Oct. 24, 1933. W. E. SANBORN 1,931,804

METHOD OF MAKING ARTIFICIAL DENTURES

Filed Feb. 6, 1931 3 Sheets-Sheet 1

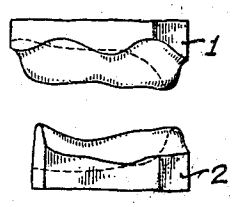


Fig. 1.

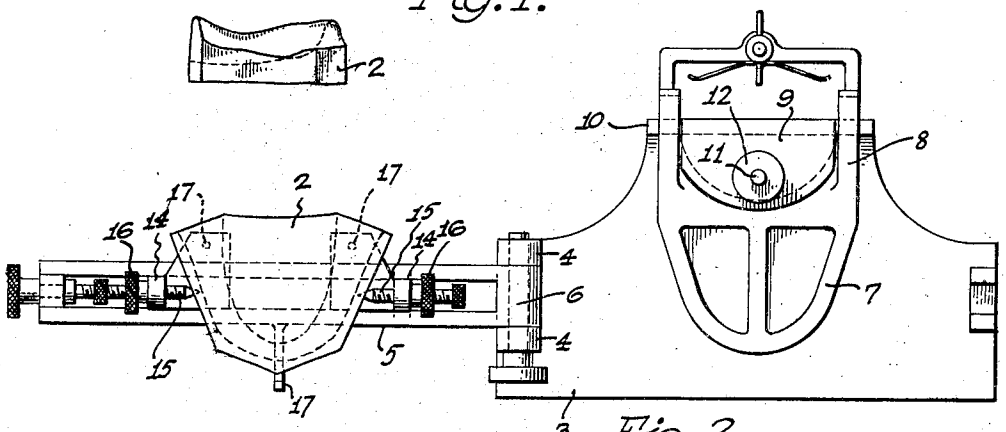


Fig. 2.

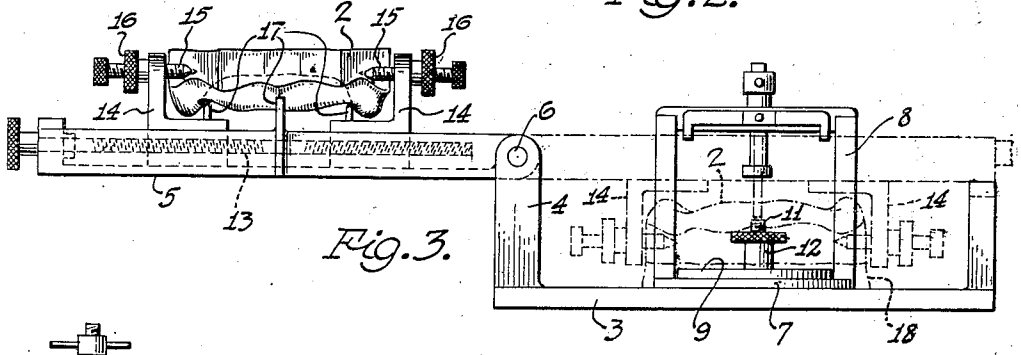


Fig. 3.

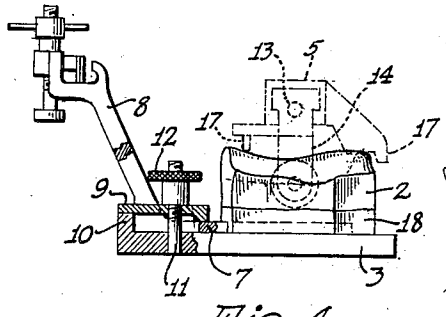


Fig. 4.

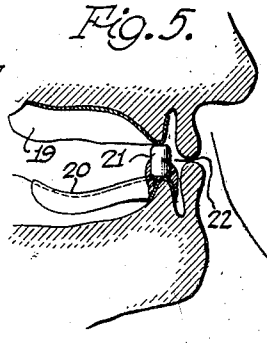


Fig. 5.

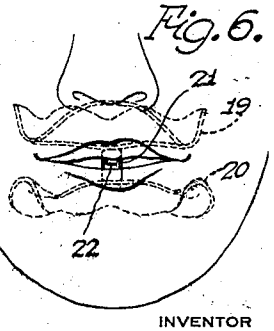


Fig. 6.

INVENTOR

William E. Sanborn,

BY

ATTORNEYS

Oct. 24, 1933. W. E. SANBORN 1,931,804

METHOD OF MAKING ARTIFICIAL DENTURES

Filed Feb. 6, 1931 3 Sheets-Sheet 2

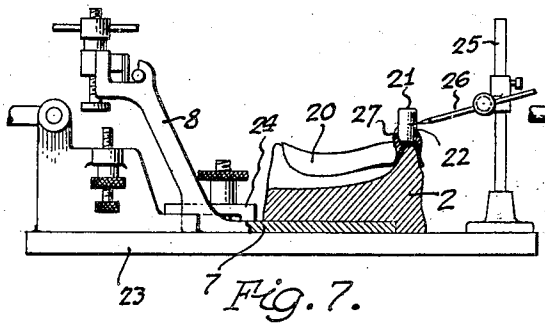


Fig. 7.

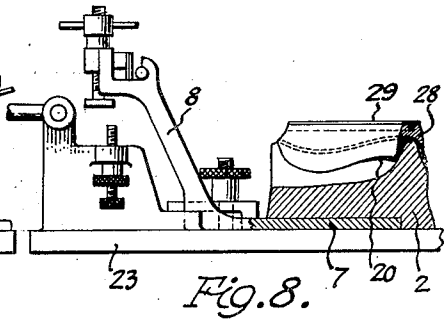


Fig. 8.

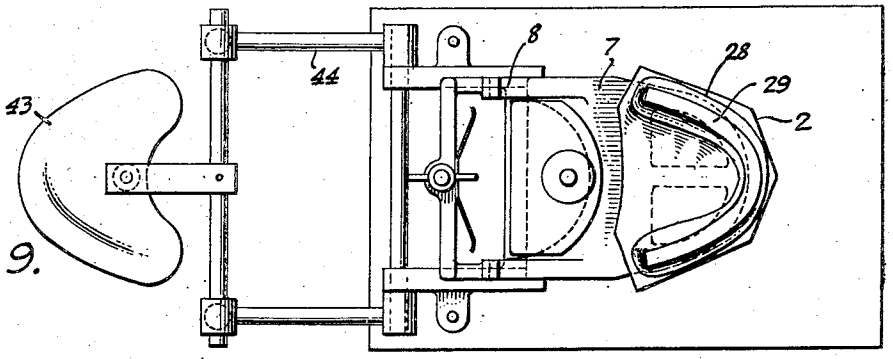


Fig. 9.

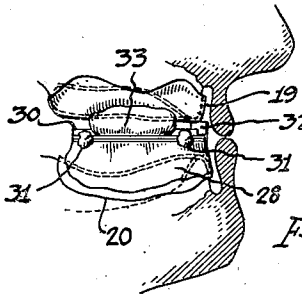


Fig. 10.

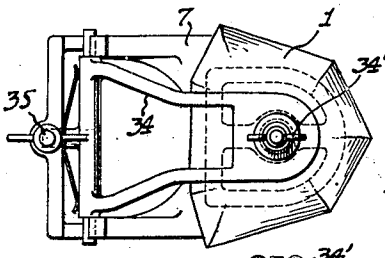


Fig. 12.

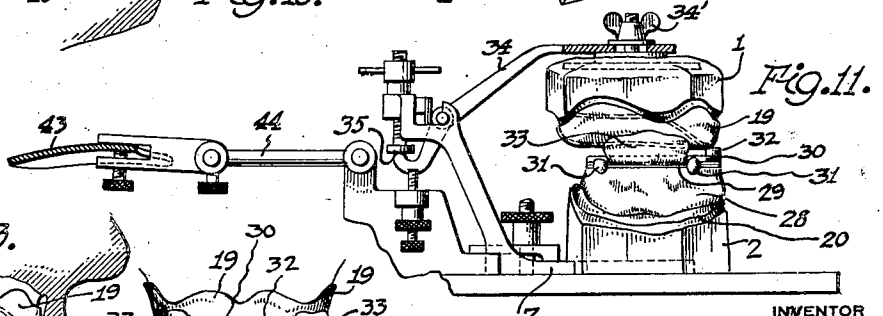


Fig. 11.

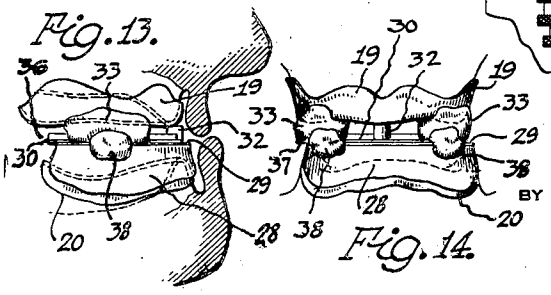


Fig. 13.

Fig. 14.

INVENTOR

William E. Sanborn,

BY

Bartlett & Bartlett

ATTORNEYS

Oct. 24, 1933. W. E. SANBORN 1,931,804

METHOD OF MAKING ARTIFICIAL DENTURES

Filed Feb. 6, 1931 3 Sheets-Sheet 3

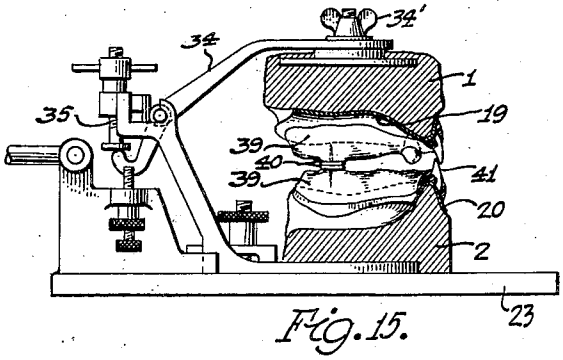


Fig. 15.

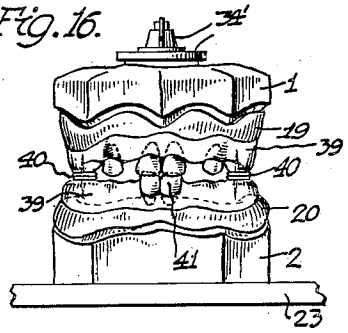


Fig. 16.

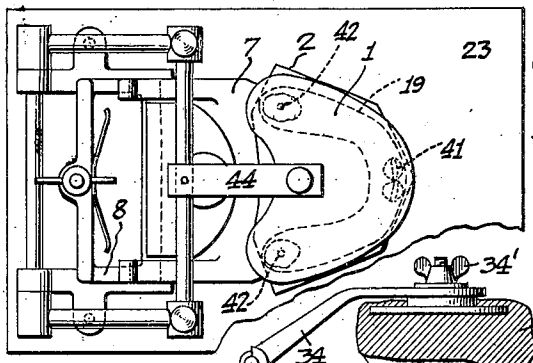


Fig. 19.

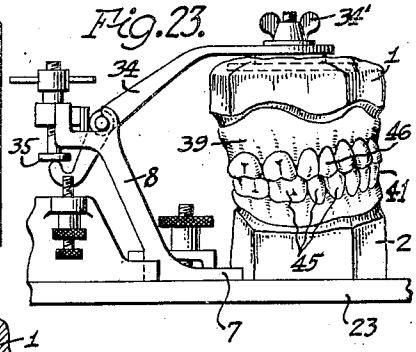


Fig. 23.

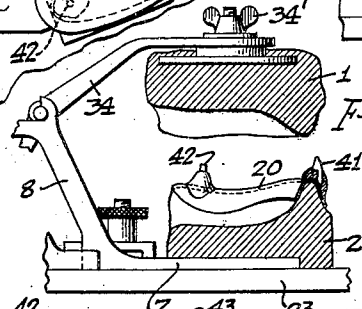


Fig. 17.

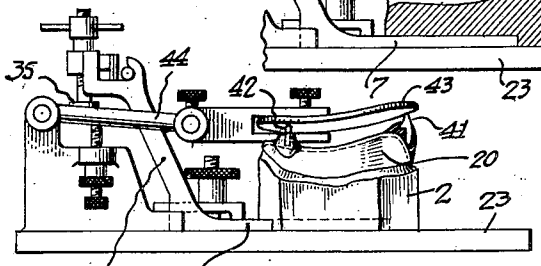


Fig. 18.

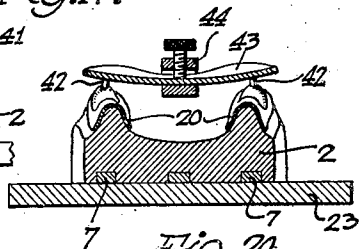


Fig. 20.

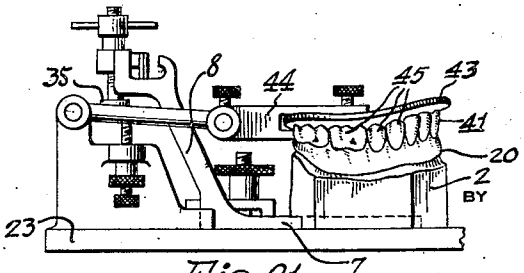


Fig. 21.

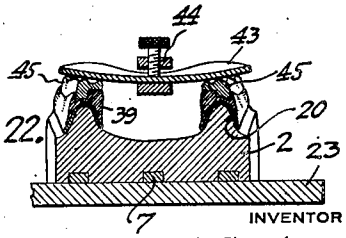


Fig. 22.

INVENTOR

William E. Sanborn,

Bartlett & Bartlett

ATTORNEYS

Patented Oct. 24, 1933

1,931,804

UNITED STATES PATENT OFFICE

1,931,804

METHOD OF MAKING ARTIFICIAL DENTURES

William E. Sanborn, Detroit, Mich.

Application February 6, 1931. Serial No. 513,957

7 Claims. (Cl. 32—4)

The present invention pertains to a novel method of making artificial dentures, including the fitting of the teeth therein, and the object generally is to avoid the errors which are recognized as being common in dentures made according to present practices.

One of the greatest difficulties in the art is the misfit or improper occlusion appearing in the dentures when they should be ready for actual use. These errors are at present corrected only by guess work or a tedious trial and error process which at best gives only an appoximately correct result.

The unreliability of the present methods may be traced to an improper determination of the occlusal plane in that the plane is determined by splitting the molding compound attaching the plates to one another.

The present invention consists of novel operations which result in determining a definite and correct position for the curve of the Spee template by which the occlusal plane in turn is established. Moreover, the occlusal plane is determined while the plates are severed from each other and is also determined with reference to a horizontal plane initially established on the ridge of the cast and again with reference to the patent's lip parting line.

Still another characteristic of the invention is that the spacing of the foremost points of the upper and lower plates, as determined in the mouth of the patient, is maintained throughout the several subsequent operations. Numerous other characteristics of the invention will appear as the description proceeds.

The invention is fully disclosed by way of example in the following description and in the accompanying drawings, in which—

Figure 1 is a perspective view showing the casts of the gums;

Fig. 2 is a plan view of the device for locating the lower cast in the articulator;

Fig. 3 is an elevation thereof;

Fig. 4 is a partial longitudinal section of the articulator, showing the lower cast mounted therein;

Fig. 5 is a longitudinal section through the mouth of the patient, showing the temporary plates fitted therein and definitely spaced apart;

Fig. 6 is a corresponding front elevation;

Fig. 7 is a side elevation, partly in section, showing the lower cast mounted on the articulator and the lower plate fitted on the cast;

Fig. 8 is a similar view showing the lower plate built up for the approximate determination of the line of occlusion;

Fig. 9 is a plan view of the apparatus shown in Figure 8;

Fig. 10 is a longitudinal section of the mouth of the patient, showing the lower plate inserted therein and the upper plate located with respect to the lower plate;

Fig. 11 is an elevation showing the plates mounted in the articulator in the relation determined in Figure 10;

Fig. 12 is a corresponding plan view;

Fig. 13 is a longitudinal section of the mouth of the patient, showing the plates reset on the gums for another determination of the proper relation;

Fig. 14 is a corresponding front elevation;

Fig. 15 is a longitudinal section of the articulator with the plates reinserted and the upper jaw of the articulator reset to the position determined in Figure 13;

Fig. 16 is a corresponding front elevation, showing certain of the teeth set in place;

Fig. 17 is a section similar to Figure 15, modified by the determination of certain of the lower back teeth positions;

Fig. 18 is an elevation of the articulator with the lower plate therein and a parting or occlusion template mounted on the lower plate;

Fig. 19 is a corresponding plan view;

Fig. 20 is a corresponding cross section;

Fig. 21 is an elevation similar to Figure 18, showing the remaining teeth applied to the lower plate with reference to the template;

Fig. 22 is a corresponding cross section; and

Fig. 23 is another elevation of the complete articulator and the upper teeth applied to the upper plate with reference to the lower teeth.

Reference to these views will now be made by use of like characters which are employed to designate corresponding parts throughout.

In Figure 1 are illustrated the upper and lower casts 1 and 2 representing the gums of the patient and made in the usual manner from a wax impression. These casts consist of plaster of Paris or other suitable material and may be made according to methods will known in the art.

The apparatus illustrated in Figures 2, 3 and 4 is designed to locate the lower cast 2 in a given relation to the base of the articulator. This device comprises a base member 3 having an upright bracket or bearing 4 on which is hinged an arm 5. The hinge 6 joining the arm to the upright 4 is a horizontal hinge, that is, it is adapted

to support the arm 5 in a horizontal position or parallel to the base 3.

Upon the base 3 is mounted a separable articulator which comprises a base member 7 with a structurally integral bearing arm 8. A clamping plate 9 rests on an edge of the base 7 and also on a flange 10 at one edge of the base 3. A stud 11 is fixed in the base 3 and passes through the clamp plate 9, and a nut 12 threaded on the stud is thus adapted to fix the articulator to the base member 3. The articulator may be removed from the base 3, for a purpose presently to be described, by loosening the nut 12 and drawing the member 7 from beneath the plate 9.

A screw 13 is passed lengthwise through the arm 5 and carries a pair of spaced supports 14 threaded thereon. The supports are spaced apart sufficiently to receive the lower cast 2, and through each support is threaded a horizontal supporting screw 15 equipped with a lock nut 16. The arm 5 and supports 14 are formed with three props or supports 17 which determine a plane parallel to the base 3.

The lower cast 2 is now inverted over the props 17 in such a manner that the latter engage the cast at three points which should lie in a horizontal plane. This position is secured by the screws 15 and lock nuts 16, and the arm 5 is then turned over to occupy a position directly above the base 3 as indicated by the dotted lines in Figure 3. The lower cast is secured in this position to the articulator base 7 by means of cement 18 or similar material. The articulator 7, 8 may now be released from the base 3 in the manner described, and the result of the foregoing procedure is that three selected points on the cast 2 lie in a plane which should be horizontal or parallel to the base of the articulator.

Base plates 19 and 20 are made from the casts 1 and 2 respectively in the usual manner and are mounted on the gums of the patient as shown in Figures 5 and 6. By means of a plug or stop 21 which the dentist inserts between the upper and lower plates at the front of the mouth, he determines the spacing at this point in conformity with a proper and natural appearance of the lips. The dentist may have a graduated series of such plugs and select the proper plug after a number of trials, or he may whittle one of the plugs, if necessary, until it produces the proper lip appearance when inserted in the position illustrated. The plane of the lip parting is scribed on the plug as at 22 by means of any suitable marking instrument.

In Figures 7 and 8 the articulator 7, 8 has been secured to another base plate 23 by a clamp 24 such as that already described. It will be recalled that the lower cast 2 has previously been attached to the articular base 7. The base plate 20 is set on the cast 2. The member 23 has a vertical post 25 carrying an adjustable scribing tool 26. The plug 21 remains attached to the lower plate 20 by a piece of wax 27, and the point of the tool is set to the lip parting line 22. A body of wax or similar material 28 is molded upon the plate 20, and upon the wax is applied a curved or horseshoe plate 29 presenting a flat upper surface. The plane in which this upper surface lies is determined by the previously set tool 26 so that this plane is a horizontal plane passed through the parting point 22 in its original relation to the lower plate 20.

Summarizing the method to this point, it will be seen that one of the steps of the process consists in locating the plates 29 and 30 in a plane parallel to the base of the articulator or, in other words, in a horizontal plane in the mouth of the patient when the plates 19 and 20 are mounted on the gums. This relation is obtained by mounting the cast 2 upon the props 17 lying in a horizontal plane, securing the cast in this position with respect to the props, inverting the cast through an angle of 180° and building down to the base of the articulator. The points formerly resting on the props 17 are still in the horizontal plane.

It is within the skill of the dentist to select three points which should lie in a horizontal plane in the mouth of the patient. Although this requires estimation on the part of the dentist, it is by no means guess work, for three such points can be very accurately determined by sight. Any three points in any horizontal plane may be selected, and the props are readily adjustable to engage three such selected points. Although the forward prop is fixed, the cast may be adjusted relatively to it, and then the lateral props may be separately adjusted.

Thus, the adjustability of the props 17 is not universal in one plane, being limited by the fixed position of the intermediate prop 17 which is formed integral with the member 15. Consequently the skill of the dentist is relied upon to find three points on the cast 2 that normally occupy one horizontal plane and which at the same time may be engaged respectively by the props 17 within the limits of their adjustability as above set forth.

If the dentist prefers not to rely on a sight determination of these three points, he may use some such instrument as a three point gauge containing a level gauge, inserted in the patient's mouth, just before or after making the cast. Three points thus found to lie in a horizontal plane can readily be transferred to the case.

The lower plate 20 with the horseshoe plate 29 thereon is reset in the mouth of the patient as shown in Figure 10. Upon the plate 29 is secured a similar plate 30 in coincident relation by means of pieces of wax 31. The upper plate 19 is also fitted in the mouth, and between this plate and the member 30 is inserted a plug 32 of such height that, added to the thickness of the plate 30, it equals the length of the plug 21 above the mark 22. In other words, the plates 19 and 20 have the same vertical spacing now as in Figure 5, the lip parting line occurring between the plates 29 and 30. In order to support the upper plate 19 in the relation determined by the parts 31 and 32, the patient is caused to bring the plate 19 upon lateral spacing plugs 33 of wax laid upon the plate 30, until the upper plate 19 is stopped by the plug 32. This procedure determines the vertical spacing of the plates 19 and 20.

The plates 19 and 20 are now secured together by the pieces of wax 31 and 33, and this structure is transferred to the lower cast 2 which has previously been attached to the articulator, as shown in Figure 11. The upper cast 1 is set in the upper plate 19, and in this relation to the lower cast 2 it is fixed to the movable jaw 34 of the articulator in the usual manner. The lower limit of the movement of the jaw is set by an adjustable stop 35 comprised in the articulator. In this manner the articulator is set.

The plates 29 and 30 are now separated from each other by removal of the wax 31, the plate 29 however remaining fixed to the lower plate 20 as shown in Figure 8 and the upper plate 30 remaining attached to the upper plate 19 by the

wax 33. The plates 19 and 20 are again inserted in the mouth of the patient as shown in Figures 13 and 14, and the patient is caused to bring his jaws and lips to a proper and normal relative position. In most cases it will be found that the latter relative position is different from that previously determined in Figure 10. The difference is in the nature of a lengthwise displacement 36 of the plates 29 and 30 from their former coincident relation, or a transverse displacement 37, or both, in a horizontal plane. The vertical relation however is maintained by the devices used in Figures 10 and 11. The new relation of the plates 19 and 20 determined in Figures 13 and 14 is set by pieces 38 of wax attaching the pieces 33 to the lower plate 20.

The plates 19 and 20 thus fastened together are reset in the articulator, as in Figure 15, the lower plate 20 fitting on the lower cast 2 and the upper cast 1 being adjusted on the movable jaw 34 of the articulator by means of the floating wingnut 34', so that it seats perfectly in the upper cast 19. The spacing of the plates as determined in Figures 13 and 14 is set and maintained by the previous adjustment of the stop 35. The horseshoe plates 29 and 30 as well as the wax and the stop 32 between the plates are now removed, and new pieces of wax 39 are attached to the plates 19 and 20 and equipped with mutually contacting stops 40 in the nature of thumb tacks or similar devices, preferably at positions normally occupied by certain of the back teeth, in order to support the wax against plates and to maintain the spacing previously determined. With the device in this condition, certain of the more prominent teeth 41 are attached to the plates by means of the wax and properly fitted together for the correct bite. This process is governed also by trying the plates in the mouth of the patient, and at such times the stops 40 aid in holding the plates on the gums of the patient. The back stops or supports 40 are then removed and replaced on the lower plate by a pair of built up pointed members 42 representing the tops of the back teeth in the lower jaw. One of these members is located by observation with reference to the lip movements of the patient, and the other is set at the same height from the base 23 with the aid of a height gauge.

A parting or occlusion template 43 is set on the points already determined for the lower set of teeth, thereby assuming a fixed and definite relation to the horizontal or the base 23, and is secured to an arm 44 hinged on the articulator structure so that it may readily be swung over the lower teeth 20 as in Figures 18, 19 and 20 and withdrawn therefrom whenever desired, without destroying its setting. By means of the lower surface of the template, which is shaped according to the correct line of occlusion and the angles of the tops of the lower teeth in both directions, the remainder of the lower teeth 45 are inserted as in Figures 21 and 22. It will be understood that the tops of these teeth must fit against the lower surface of the template 43, and the movability of the latter in the manner described greatly facilitates a trial and error method of setting the lower teeth until they are properly positioned. During this operation, the movable jaw 34 of the articulator may be removed, but the adjustment of the stop 35 and the setting of the cast 1 on the arm 34 must not be destroyed. When the arm 34 is remounted on the articulator, it thus occupies the same position as in Figures 15 and 16.

The arm 34 is in fact remounted in the articulator after all the lower teeth have been inserted by the method described. The remaining upper teeth 46 are now attached to the upper plate 19 by means of the wax 39 and are fitted with respect to the lower teeth to produce the correct bite. The wax 39 is then trimmed to correspond to the desired contour of the gums, and the plates with the teeth attached thereto are now ready to be used as a model or pattern for the final or permanent plates.

It will thus be seen that one of the results accomplished by this invention is that the cast of the gum 2 is initially laid on the base member 3 in the proper parallel relation thereto. Secondly, the occlusal plane defined by the contacting surfaces of the members 29 and 30 is originally a separation between the two plates, as distinguished from the current methods of fastening the plates together and subsequently splitting them along a parting intended to be the occlusal plane but necessarily deviating therefrom due to the impossibility of accurately separating the plates. Thirdly, the occlusal plane determined according to the present invention, while the plate 29 upon the cast 2 is separate from the other plate 30, is rendered parallel to the base 3 by means of the scribing tool 26 and hence is parallel to a plane passed through three points of the ridge of the cast 2 selected in the initial mounting of this cast upon the supports 17. Fourthly, the occlusal plane is in the lip parting surface as determined in the mouth of the patient; and fifthly, the spacing of the plates as originally determined in the mouth of the patient is maintained while determining the lateral relation and performing of the subsequent operations.

Numerous other particular advantages of the invention may be specified, but it is not considered necessary to elaborate further in this direction. The result of the method described herein is a pair of plates which fit with a degree of accuracy corresponding to the accuracy with which the herein described method is followed. With a given degree of skill and care, the errors in plates made according to present methods are largely avoided.

Although a specific embodiment of the invention has been illustrated and described, it will be understood that various alterations in the details of construction may be made without departing from the scope of the invention, as indicated by the appended claims.

What I claim is:—

1. In the fitting of artificial dentures, the operations of forming separate base plates, fitting the same in the mouth of the patient, determining the spacing of said plates at the foremost point by a spacing plug inserted between said points, scribing the lip parting line on said plug, building up one of said plates with material, trimming said material flat in a horizontal plane determined by said line, building up the other plate and trimming it off flat in the same plane while maintaining the previously determined spacing between the plates and maintaining the plates detached from each other in said plane, determining and temporarily fixing the central bite relation of said plates in the mouth of the patient in said plane, transferring said plates in said relation to an articulator, fitting a forward tooth to one of said plates and erecting two points on said plate to represent the tops of back teeth, applying the remaining teeth to said plate with reference to an occlusion template laid on said forward

tooth and points, and applying teeth to the remaining plate to fit the first named teeth.

2. In the fitting of artificial dentures, the operations of forming separate base plates, fitting the same in the mouth of the patient, determining the spacing of said plates at the foremost point by a spacing plug inserted between said points, scribing the lip parting line on said plug, building up one of said plates with material, trimming said material flat in a horizontal plane determined by said line, building up the other plate and trimming it off flat in the same plane while maintaining the previously determined spacing between the plates and maintaining the plates detached from each other in said plane, determining and temporarily fixing the central bite relation of said plates in the mouth of the patient in said plane, transferring said plates in said relation to an articulator, and fitting the teeth to said plates.

3. In the fitting of artificial dentures, the operations of forming separate base plates, fitting the same in the mouth of the patient, determining the spacing of said plates at the foremost point by a spacing plug inserted between said points, scribing the lip parting line on said plug, building up said plates with material, applying a flat member to the material of each plate in the plane determined by said line while maintaining said members separated from each other and maintaining the previously determined spacing between said plates, determining and temporarily fixing the central bite relation of said plates in the mouth of the patient in said plane, transferring said plates in said relation to an articulator, fitting a forward tooth to one of said plates and erecting two points on said plate to represent the tops of back teeth, applying the remaining teeth to said plate with reference to an occlusion template laid on said forward tooth and points, and applying teeth to the remaining plate to fit the first named teeth.

4. The method of determining the occlusal plane in the making of artificial dentures consisting in mounting a plaster cast of the patient's gum upon a base member in such a manner that three points on the ridge of the gum lie in a plane parallel to the supporting surface of said member, fitting previously prepared base plates in the mouth of the patient, determining the spacing at the foremost point of said plates by a spacing plug inserted between said points, scribing the lip parting line on said plug, mounting the corresponding plate upon said cast while maintaining said plug attached to the plate, building up said plate with material, trimming off said material in a plane by the aid of a height gauge mounted upon said base member and set to said parting line, building up the other plate to a flat surface in the same plane while maintaining the previously determined spacing between said plates.

5. The method of determining the occlusal plane in the making of artificial dentures consisting in supporting a cast of the patient's gum by laying the ridge thereof on three points which determine a plane, transferring the cast thus supported over a base member having a supporting surface parallel to said plane, while maintaining said three ridge points in a plane parallel to the first named plane and parallel to said surface, fitting previously prepared base plates in the mouth of the patient, determining the spacing at the foremost point of said plates by a spacing plug inserted between said points, scribing the lip parting line on said plug, mounting the corresponding plate upon said cast while maintaining said plug attached to the plate, building up said plate with material, trimming off said material in a plane by the aid of a height gauge mounted upon said base member and set to said parting line, building up the other plate to a flat surface in the same plane while maintaining the previously determined spacing between said plates.

6. The method of determining the occlusal plane in the making of artificial dentures and fitting teeth to said dentures consisting in mounting a plaster cast of the patient's gum upon a base member in such a manner that three points on the ridge of the gum lie in a plane parallel to the supporting surface of said member, fitting previously prepared base plates in the mouth of the patient, determining the spacing at the foremost point of said plates by a spacing plug inserted between said points, scribing the lip parting line on said plug, mounting the corresponding plate upon said cast while maintaining said plug attached to the plate, building up said plate with material, trimming off said material in a plane by the aid of a height gauge mounted upon said base member and set to said parting line, building up the other plate to a flat surface in the same plane while maintaining the previously determined spacing between said plates, determining and temporarily fixing the central bite relation of said plates in the mouth of the patient in said plane, transferring said plates in said relation to an articulator, and fitting the teeth to said plates.

7. The method of determining the occlusal plane in the making of artificial dentures and fitting teeth to said dentures consisting in mounting a plaster cast of the patient's gum upon a base member in such a manner that three points on the ridge of the gum lie in a plane parallel to the supporting surface of said member, fitting previously prepared base plates in the mouth of the patient, determining the spacing at the foremost point of said plates by a spacing plug inserted between said points, scribing the lip parting line on said plug, mounting the corresponding plate upon said cast while maintaining said plug attached to the plate, building up said plate with material, trimming off said material in a plane by the aid of a height gauge mounted upon said base member and set to said parting line, building up the other plate to a flat surface in the same plane while maintaining the previously determined spacing between said plates, determining and temporarily fixing the central bite relation of said plates in the mouth of the patient in said plane, transferring said plates in said relation to an articulator, fitting a forward tooth to one of said plates and erecting two points on said plate to represent the tops of back teeth, applying the remaining teeth to said plate with reference to an occlusion template laid on said forward tooth and points, and applying teeth to the remaining plate to fit the first named teeth.

WILLIAM E. SANBORN.