J. W. NEEDLES.

ARTICULATOR.

APPLICATION FILED OCT. 6, 1920.

1,368,408. **Patented Feb. 15, 1921.**

3 SHEETS—SHEET 1.

Fig. 1.

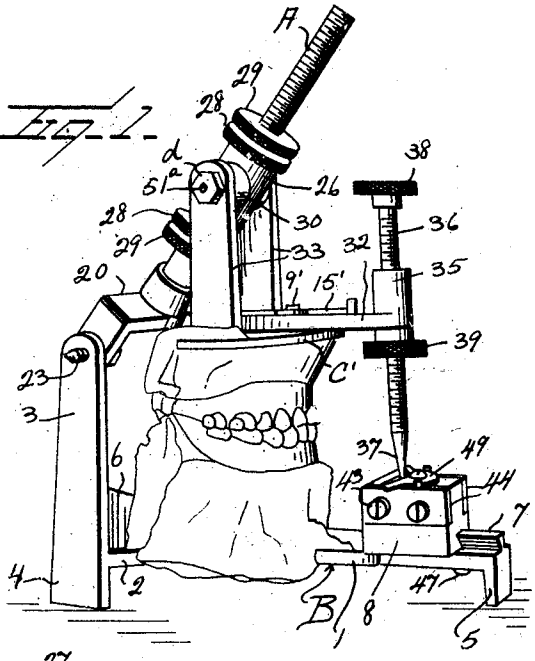


Fig. 3.

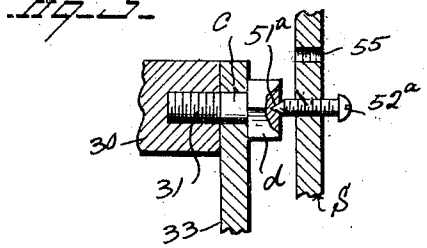
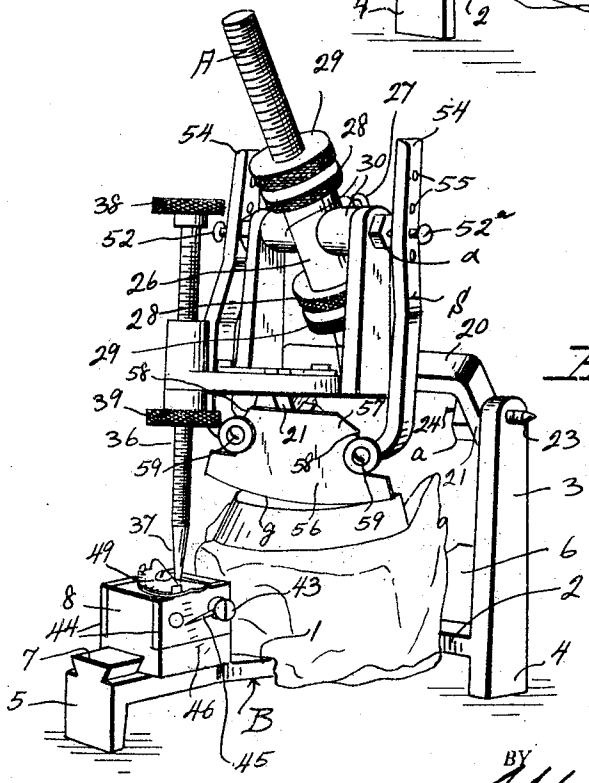


Fig. 2.



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3 SHEETS—SHEET 2.

Fig. 4.

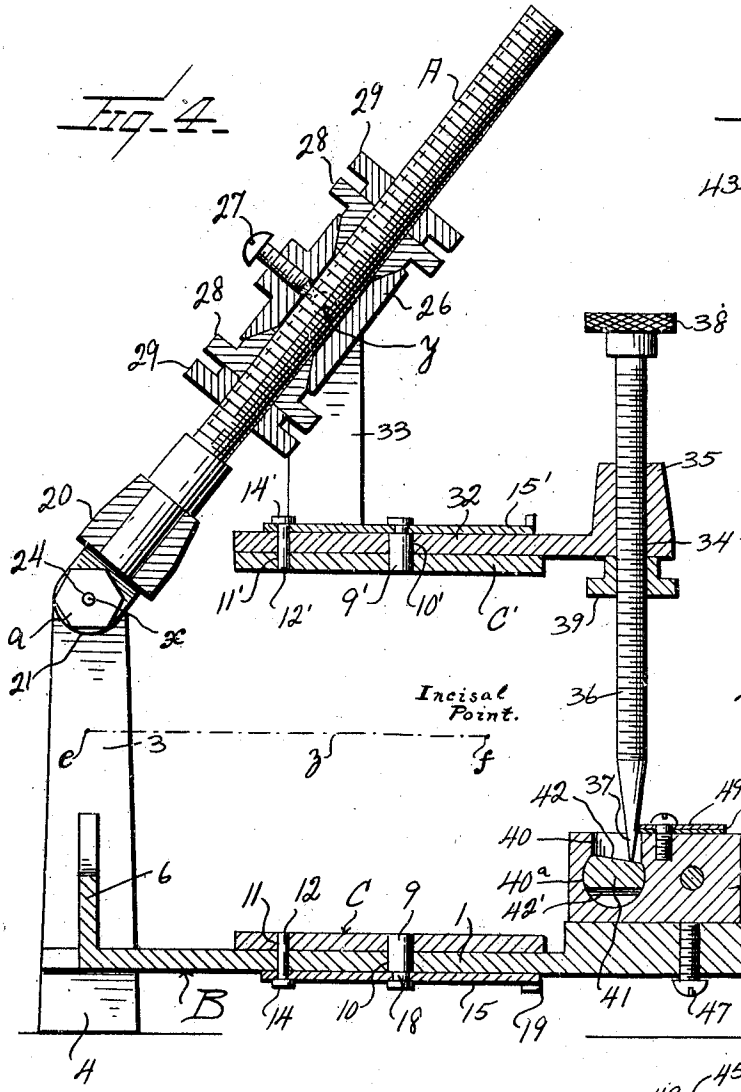


Fig. 13.

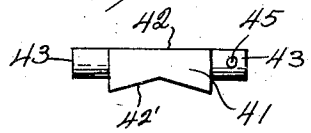


Fig. 5.

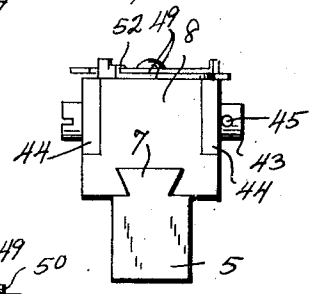
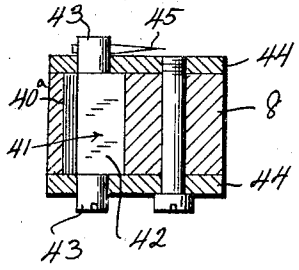


Fig. 7.



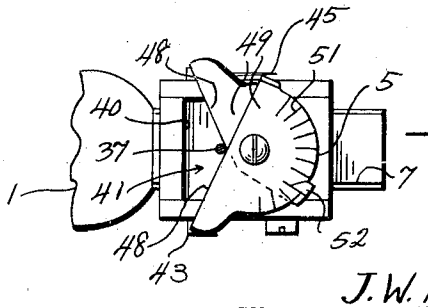


Fig. 6.

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3 SHEETS—SHEET 3.

Fig. 8.

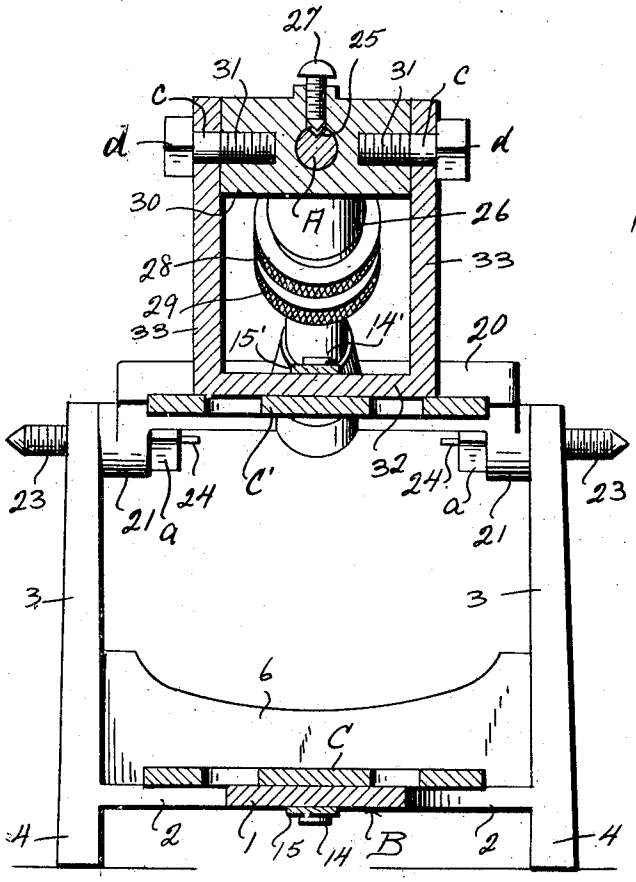


Fig. 9.

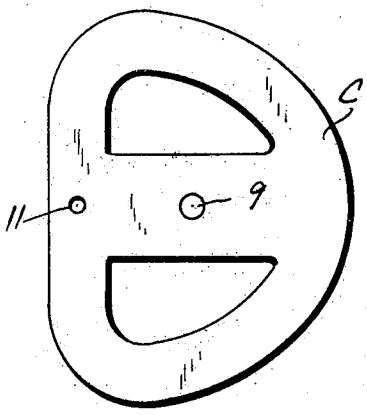


Fig. 10.

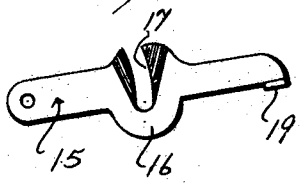


Fig. 11.

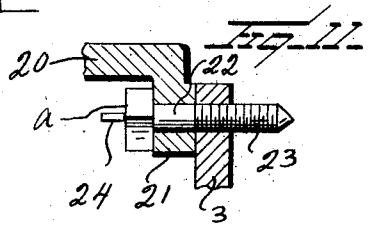
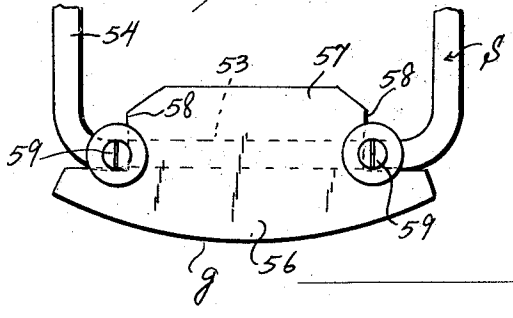


Fig. 12.



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JOHN W. NEEDLES, OF PUEBLO, COLORADO.

ARTICULATOR.

1,368,408. Specification of Letters Patent. Patented Feb. 15, 1921.

Application filed October 6, 1920. Serial No. 414,980.

To all whom it may concern:

Be it known that I, JOHN W. NEEDLES, a citizen of the United States, residing at Pueblo, in the county of Pueblo and State of Colorado, have invented certain new and useful Improvements in Articulators, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to certain improvements in articulators, and it is an object of the invention to provide a novel and improved anatomical articulator capable of being adjusted so that the relative motion between the upper and lower jaws of any patient may be accurately reproduced.

Another object of the invention is to provide a novel and improved device of this general character embodying means for supporting molds or casts of a patient in their proper relative position to each other and to the joints comprised in the articulator and wherein the articulator embodies a guiding mechanism adjustable to reproduce the normal habitual motions used by the patient in mastication.

It is also an object of the invention to provide a novel and improved device of this general character which may be employed for mounting casts or molds of natural teeth for the purpose of studying the motions necessary to correct mal-positions of the teeth in orthodontia cases.

Furthermore, it is an object of the invention to provide a novel and improved device of this general character which is adapted to be employed to adjust artificial teeth to proper occlusion in making plates or bridges and in designing and carving the occlusal surfaces of artificial teeth so that they may be properly articulated.

The invention consists in the details of construction and in the combination and arrangement of the several parts of my improved articulator whereby certain important advantages are attained and the device rendered simpler, less expensive and otherwise more convenient and advantageous for use, as will be hereinafter more fully set forth.

The novel features of my invention will hereinafter be definitely claimed.

In order that my invention may be the better understood, I will now proceed to describe the same with reference to the accompanying drawings, wherein:

Figure 1 is a view in perspective illustrating an articulator constructed in accordance with an embodiment of my invention showing upper and lower teeth in occlusion on a spherical surface.

Fig. 2 is a view in perspective of my improved articulator showing the cutting element in position to carve a spherical surface on the lower bite rim.

Fig. 3 is an enlarged fragmentary view illustrating in detail the mounting for the stirrup carrying the cutting element and also a pivotal connection embodied in the universal joint.

Fig. 4 is an enlarged vertical sectional view with certain of the parts in elevation taken through my improved articulator.

Fig. 5 is a view in elevation of the outer end of the lower arm or member.

Fig. 6 is a fragmentary view in top plan of the structure illustrated in Fig. 5.

Fig. 7 is a horizontal sectional view taken through the block comprised in the guiding mechanism with certain of the parts in top plan.

Fig. 8 is a transverse vertical sectional view taken through my improved articulator as herein disclosed.

Fig. 9 is a view in plan of one of the cast or mold plates.

Fig. 10 is a view in plan of one of the holding members coacting with a cast or mold plate.

Fig. 11 is a fragmentary view partly in section and partly in elevation illustrating a pivotal connection between the cross head and its coacting post.

Fig. 12 is a fragmentary view in elevation of the cutting element and the coacting stirrup, and

Fig. 13 is a view in side elevation of the rotary member comprised in the guiding mechanism for the incisal pin.

As disclosed in the accompanying drawings, B denotes the base of my improved articulator including an elongated horizontal arm 1 having one end portion laterally extended, as at 2, in opposite directions with the upstanding or vertical arms 3 integrally formed with the opposite ends of said extensions 2. The arms 3 are extended below the arm 1 to provide the supporting

feet 4 while the opposite or forward end portion of the arm 1 has also integrally formed therewith the depending supporting foot 5. The arms 3 and the adjacent end portion of the arm 1 and the extensions 2 are braced or reinforced by the web 6 integrally formed therewith.

The forward or free end portion of the arm 1 is provided in its transverse center with a dove-tailed trackway 7 extending longitudinally thereof and with which is slidably engaged a block 8 to be hereinafter more particularly referred to.

The arm 1 is adapted to have rested thereon at substantially its central portion a cast plate C. The plate C is provided at substantially its center with a depending shank 9 insertible through an opening 10 in the arm 1, said pin extending below said arm. In advance of the shank 9, the plate C has disposed therethrough an opening 11 to receive an upstanding pin 12 carried by the arm 1, said pin 12 and shank 9 coacting, respectively, with the plate C and the arm 1 to properly position the plate C on the arm 1.

The pin 12 is in continuation of a pivot member 14 depending from the arm 1 for the locking or holding arm 15. An intermediate portion of the arm 15 is transversely enlarged, as at 16, and said enlarged portion is provided with an open ended arcuate slot 17 and the marginal portions of the arm 15 defining said slot engaged within an annular groove 18 produced in the outer end portion of the shank 9 below the arm 1 whereby the plate C is locked against displacement. The free end portion of the arm 15 is provided with an outstanding flange 19 to provide means whereby the requisite swinging movement of the arm 15 is materially facilitated.

A denotes an elongated cylindrical arm or shank having one end portion provided with a cross head 20, said arm or shank being connected to the longitudinal central portion of said cross head. The extremities of the cross head are provided with the outstanding lugs or wings 21 at right angles to the cross head 20 and extending in a direction away from the shank or arm A.

The cross head 20 snugly fits between the upper ends of the arms 3 and disposed through the lugs or flanges 21 are the headed pivot members 23 loosely directed through the lugs or flanges 21 but threaded through the arms 3. The heads *a* of the pivot members 23 are inwardly disposed and the members 23 are of a length to extend a material distance beyond the outer faces of the arms 2. The outer ends of the pivot members 23 are cone pointed, whereby the same may have requisite coaction with a face bow in adjusting the plaster cast of the lower jaw. The heads *a* of the pivot members 23 at the axial centers thereof are provided with the outstanding pins 24, each of said pins serving as a center from which to take measurements necessary in locating the correct point of the center of the universal movement of the articulator for each patient. Each of the pivot members 23 has a portion 22 thereof adjacent the head *a* free and unobstructed, and which portion is disposed through and within a coacting lug or flange 21.

The arm A throughout substantially its entire length is threaded, said threads being interrupted by a longitudinally disposed V-shaped groove or channel 25 produced in the outer or top portion of the arm A and of a length substantially co-extensive with the length of the threaded portion of said arm. This groove or channel 25 is also in parallelism with the axial center of the arm A.

Freely mounted on the arm A is a sleeve 26 having threaded through a wall thereof at its central part a pointed screw 27 adapted to extend within the groove or channel 25 and which serves to limit the rotation of the sleeve 26 about the arm A. The sleeve 26 is adjustable lengthwise of the arm A through the instrumentality of the cone nuts 28 threaded upon the arm A and coacting with the opposite ends of the sleeve and which nuts 28 are normally held against rotation by the lock nuts 29 threaded upon the arm A.

The sleeve 26 is provided with the oppositely directed and alined tubular bosses 30 perpendicularly related to the axial center of the sleeve. Threaded within the bosses 30 are the headed shanks 31 with the portions *c* of said shanks adjacent the heads *d* thereof having their peripheries free and unobstructed.

32 denotes an upper cast supporting arm or member of requisite and preferred configuration and dimension. This arm or member 32 is provided with the transversely spaced upstanding arms 33 arranged in parallelism. The upper or free end portions of the arms 33 substantially contact with the outer ends of the tubular bosses 30 through which extend the headed shanks 31 and in which are positioned the portions *c* of said shanks, whereby the member or arm 32 is supported for swinging movement by the sleeve 26.

The mounting of the sleeve 26 and the operative connection of the arm or member 32 therewith through the instrumentality of the arms 33 constitutes a joint whereby the member or arm 32 is capable of universal movement.

A cast plate C′ is adapted to underlie the member or arm 32 and is operatively engaged therewith and supported thereby in the same manner as hereinbefore set forth with respect to the cast plat C. The lock-

ing or holding arm 15′ is pivotally engaged with the upper surface of the member or arm 32 by the pivot member 14′ which is continued by a pin 12′ depending from the member or arm 32. This pin 12′ is adapted to be received within an opening 11′ in the cast plate C′. The cast plate C′ is also provided with an upstanding shank 9′ insertible through an opening 10′ in the arm or member 32 and with which the locking or holding arm 15′ engages.

The outer end portion of the member or arm 32 is provided with an opening 34 continued by the bore of an upstanding tubular boss 35. Threaded through the bore of the boss 35 and the opening 34 is an elongated shank or pin 36 having its lower end portion gradually tapered to provide a conical point 37. The upper or opposite end portion of the shank or pin 36 is provided with the head 38 whereby the same may be readily and conveniently rotated as required in order to adjust the same lengthwise with respect to the arm or member 32. Threaded upon the pin or shank 36 and preferably coacting with the under face of the adjacent end portion of the member or arm 32 is the locking nut 39 whereby said shank or pin may be held in its desired arrangement.

The upper face of the block 8 adjacent its inner end is provided with a transversely disposed slot 40 having its lower portion 40^a arcuate in cross section and in which lower portion 40^a is snugly seated for rotary movement a member 41 having its upper face provided with a relatively broad flat or plane surface 42. The member 41 opposed to the flat or plane surface 42 is provided with the flat or plane surfaces 42′ converging toward the center of the member 41 and in a direction toward its axis. These flat or plane surfaces 42′ form a dihedral angle of about 160°, more or less, and the member 41 may be rotated or reversed to permit the flat or plane surfaces 42′ to be employed in lieu of the flat or plane surface 42.

The opposite ends of the members 41 are provided with the trunnions 43 extending through the side plates 44 suitably anchored to the sides of the block 8 and closing the ends of the slot 40. One of said trunnions has disposed therethrough a pin 45 to facilitate the desired rotation of the member 41 to vary or adjust the inclination of the flat or plane surface 42, and which pin 45 also serves as an index to coact with the degree graduations 46 provided on the adjacent side plates 44 for the purposes of record and to allow readjustment if the models are removed.

The block 8 is held in its desired adjusted position along the coacting trackway 7 through the instrumentality of the holding screw 47 threaded upwardly through the arm 1 and trackway 7 and engaging the block 8.

The pin or shank 36 constitutes an incisal guide pin and, in practice, the pin 37 thereof rests upon the flat or plane surface 42 of the member 41 and also coacts with the straight edges 48 of the plates 49 pivotally mounted upon the top surface of the block 8 at a point in close proximity to the slot 40 at the longitudinal center thereof.

The plates 49 are superimposed one upon the other and have the rearwardly disposed semicircular portions 50. The upper portion 50 is provided with the degree graduations 51 with which coacts the index or pointer 52 carried by the lower portion 50. The degree graduations 51 and the index or pointer 52 provide means whereby a record may be made of a desired relative adjustment of the plates 49 and to allow readjustment if the models are removed.

My improved articulator is adapted to be adjusted so that the relative motion between the upper and lower jaws of any patient may be accurately reproduced. This is accomplished by mounting plaster casts of the jaws in their proper relative position to each other and to the joints of the articulator and then adjusting the guiding mechanism of the articulator to reproduce the normal habitual motions used by the patient in mastication. The point x represents the joint between the condyle of the lower jaw and the articular surface of the temporal bone. The joint y comprised in the universal joint hereinbefore described is adjustable along the arm or shank A so that the distance between x and y is variable.

The chewing or occlusal surfaces of all teeth are thought to lie approximately on the surface of a sphere. The joint y (that is, the intersection of the two axes of the universal joint) is adjusted so that it coincides with the center of the sphere upon which the occlusal surfaces of the teeth lie. The condyles (joint x) also lie on the surface of the same sphere. Therefore, the joint y must be so placed that it is equidistant from both condyles x and from the occlusal surface or plane of the teeth, diagrammatically indicated at z. If there were no cusps on the teeth and the above relations were correct, the teeth of the upper model might oscillate about the joint y in any direction and still stay in contact with the teeth of the lower model.

Since one sphere and only one can pass through any four points in space, there is one sphere and only one that can pass through the two condyles of the jaw and any two chosen points of the occlusal surface of the teeth. With the relative positions of the condyles and any two points on the occlusal plane or surface known, the center and ra-

dius of the sphere can be readily determined. With the articulator adjusted to reproduce these conditions, it is possible to arrange the teeth in their proper relations.

Since in masticating on the right side, the jaw habitually oscillates in a definite plane, it is necessary to have a guiding mechanism on the articulator which will confine its motion to this one plane. This condition is also true of the left side, and the two planes meet at an angle in the median line. This condition is reproduced in the articulator by the straight edges 48 of the plates 49.

The amount of opening and closing of the jaws that is required in the lateral motion of the jaws depends upon the height of the cusps of the teeth. This is controlled in the articulator by the inclination of the adjustable surface or plane 42, or by the two planes or surfaces 42′ which may be rotated to take the position of plane 42.

The incisal guide pin 36 in sliding on the inclined plane or surface 42 or the planes or surfaces 42′ imparts the vertical component of this motion to the upper model and the motion imparted to said pin 36 with contact thereof with the edges 48 of the plates 49 imparts the horizontal components of motion to the upper model. The planes or surfaces 42′ are used when the antero-posterior component of the horizontal motion is too small to give sufficient vertical motion by the use of the flat surface or plane 42.

The incisal pin 36 is adjustable as to length below the member or arm 32 so that the cast plate C′ carried by said arm or member may always be horizontal when the joint *y* is in proper relative position to the casts and to the condyles. The block 8 is adjustable longitudinally of the member or arm 1 to assist in the maintenance of the cast plate C′ horizontally. The distance between the joints *x* and *y* is adjustable to allow of variation in the radius of the sphere. These adjustments are necessary in order that the vertical distance *e*—*x* and horizontal distance *e*—*f* of the incisal point *f* from the inter-condylar axis may be properly reproduced on the articulator. The pins 24 hereinbefore referred to are employed in determining the radius of the sphere for a purpose which is apparent to those skilled in dentistry.

The outer surfaces of the heads *d* of the shanks 31, hereinbefore referred to, are provided with the center sockets 51ª to receive the bearing screws 52ª for the stirrup S. The stirrup S is substantially U-shaped in form and when applied has its base or intermediate portion 53 disposed transversely of the member or arm 32 at a point therebelow while the upstanding side arms 54 of the stirrup S are provided with the longitudinally spaced openings 55, whereby the positions of the bearing screws 52ª along said side arm may be varied so that the distance between the cutting edge *g* of the blade 56 and the axis connecting the bearing screws may be adjusted in accordance with the requirements of practice.

The cutting edge *g* of the blade 56 is arcuate and said edge of the blade operates to carve the spherical surface of the lower bite rim in order to produce the desired spherical occlusal plane. The blade 56 overlies a side of the intermediate portion 53 and is provided with an upstanding central portion 57 affording the substantially parallel end marginal portions 58 with which coacts the clamping screws 59 engaged directly with the portion 53 of the stirrup S. By this arrangement, the blade 56 may be adjusted vertically independently of the stirrup S.

It will also be readily understood that the stirrup S may be applied or removed with convenience and facility when the occasions of practice may require.

The blade 56 is for the purpose of carving a spherical surface upon a lower bite rim and upon which surface the teeth are to be set or arranged. Having determined fixed points through which the curve of the sphere must pass, it is possible by the use of the spherical blade 56 to accurately adjust the center of the universal movement of the upper jaw model supporting member and the length of the radius of the arc through which the blade 56 swings to make the spherical surface pass through the desired points.

From the foregoing description it is thought to be obvious that an articulator constructed in accordance with my invention is particularly well adapted for use by reason of the convenience and facility with which it may be assembled and operated, and it will also be obvious that my invention is susceptible of some change and modification without departing from the principles and spirit thereof and for this reason I do not wish to be understood as limiting myself to the precise arrangement and formation of the several parts herein shown in carrying out my invention in practice except as hereinafter claimed.

I claim:

1. A dental articulator comprising a shank supported for swinging movement, a sleeve loosely mounted on the shank, means for holding the sleeve against movement lengthwise of the shank, and a jaw model supporting member pivotally engaged with the sleeve whereby said member has swinging movement about an axis angular to the axis of the sleeve.

2. A dental articulator comprising a shank supported for swinging movement, a sleeve loosely mounted on the shank, means for holding the sleeve against movement lengthwise of the shank, and a jaw model

supporting member pivotally engaged with the sleeve whereby said member has swing-movement about an axis angular to the axis of the sleeve, said sleeve and shank having coacting means for limiting the rotation of the sleeve about the shank.

3. A dental articulator embodying a lower jaw model supporting member, a shank pivotally supported for movement toward or from said supporting member, an upper jaw model supporting member carried by the shank and having swinging movement in a plurality of paths, and variable means for imparting rocking movement to the upper supporting means both laterally of the lower supporting member and in a direction therefrom.

4. A dental articulator embodying a lower jaw model supporting member, a shank pivotally supported for movement toward or from said supporting member, an upper jaw model supporting member carried by the shank and having swinging movement in a plurality of paths, and variable means for imparting rocking movement to the upper supporting member both laterally of the lower supporting member and in a direction thereform, said upper jaw model supporting member being movable lengthwise of the shank.

5. A dental articulator embodying a lower jaw model supporting member, a shank pivotally supported for movement toward or from said supporting member, an upper jaw model supporting member carried by the shank, and having swinging movement in a plurality of paths, variable means for imparting rocking movement to the upper supporting member both laterally of the lower supporting member and in a direction therefrom, said upper jaw model supporting member being movable of the shank, and means for maintaining said upper jaw model supporting number at a fixed point on the shank.

6. A dental articulator comprising a shank supported for swinging movement, a sleeve loosely mounted on the shank, means for holding the sleeve against movement lengthwise of the shank, a jaw model supporting member pivotally engaged with the sleeve whereby said member has swinging movement about an axis angular to the axis of the sleeve, said shank having a channel extending therealong, and a member extending through a wall of the sleeve to extend within the channel to limit the rotation of the sleeve about the arm.

7. A dental articulator embodying a lower jaw model supporting member, a shank pivotally supported for movement toward or from said supporting member, an upper jaw model supporting member carried by the shank and having swinging movement in a plurality of paths, variable means for imparting rocking movement to the upper supporting member both laterally of the lower supporting member and in a direction therefrom, said upper jaw model supporting member being movable lengthwise of the shank, and variable means coacting with the shank for limiting the lateral rocking movement of the upper supporting member.

8. A dental articulator comprising a shank supported for swinging movement, a sleeve loosely mounted on the shank, means for holding the sleeve against movement lengthwise of the shank, a jaw model supporting member pivotally engaged with the sleeve whereby said member has swinging movement about an axis angular to the axis of the sleeve, said shank having a channel extending therealong, and a member extending through a wall of the sleeve to extend within the channel to limit the rotation of the sleeve about the arm, the portion of the member extending within the channel being pointed.

9. A dental articulator comprising a lower jaw model supporting member, an upper jaw model supporting member coacting therewith, said upper jaw model supporting member having universal movement, an incisal guide pin adjustably carried by the upper supporting member, variable means carried by the lower supporting member cooperating with the incisal guide pin to impose both lateral and vertical rocking movement to the upper member on desired radii, means for indicating the radius of lateral rocking movement of the upper member, and means for indicating the radius of the vertical rocking movement of the upper member.

10. A dental articulator comprising a shank supported for swinging movement, a sleeve loosely mounted on the shank, means for holding the sleeve against movement lengthwise of the shank, a jaw model supporting member pivotally engaged with the sleeve whereby said member has swinging movement about an axis angular to the axis of the sleeve, said shank having a channel extending therealong, and a member extending through a wall of the sleeve to extend within the channel to limit the rotation of the sleeve about the arm, the portion of the member extending within the channel being pointed, said channel being substantially V-shaped in cross section.

11. A dental articulator comprising a shank supported for swinging movement, a sleeve loosely mounted on the shank, members threaded upon the shank and engageable with the opposite ends of the sleeve to hold the sleeve against movement lengthwise of the shank, and a jaw model supporting member pivotally engaged with the

sleeve whereby said member has swinging movement about an axis angular to the axis of the sleeve.

12. A dental articulator comprising a lower arm to support a cast plate, an upstanding post carried by said arm, a shank pivotally supported by said post and having swinging movement toward or from the arm, a sleeve loosely mounted on the shank, means for holding the sleeve against movement lengthwise of the shank, and a jaw model supporting member pivotally engaged with the sleeve and having swinging movement about an axis angular to the axis of the sleeve.

13. A dental articulator comprising a shank supported for swinging movement, a sleeve loosely mounted on the shank, means for holding the sleeve at different points on the shank against movement lengthwise of the shank, and a jaw model supporting member pivotally engaged with the sleeve whereby said member has swinging movement about an axis angular to the axis of the sleeve.

14. A dental articulator comprising a lower jaw model supporting member, a shank supported for vertical swinging movement above said supporting member and positioned above the median line of said supporting member posteriorly thereof, an upper jaw model supporting member, means coacting with the shank and upper supporting member to support said upper member by the shank, said upper member having universal movement independently of the shank, and variable means for simultaneously imparting vertical swinging movement to the upper supporting member in directions both longitudinally and laterally of the median line of the lower supporting member in constantly varying planes.

15. A dental articulator comprising a lower jaw model supporting member, a shank supported for vertical swinging movement above said supporting member and positioned above the median line of said supporting member posteriorly thereof, an upper jaw model supporting member carried by the shank and having universal movement relative to the shank, and variable means for simultaneously imparting vertical swinging movement to the upper supporting member in directions both longitudinally and laterally of the median line of the lower supporting member in constantly varying planes, the point of intersection of the axes comprised in the universal joint being variable relative to the pivotal connection of the shank.

16. A dental articulator comprising a lower arm to support a cast plate, upstanding posts carried by the rear end portion of the arm and equidistantly spaced at opposite sides of the median line of the arm, a shank, a cross head carried by one end portion of the shank and extending equal distances beyond the opposite sides thereof, the end portions of the cross head being pivotally supported between the upper portions of the posts, a sleeve loosely mounted on the shank, means for holding the sleeve against movement lengthwise of the shank, and an upper arm arranged above the lower arm with upstanding members carried thereby at its rear end portion, the upper end portions of said members being pivotally engaged with the sleeve whereby said second arm has swinging movement about an axis at right angles to the axis of the sleeve.

17. In an articulator, the combination with an upper jaw model supporting member having universal movement, an incisal guide pin carried by said member, a member positioned below the supporting member and rotating about an axis disposed substantially at right angles to the median line of the supporting member, said second member being provided with a plane surface with which the guide pin contacts, and means for varying the angle of inclination of the plane surface of said second member relative to the horizontal.

18. In an articulator, the combination with an upper jaw model supporting member having universal movement, an incisal guide pin carried by said member, a member positioned below the supporting member and rotating about an axis disposed substantially at right angles to the median line of the supporting member, said second member being provided with a plane surface with which the guide pin contacts, and means for varying the angle of inclination of the plane surface of said second member relative to the horizontal, the portion of the incisal guide pin between the supporting member and the second member being adjustable as to length.

19. In an articulator, the combination with an upper jaw model supporting member having universal movement, an incisal guide pin carried by said member, a member positioned below the supporting member and rotating about an axis disposed substantially at right angles to the median line of the supporting member, said second member being provided with a plane surface with which the guide pin contacts, means for varying the angle of inclination of the plane surface of said second member relative to the horizontal, and plates movable about a common center and adapted to extend over the plane surface of the second member, said plates being provided with straight edges with which the incisal guide pin is adapted to contact.

20. In an articulator, the combination with an upper jaw model supporting member having universal movement, an incisal

guide pin carried by said member, a member positioned below the supporting member and rotating about an axis disposed substantially at right angles to the median line of the supporting member, said second member being provided with a plane surface with which the guide pin contacts, means for varying the angle of inclination of the plane surface of said second member relative to the horizontal, and plates movable about a common center and adapted to extend over the plane surface of the second member, said plates being provided with straight edges with which the incisal guide pin is adapted to contact, said plates being movable about their pivots one independently of the other.

21. In an articulator, the combination with an upper jaw model supporting member having universal movement, an incisal guide pin carried by said member, a member positioned below the supporting member and rotating about an axis disposed substantially at right angles to the median line of the supporting member, said second member being provided with a plane surface with which the guide pin contacts, means for varying the angle of inclination of the plane surface of said second member relative to the horizontal, and plates movable about a common center and adapted to extend over the plane surface of the second member, said plates being provided with straight edges with which the incisal guide pin is adapted to contact, said plates being movable about their pivots one independently of the other, said plates being provided with coacting means to indicate the relative angle between the straight edges of the plates.

22. In an articulator, the combination with an upper jaw model supporting member having universal movement, an incisal guide pin carried by said member, a member positioned below the supporting member and rotating about an axis disposed substantially at right angles to the median line of the supporting member, said second member being provided with a plane surface with which the guide pin contacts, and means for varying the angle of inclination of the plane surface of said second member relative to the horizontal, and means for indicating the angle of inclination of the plane surface with respect to the horizontal.

23. In an articulator, the combination with an upper jaw model supporting member having universal movement, an incisal guide pin carried by said member, a member positioned below the supporting member and rotating about an axis disposed substantially at right angles to the median line of the supporting member, said second member being provided with a plane surface with which the guide pin contacts, said second member being provided with a second plane surface, said second surface embodying plane surfaces converging inwardly.

24. In an articulator, the combination with an upper jaw model supporting member having universal movement, an incisal guide pin carried by said member, a member positioned below the supporting member and rotating about an axis disposed substantially at right angles to the median line of the supporting member, said second member being provided with a plane surface with which the guide pin contacts, said second member being provided with a second plane surface, said second surface embodying plane surfaces converging inwardly toward the longitudinal center of the second member.

25. A dental articulator comprising a lower jaw model holder, an upper jaw model holder operatively supported thereby through the medium of a universal joint, and a cutting element supported by the upper holder and positioned therebelow, said cutting element extending transversely of the lower model holder and having its lower margin formed into an arcuate cutting edge.

26. A dental articulator comprising a lower jaw model holder, an upper jaw model holder operatively supported thereby through the medium of a universal joint, and a cutting element supported by the upper holder and positioned therebelow, said cutting element extending transversely of the lower model holder and having its lower margin formed into an arcuate cutting edge, said cutting element being adjustable toward or from the upper holder.

27. A dental articulator comprising a lower jaw model holder, an upper jaw model holder operatively connected therewith by a universal joint, said universal joint comprising perpendicularly related axes, one of said axes extending transversely of the upper holder, a stirrup engageable with the universal joint for swinging movement about the transverse axis of the joint, and a cutting blade carried by the stirrup and provided with an arcuate cutting edge.

28. A dental articulator comprising a lower jaw model holder, an upper jaw model holder operatively connected therewith by a universal joint, said universal joint comprising perpendicularly related axes, one of said axes extending transversely of the upper holder, a stirrup engageable with the universal joint for swinging movement about the transverse axis of the joint, and a cutting blade carried by the stirrup and provided with an arcuate cutting edge, said blade being adjustable toward or from the upper holder independently of the stirrup.

29. A dental articulator comprising a

lower jaw model holder, an upper jaw model holder operatively connected therewith by a universal joint, said universal joint comprising perpendicularly related axes, one of said axes extending transversely of the upper holder, a stirrup engageable with the universal joint for swinging movement about the transverse axis of the joint, and a cutting blade carried by the stirrup and provided with an arcuate cutting edge, said stirrup being adjustable relative to the transverse axis of the joint.

30. In an articulator, the combination with an upper jaw model supporting member having universal movement, an incisal guide pin carried by said member, a member positioned below the supporting member and rotating about an axis disposed substantially at right angles to the median line of the supporting member, said second member being provided with a plane surface with which the guide pin contacts, said second member being provided with a second plane surface, said second surface embodying plane surfaces converging inwardly toward the longitudinal center of the second member, said converging plane surfaces forming a dihedral angle of substantially 160°.

31. A dental articulator comprising a lower arm to support a cast plate, upstanding posts carried by the rear end portion of the arm and equidistantly spaced at opposite sides of the median line of the arm, a shank, a cross head carried by one end portion of the shank and extending equal distances beyond the opposite sides thereof, the end portions of the cross head being pivotally supported between the upper portions of the posts, a sleeve loosely mounted on the shank, means for holding the sleeve against movement lengthwise of the shank, and an upper arm arranged above the lower arm with upstanding members carried thereby at its rear end portion, the upper end portions of said members being pivotally engaged with the sleeve whereby said second arm has swinging movement about an axis at right angles to the axis of the sleeve, the pivotal connections between the cross head and the posts comprising shanks extending inwardly of the posts, the inner end portion of each of said shanks at its axial center being provided with a pin.

32. A dental articulator comprising a lower arm to support a cast plate, upstanding posts carried by the rear end portion of the arm and equidistantly spaced at opposite sides of the median line of the arm, a shank, a cross head carried by one end portion of the shank and extending equal distances beyond the opposite sides thereof, the end portions of the cross head being pivotally supported between the upper portions of the posts, a sleeve loosely mounted on the shank, means for holding the sleeve against movement lengthwise of the shank, and an upper arm arranged above the lower arm with upstanding members carried thereby at its rear end portion, the upper end portions of said members being pivotally engaged with the sleeve whereby said second arm has swinging movement about an axis at right angles to the axis of the sleeve, the pivotal connections between the cross head and the posts comprising shanks extending beyond the outer side faces of the posts, the outer end portions of each of said shanks being conoidal.

33. A dental articulator comprising a lower jaw model supporting member, an upper jaw model supporting member coacting therewith and having universal movement, an incisal guide pin adjustably carried by the upper supporting member, variable means carried by the lower supporting member coöperating with the incisal guide pin to impose both lateral and vertical rocking movement to the upper member on desired radii, and means for indicating the radius of the lateral rocking movement of the upper member.

34. A dental articulator comprising a lower jaw model supporting member, an upper jaw model supporting member coacting therewith and having universal movement, an incisal guide pin adjustably carried by the upper supporting member, variable means carried by the lower supporting member coöperating with the incisal guide pin to impose both lateral and vertical rocking movement to the upper member on desired radii, and means for indicating the radius of the vertical rocking movement of the upper member.

In testimony whereof I hereunto affix my signature.

JOHN W. NEEDLES.