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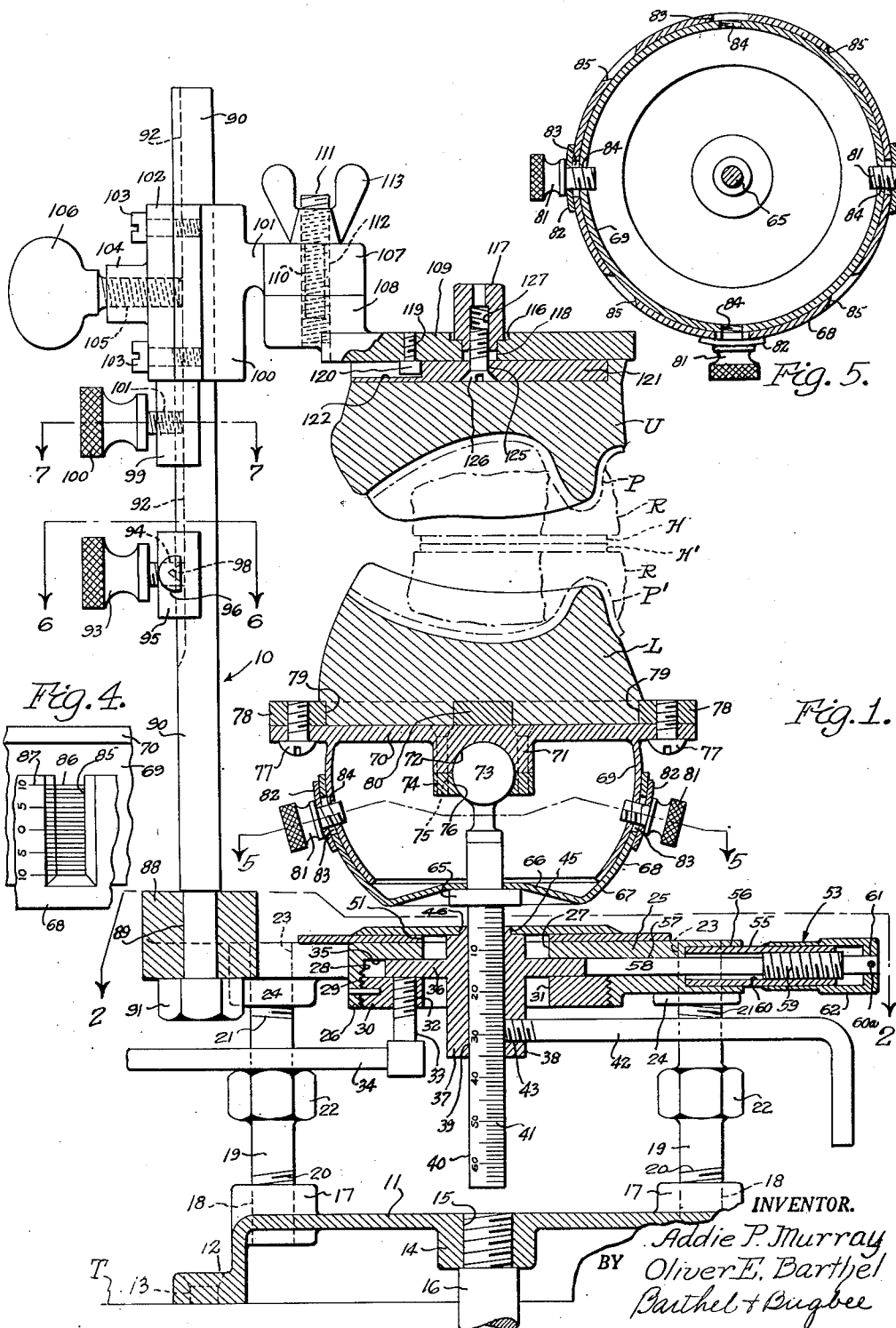
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ARTICULATOR FOR MAKING ARTIFICIAL DENTURES

Filed March 20, 1950

2 SHEETS—SHEET 1



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2 SHEETS—SHEET 2

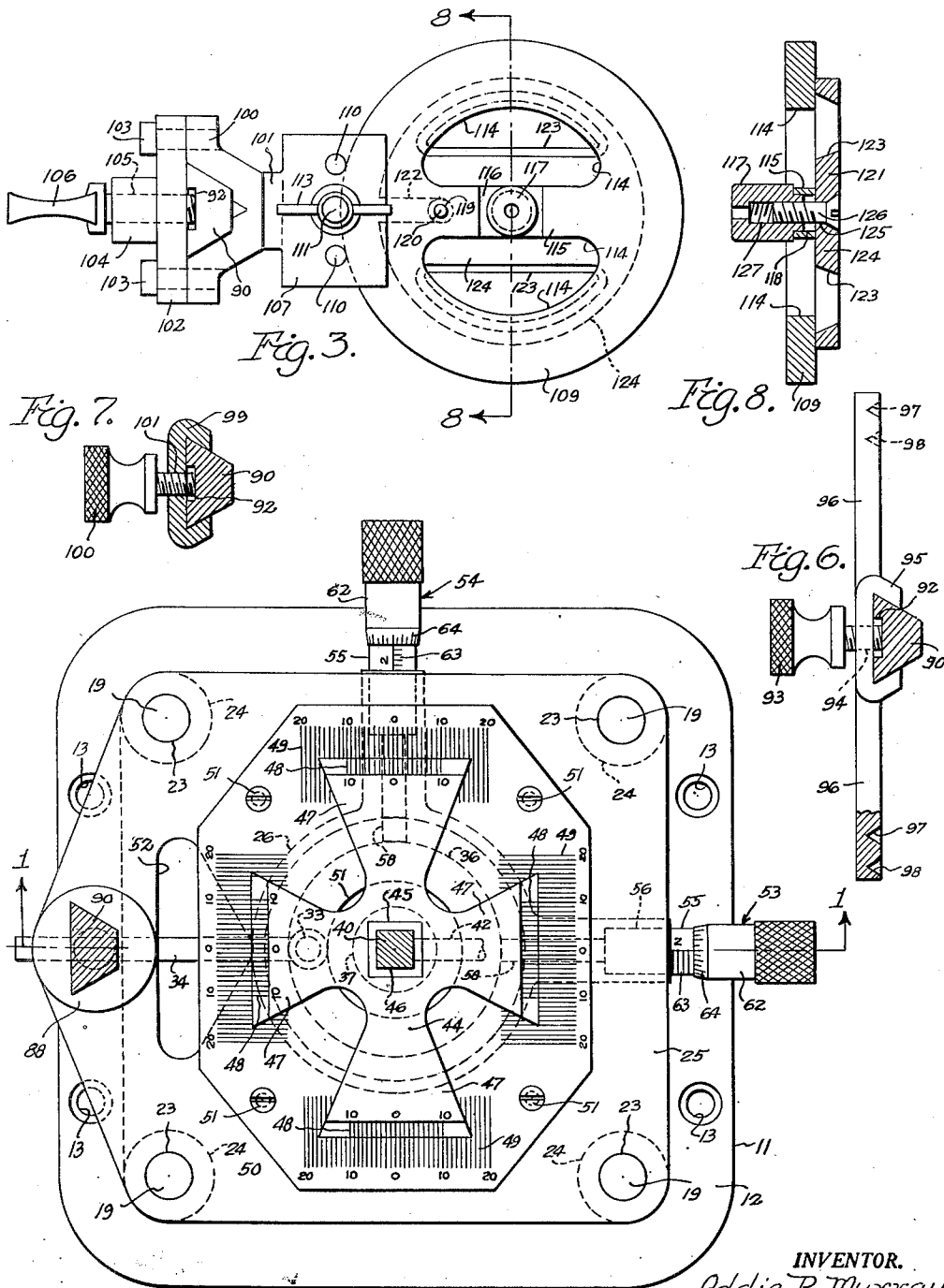


Fig. 2.

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ARTICULATOR FOR MAKING ARTIFICIAL DENTURES

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10 Claims. (Cl. 32—32)

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This invention relates to dental appliances and, in particular, to articulators for making artificial dentures.

One object of this invention is to provide an improved articulator by which the artificial teeth may be fitted into artificial dentures in an accurate and precise manner so that they will occupy the proper positions when fitted into the wearer's mouth and proper biting or occlusion will be obtained.

Another object is to provide an improved articulator for making artificial dentures wherein the casts made from impressions of the upper and lower jaws of the wearer may be placed in the articulator in the same relative positions that the jaws occupy in the wearer's head.

Another object is to provide an improved articulator for making artificial dentures wherein the various parts of the articulator may be moved relatively to one another and the amount of such motion indicated on accurate scales whereby the articulator may always be accurately reset to its previous position by the use of these scales.

In the drawings:

Figure 1 is a central vertical section, partly in side elevation, of an improved articulator according to a preferred form of the invention, taken along the line 1—1 in Figure 2;

Figure 2 is a horizontal section through the articulator, taken along the line 2—2 in Figure 1;

Figure 3 is a top plan view of the upper portion of the articulator shown in Figure 1;

Figure 4 is a fragmentary front elevation of part of the central portion of the articulator shown in Figure 1, showing one of the scales for indicating deviations of the setting of the machine from a setting assumed as a zero setting;

Figure 5 is an approximately horizontal section taken along the line 5—5 in Figure 1;

Figure 6 is a horizontal section taken along the line 6—6 in Figure 1;

Figure 7 is a horizontal section taken along the line 7—7 in Figure 1; and

Figure 8 is a vertical section taken along the line 8—8 in Figure 3.

Referring to the drawings in detail, Figures 1 and 2 show an improved articulator, generally designated 10 according to the preferred form of the invention as mounted upon a base 11 having a downwardly-extending flange 12 with holes 13 therein by which it may be secured to a table T by means of suitable fasteners (not shown). The central portion of the base 11 is provided with a boss 14 which is bored and threaded as at 15 to receive the threaded upper portion of a

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clamping member 16 by which the base 11 may be removably clamped to the table T instead of by using the fasteners through the holes 13.

The base 11 is of approximately rectangular or square shape and is provided at its corners with bosses 17 which are bored and threaded as at 18 to receive the lower ends of posts 19, the opposite ends of which are oppositely-threaded, the portion 20, for example, being a right-hand thread and the portion 21 thereof a left-hand thread. The posts 19 are preferably provided with hexagonal or other polygonal portions 22 by which they may be rotated for adjustment purposes.

The upper ends of the posts 18 are threaded into threaded bores 23 in bosses 24 at the four corners of an approximately square platform 25. The platform 25 is provided with a central boss 26 which is provided with a central bore 27 and an undercut counterbore 28, the lower end of which is threaded as at 29 and closed by a screw plug 30 having a central aperture 31 therein of substantially the same diameter as the bore 27. The plug 30 is bored and threaded as at 32 to receive a clamping screw 33 having an operating handle 34 projecting radially therefrom by which the clamping screw 33 may be rotated in the threaded bore 32. Mounted in the space between the plug 30 and the shoulder 35 at the upper end of the counterbore 28 is the annularly flanged portion 36 of a central support 37 having a vertical boss 38 which is bored as at 39 to receive a vertical rod 40 of square cross-section (Figure 2) having graduations 41 thereon according to a suitable system of measurement, such as inches or millimeters. The rod 40 is held in position by a clamping screw 42 which is threaded through a threaded bore 43 in the boss 38 and engages the rod 40 either directly or through a cushioning plug of softer metal which prevents the defacement of the rod 40.

The flanged portion 36 is of disc-like form and the external diameter of the boss 38 is sufficiently less than the internal diameter of the bores 27 and 31 to permit a certain amount of lateral sliding motion between the central support 37 and the platform 25. In order to measure deviations from a prearranged zero position of these parts, a cross-shaped measuring pointer 44 is centrally bored with a square bore as at 45 to fit upon the correspondingly squared portion 46 at the upper end of the boss 38. Each arm 47 of the pointer 44 is provided with graduations 48 on the beveled end thereof adapted to align with graduations 49 on a plate 50 which is secured as

by the screws 51 to the platform 25. The graduation plate 50 is likewise provided with a central aperture 51 similar in diameter to the apertures 27 and 31 previously described. The graduations 48 (Figure 2) may, if desired, be inscribed according to the vernier system to permit measurement readings to be accurately made according to subdivisions of the graduations 49. The platform 25 at its rearward side is provided with a sight aperture 52.

In order to measure the deviations of the central support 37 from its zero position, other than by the pointers 47 and scales 48, 49, micrometer devices generally designated 53 and 54 are provided with their axes at right angles to one another. Each of the micrometer devices 53 and 54 is identical in construction to the other, hence a single description suffices for both and similar parts are similarly designated. The micrometer device 53 or 54 (Figure 1) consists of a tubular stem or sleeve 55 which is inserted in a bore 56 from which a counterbore 57 extends horizontally through to the bore 28. A micrometer screw spindle 58, having the usual screw-threaded portion 59 threaded into a correspondingly threaded bore 60 in the stem 55, engages the edge of the flanged portion 36 of the central support 37. Beyond the threaded portion 59 the spindle 58 is secured as at 60a in a bore 61 in the end wall of a thimble 62. The stem 55 and thimble 62 have cooperating graduations 63 and 64 respectively (Figure 2).

The rod 40 above the pointer 44 (Figure 1) is provided with a shoulder portion 65 upon which rests the bottom wall 66 of an outer shell 67 having a partially spherical portion 68. Fitting into the spherical portion 63 of the shell 67 is a corresponding partially spherical inner shell 69 which extends downward from a lower cast support 70. The latter has a central boss 71 with a spherical socket 72 formed therein and receiving the spherical ball 73 mounted on the upper end of the rod 40. A retaining ring 74 secured by fasteners 75 to the boss 71 has a corresponding partially spherical surface 76 forming a continuation of the partially spherical socket 72. Secured as by the screws 77 to the upper surface of the lower support 70 (Figure 1) is a lower disc or base plate 78 having a pair of elongated apertures 79 therein and a bridge portion 80 extending diametrically between them, the construction being generally similar to that of the upper disc shown in Figure 3 and described below. As will be seen in connection with the operation of the invention, the lower base plate 78 on the lower support 70 receives the lower cast or model L of the lower jaw and gum of the patient or wearer.

In order to enable the lower support 70 to be tilted and clamped relatively to the shell 67, four knurled clamping screws 81 (Figure 1) are threaded at intervals of 90° through washers 82 and enlarged holes 83 in the shell 67 into threaded holes 84 in the inner shell 69 (Figures 1 and 5). In Figure 5 only two of the four clamping screws 81 have been completely shown, the uppermost screw being omitted in order to show the threading in the hole 84. In order to indicate the amount of tilt, the spherical shell 67 is provided with rectangular windows 85 (Figures 4 and 5) through which graduations 86 on the inner shell 69 are visible and alignable with graduations 87 along one edge of the window 85.

Near its rearward edge the platform 25 is provided with an upwardly extending boss 88 which is bored as at 89 to receive the lower end of an

upright rod 90 held therein by the nut 91 threaded upon the lower end thereof. The rod 90 throughout the upper portion of its length is of trapezoidal cross-section (Figures 2, 3, 6 and 7) and is provided with a longitudinal groove 92 which is adapted to receive the end of a clamping screw 93 threaded through a bore 94 (Figure 6) in an approximately C-shaped lower bracket 95. The latter partly encircles the rod 90 and closely fits it. Secured to the bracket 95 and extending laterally from it on both sides is a cross arm 96 having paired outer and inner indentations 97 and 98 respectively. The indentations 97 and 98 serve to receive the pointed ends of the arms or calipers used in adjusting the instrument, as described further in connection with the operation.

Mounted above the bracket 95 is an upper bracket 99 (Figure 7) having a clamping screw 100 threaded into a bore 101, so as to engage the bottom wall of the groove 92. The upper bracket 99 is of similar construction to the bracket 95. Mounted on the rod 90 above the upper bracket 99 is a top bracket 100 which consists of an arm 101 fitted to the rod 90 (Figure 3) and having a retaining plate 102 secured as at 103 thereto. The retaining plate 102 is provided with a boss 104 (Figure 1) having a threaded bore 105 into which is threaded a clamping screw 106, the end of which engages the bottom of the groove 91. The arm 101 terminates in a boss 107 of rectangular outline to the underside of which is secured a boss 108 mounted on the rearward edge of a plate or upper support 109. Locating pins 110 are provided to properly locate the bosses 107 and 108 relatively to one another so that the plate 109 may be taken off and replaced in the same position. A threaded stud 111 secured in the boss 108 and passing through a bore 112 in the boss 107 is surmounted by a wing nut 113 for clamping the bosses 107 and 108 together.

The plate 109 is provided with approximately semi-circular apertures 114 (Figure 3) separated by a diametrical bridge portion 115. The bridge portion 115 is recessed slightly as at 116 to receive a knurled thumb nut 117 the lower end of which is reduced in diameter and enters a hole 118 extending downward through the plate 109 from the recessed portion 116 (Figure 1). The disc 109 is also bored and threaded as at 119 to receive a locating screw 120. Secured to the underside of the plate 109 is an upper disc 121 having a radial slot 122 therein (Figure 3) for receiving the head of the locating screw 120. The upper disc 121, like the lower disc 78, is likewise provided with elongated apertures 123 separated by a bridge portion 124. The latter contains a central hole 125 through which a screw 126 is inserted upward, passing through the hole 118 into the threaded bore 127 in the thumb nut 117. In this manner, the upper disc 121 receives and supports the upper cast U of the patient's jaw and is, in turn, supported by the plate 109.

In addition to the upper and lower casts or models U and L, Figure 1 in chain lines shows the upper and lower denture plates P and P' on which the teeth are to be mounted in the patient's mouth; also upper and lower "bite rims" R and R' of wax or other similar material as described below, and the so-called horseshoe plates H and H' attached to the "bite rims" R and R'.

Operation

When the articulator is installed and prior to using it, the platform 25 thereof is accurately adjusted to a truly horizontal position by adjusting the screw posts 19 while using a spirit level.

In the operation of the invention, a wax impression of the space between the patient's gums of the upper and lower jaws is taken in the usual way and with the usual wax-like material. This wax impression, which gives the contour of the upper and lower gums and the space between them, is then removed from the mouth, placed in a mold and plaster-of-Paris poured in above and below it to make the upper and lower plastic casts of the upper and lower jaw and gum contours. The casts or models are then mounted on their respective discs or base-plates 78 and 121 and these mounted on the lower and upper supports 70 and 109 as shown in Figure 1. The object now is to place the casts or models L and U in exactly the same relative positions and separations that the jaws and gums of which they are facsimiles occupied in the mouth of the patient at the time the wax impression was taken from which the casts or models were made. If this condition is obtained, then central occlusion of the teeth will likewise be obtained and the patient will be able to bite properly with his teeth.

The platform 25 and upper plate 109 are now leveled with the air of a spirit level by adjusting the posts 19 and all of the scales of the articulator are set at zero. The plate 70 is then also leveled by means of a spirit level so that the plates 109 and 70 are parallel to the platform 25. The upper plate 109 is now adjusted upward or downward by means of the bracket 100 and clamping screw 106 on the rod 90 until the upper cast U is the same distance from the lower cast L that the upper and lower gums were separated at the time the wax impression was taken from which the casts U and L were made. Let it be assumed also that the usual upper and lower plates on which the teeth are to be mounted have been prepared in a conventional manner. The object is now to get the teeth inserted correctly and lined up properly so as to provide proper occlusion when they are placed in the mouth.

To do this, the operator mounts the upper and lower plates P and P' on the upper and lower casts U and L and then forms or builds up "bite rims" of wax on the plates so mounted in the articulator. He first puts a ridge of wax on the lower plate P' to approximately the correct height of the teeth to be placed thereon, then superimposes a horseshoe plate (not shown) on the wax rim and levels up the horseshoe plate by a spirit level with its upper surface located midway between the ridges on the upper and lower plates P and P'. The horseshoe plate has downwardly projecting pins which pierce the wax and hold the horseshoe plate in position.

The operator now places a similar upper horseshoe plate upon the lower horseshoe plate, with its pin projecting upward, and melts wax upon it to fill up the space between the upper horseshoe plate and the upper plate P, the wax adhering to the pins on the upper horseshoe plate. The operator then raises the upper plate 109 by loosening the clamp screw 106, leaving the bracket 99 tightly clamped in place by means of the clamping screw 100, so as to be able to use it as a stop in replacing the upper plate 109 in its former position.

With the upper and lower plates 109 and 70

thus separated the operator removes the wax bite rims with the horseshoe plates and tooth plates attached, and places the upper assembly thereof in the mouth, fitting over the upper gum. He then places on the lower horseshoe plate a layer of a very soft compound such as is used to take mouth impressions and places the lower assembly of the tooth plate, wax bite rim and lower horseshoe plate in the mouth. The patient is then directed to reregister his gums to re-establish the centric relationship thereof. Without moving the relative positions of the upper and lower assemblies after such centric relationship has been established, the compound is allowed to set.

Thereupon the entire combination of the upper and lower assemblies is removed from the mouth and placed on the upper cast U in its still raised position. The upper arm 101 is then lowered so that the combined assemblies approach the lower cast L. However, the lower tooth plate P' will not now fit over the lower cast L because it has moved into a shifted position by reason of being placed in the patient's mouth. The layer of impression compound between the two horseshoe plates indicates the actual error at this time between the true perpendicular as it exists in the head of the patient and the true perpendicular as it exists in the articulator as originally adjusted, with all its scales reading zero and with its various supports leveled by the spirit level.

The operator now loosens up the clamping screws 33 and 81 and moves the central support 37 to and fro, measuring its motion by the micrometer devices 53 and 54, and tilts the inner shell 69 relatively to the outer shell 68 (Figure 1), measuring its tilt on the scales 86 and 87 (Figures 4 and 5) until the lower plate P' fits down accurately over the lower cast L as the combined assemblies, still attached to the upper cast U, are lowered upon the lower cast L. When an accurate fit is obtained, the various clamping screws 81 and 33 are tightened to lock the articulator. The operator then takes the readings of all of the scales. He then lifts the upper arm 101 and removes the combined assemblies from their position between the casts U and L.

The operator now takes half the difference between the original scale readings and the readjusted scale readings, and resets the scales on the lower arm or supporting structure of the articulator to those half readings. He now mounts the combined or double assembly (consisting of the upper tooth plate, the upper bite rim, the upper horseshoe plate, the layer of impression compound, the lower horseshoe plate, the lower bite rim and the lower tooth plate) on the lower cast and knocks the upper cast U off the upper mounting plate or disc 121, and registers the cast on the upper base plate. He then runs plaster-of-Paris into the space between the upper cast and the upper mounting plate 121, which takes up the upper half of the error, of which the lower half has previously been absorbed by the settings of the scales described above. This procedure divides the compound angle of error between the lower and upper assemblies, so that the upper and lower tooth plates P and P' will now be properly located, ready for the insertion of the artificial teeth.

What we claim is:

1. An articulator for making artificial dentures comprising a base, an upright mounted on said base, a laterally and longitudinally movable slide mounted on said base, a post including a uni-

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versal joint mounted on said slide, a lower dental cast support rockably mounted on said universal joint, an upper dental cast support movably mounted on said upright, and measuring devices associated with said lower cast support for indicating the displacement thereof from a predetermined zero position.

2. An articulator for making artificial dentures comprising a base, an upright mounted on said base, a laterally and longitudinally movable slide mounted on said base, a post including a universal joint mounted on said slide to be vertically slidable relative to said slide, a lower dental cast support rockably mounted on said universal joint, an upper dental cast support movably mounted on said upright, and measuring devices associated with said lower cast support for indicating the displacement thereof from a predetermined zero position.

3. An articulator for making artificial dentures comprising a base, an upright mounted on said base, a platform mounted on said base in vertically-spaced relationship therewith, said platform having an aperture therethrough and a substantially flat horizontal guide surface disposed adjacent said aperture, a slide extending across said aperture and slidably engaging said guide surface, a post of smaller cross dimension than said aperture mounted on said slide and projecting upwardly through said aperture, means for urging said slide into engagement with said guide surface, a universal joint mounted on said post, a lower dental cast support rockably mounted on said universal joint, measuring devices associated with said lower cast support for indicating the linear and angular displacement thereof from a predetermined zero position, and an upper cast support movably mounted on said upright for travel toward and away from said lower cast support.

4. An articulator for making artificial dentures comprising a base, an upright mounted on said base, a platform mounted on said base in vertically-spaced relationship therewith, said platform having an aperture therethrough and a substantially flat horizontal guide surface disposed adjacent said aperture, a slide extending across said aperture and slidably engaging said guide surface, a post of smaller cross dimension than said aperture mounted on said slide and projecting upwardly through said aperture, means for urging said slide into engagement with said guide surface, a universal joint mounted on said post, a lower dental cast support rockably mounted on said universal joint, measuring devices associated with said lower cast support for indicating the linear and angular displacement thereof from a predetermined zero position, and an upper cast support movably mounted on said upright for travel toward and away from said lower cast support, said slide having a vertical bore therethrough and said post vertically slidably engaging said bore.

5. An articulator for making artificial dentures comprising a base, an upright mounted on said base, a platform mounted on said base in vertically-spaced relationship therewith, said platform having an aperture therethrough and a substantially flat horizontal guide surface disposed adjacent said aperture, a slide extending across said aperture and slidably engaging said guide surface, a post of smaller cross dimension than said aperture mounted on said slide and projecting upwardly through said aperture, means for urging said slide into engagement with said guide

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surface, a universal joint mounted on said post, a lower dental cast support rockably mounted on said universal joint, measuring devices associated with said lower cast support for indicating the linear and angular displacement thereof from a predetermined zero position, and an upper cast support movably mounted on said upright for travel toward and away from said lower cast support, said guide surface restricting the freedom of motion of said slide to horizontal directions, said slide being freely movable horizontally in lateral, longitudinal and oblique directions relatively to said predetermined zero position.

6. An articulator for making artificial dentures comprising a base, an upright mounted on said base, a platform mounted on said base in vertically-spaced relationship therewith, said platform having an aperture therethrough and a substantially flat horizontal guide surface disposed adjacent said aperture, a slide extending across said aperture and slidably engaging said guide surface, a post of smaller cross dimension than said aperture mounted on said slide and projecting upwardly through said aperture, means for urging said slide into engagement with said guide surface, a universal joint mounted on said post, a lower dental cast support rockably mounted on said universal joint, measuring devices associated with said lower cast support for indicating the linear and angular displacement thereof from a predetermined zero position, and an upper cast support movably mounted on said upright for travel toward and away from said lower cast support, said slide having contact surfaces on the sides thereof and said measuring devices including micrometer screw measuring instruments mounted on said platform in engagement with said contact surfaces.

7. An articulator for making artificial dentures comprising a base, an upright mounted on said base, a platform mounted on said base in vertically-spaced relationship therewith, said platform having an aperture therethrough and a substantially flat horizontal guide surface disposed adjacent said aperture, a slide extending across said aperture and slidably engaging said guide surface, a post of smaller cross dimension than said aperture mounted on said slide and projecting upwardly through said aperture, means for urging said slide into engagement with said guide surface, a universal joint mounted on said post, a lower dental cast support rockably mounted on said universal joint, measuring devices associated with said lower cast support for indicating the linear and angular displacement thereof from a predetermined zero position, and an upper cast support movably mounted on said upright for travel toward and away from said lower cast support, said slide having a substantially annular side contact surface, and said measuring devices including micrometer screw measuring instruments mounted on said platform in engagement with said contact surface.

8. An articulator for making artificial dentures comprising a base, an upright mounted on said base, a platform mounted on said base in vertically-spaced relationship therewith, said platform having an aperture therethrough and a substantially flat horizontal guide surface disposed adjacent said aperture, a slide extending across said aperture and slidably engaging said guide surface, a post of smaller cross dimension than said aperture mounted on said slide and projecting upwardly through said aperture,

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means for urging said slide into engagement with said guide surface, a universal joint mounted on said post, a lower dental cast support rockably mounted on said universal joint, measuring devices associated with said lower cast support for indicating the linear and angular displacement thereof from a predetermined zero position, and an upper cast support movably mounted on said upright for travel toward and away from said lower cast support, said measuring devices including a graduated cross-shaped member connected to and movable with said slide and said platform having measuring indicia registering with the graduations of said cross-shaped member.

9. An articulator for making artificial dentures comprising a base, an upright mounted on said base, a platform mounted on said base in vertically-spaced relationship therewith, spaced levelling screws mounted on said platform and engaging said base, said platform having an aperture therethrough and a substantially flat horizontal guide surface disposed adjacent said aperture, a slide extending across said aperture and slidably engaging said guide surface, a post of smaller cross dimension than said aperture mounted on said slide and projecting upwardly through said aperture, means for urging said slide into engagement with said guide surface, a universal joint mounted on said post, a lower dental cast support rockably mounted on said universal joint, measuring devices associated with said lower cast support for indicating the linear and angular displacement thereof from a predetermined zero position, and an upper cast support movably mounted on said upright for travel toward and away from said lower cast support.

10. An articulator for making artificial dentures comprising a base, an upright mounted on said base, a platform mounted on said base in

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vertically-spaced relationship therewith, said platform having an aperture therethrough and a substantially flat horizontal guide surface disposed adjacent said aperture, a slide extending across said aperture and slidably engaging said guide surface, a post of smaller cross dimension than said aperture mounted on said slide and projecting upwardly through said aperture, means for urging said slide into engagement with said guide surface, a universal joint mounted on said post, a lower dental cast support rockably mounted on said universal joint, measuring devices associated with said lower cast support for indicating the linear and angular displacement thereof from a predetermined zero position, said measuring devices including a pair of hollow nesting partially spherical shells disposed concentrically with said universal joint and rockable relatively to one another, one of said shells having graduations thereon and the other shell having measuring indicia registering with said graduations, one of said shells being connected to said slide and the other being connected to said lower cast support 70 and rockable therewith, and an upper cast support movably mounted on said upright for travel toward and away from said lower cast support.

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