely directed trays for investment compound and including axially formed bases for supporting said post in the position aforesaid.

2. In a dental device for preparing abutment teeth for mounting a removable restoration, a vertical guide post, means for mounting the vertical guide post in substantial parallelism with the axes of the teeth in the oral cavity between the contra jaws, means for radially pivoting said guide post, a radial arm, a guide on said vertical post for supporting said radial arm including means to fixedly hold said radial arm on said guide in predetermined angular position while permitting sliding movement in relation to said vertical guide, and pivot means on said radial arm to

hold a hand drill piece to direct the cavitating burr angularly to form an anchoring slot having an opening terminating proximally of an abutment tooth and an entrant opening occlusally, the cavities so formed being in parallelism with each other upon guidance of said hand drill piece in operation upon said support, said supporting means for the vertical post including channelled arch-shaped plates medially open to expose the abutment teeth in the opening thereof, said plates being channelled to receive oppositely directed trays for investment compound and including axially formed bases for supporting said post in the position aforesaid, said channels being of a depth to selectively set the vertical post in parallelism with the axes of the teeth of either the lower or the upper jaw.

3. In a dental device for preparing abutment teeth for receiving a restoration, the combination comprising an assembly having a vertical guide post, upper and lower jaw engaging plates including a pivotal support for said guide post in the oral cavity, supporting means for said member comprising means for holding investment compound comprising trays interfitting removably in said plates to anchor said plates temporarily to the teeth of the upper and lower jaws under the pressure of the jaws toward each other, but releasable therefrom to permit separation of said assembly from said trays.

4. In a dental device in accordance with claim 3 wherein said upper and lower jaw engaging plates are channelled to receive trays carrying the investment compound, said trays being formed of a depth to selectively orient the guide post in parallelism to the axes of the teeth of the upper or lower jaw.

5. In a dental device in accordance with claim 3, said guide post having a slidable guide for supporting a radial arm in radial relationship, and slidable movement along the length of said guide post including means for holding a hand drill piece angularly directed while under slidable

movement along said guide post to cavitate the abutment teeth with a slot opening proximally to the edentate space.

6. In a device for preparing abutment teeth, the combination comprising a vertical guide post member, with means for supporting the same in relation to the jaw of a patient, to be substantially in parallelism with the longitudinal axes of the abutment teeth to be prepared, and having an arm member with means for mounting the same on the post slidably longitudinally along said post member, and to reach different radial points, the arm member having a hand drill clamp connection, said clamp connection on said arm member being mounted for adjustment pivotally to direct a burr of a hand drill held on said arm, to direct the lateral portions of the burr into cavitating action whereby a burr with a spherical head and a cylindrical shank may be held with the axis of the burr at an angle to the axis of the abutment teeth to be cavitated, and by a guiding movement thereof along the post member, as aforesaid, thereby form a cavity of substantially uniform cross section, terminating proximally and having an entrance opening occlusally directed.

ABRAHAM KAPLAN.

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