Feb. 28, 1950 W. H. ANDERSON ET AL 2,498,632

MANUAL AND SELF-ADJUSTING HEATING-ELECTRODE STRUCTURE FOR DIELECTRIC HEATING

Filed April 28, 1948 2 Sheets-Sheet 1

Fig. 1.

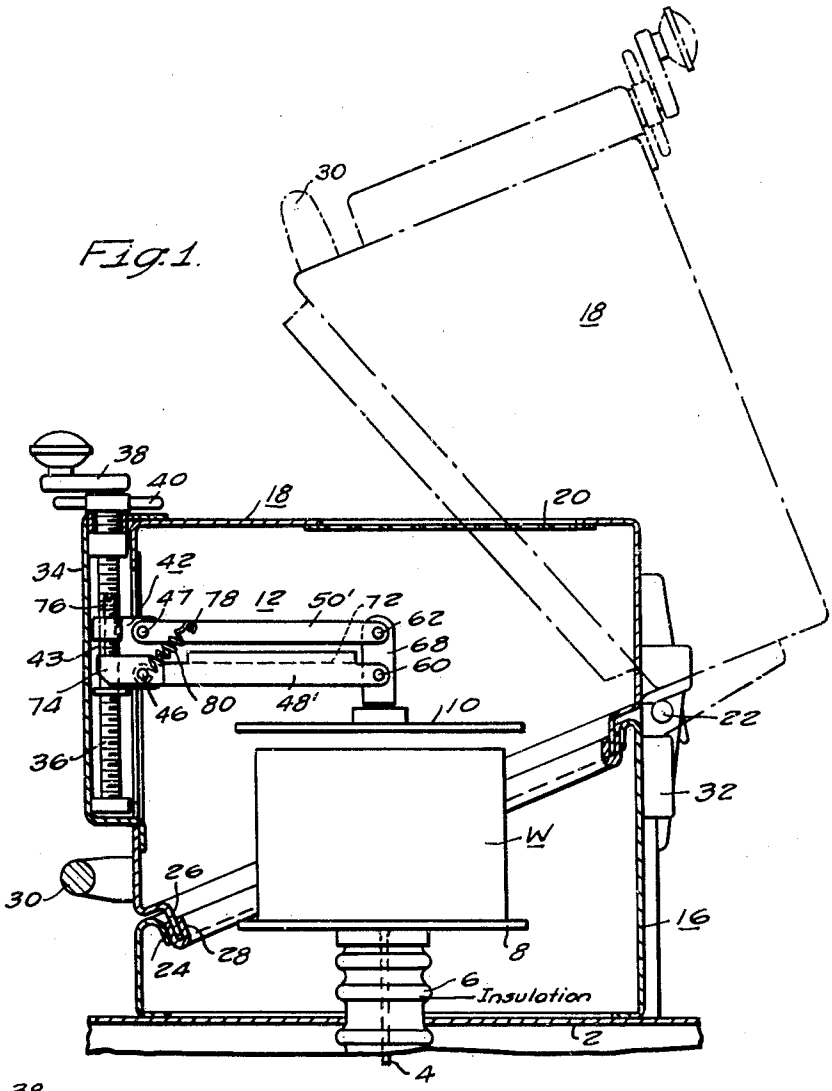


Fig. 6.

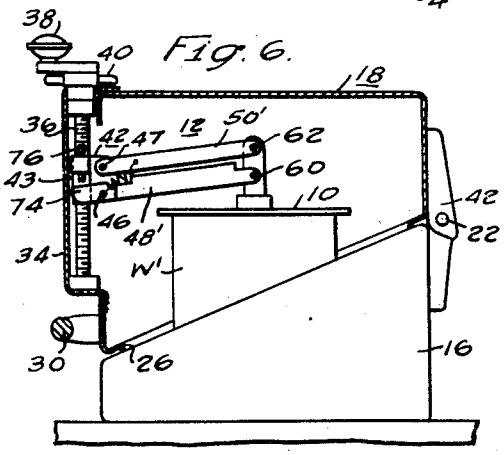
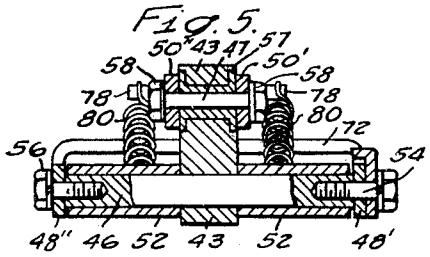


Fig. 5.



INVENTORS
William H. Anderson
and Dean S. Shingler.
BY
B. L. Langwill
ATTORNEY

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Fig. 2.

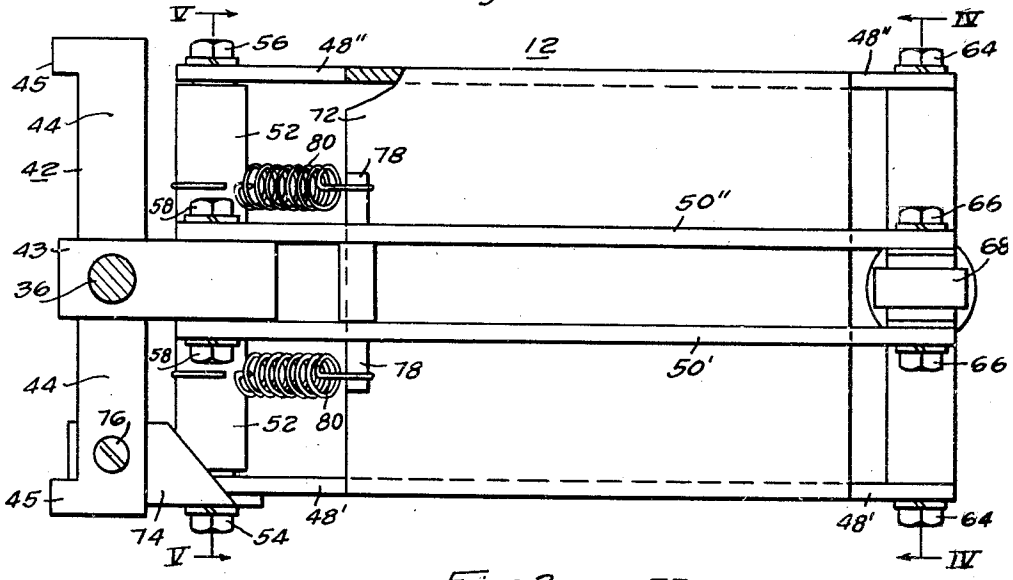


Fig. 3.

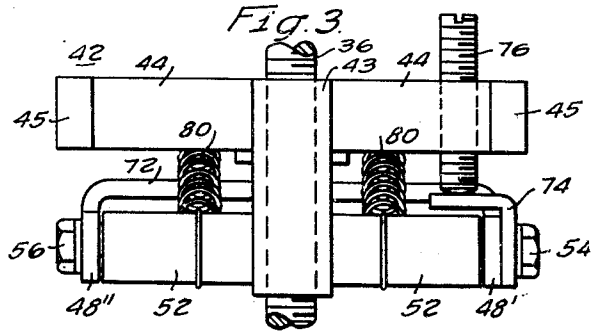
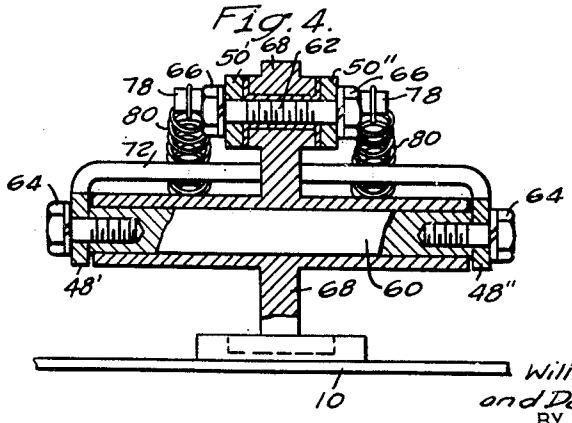


Fig. 4.



WITNESSES:

E. A. McCloskey.

Mrs. C. Groom

INVENTORS

William H. Anderson and Dean S. Shingler.

BY

B. L. Zanguill

ATTORNEY

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2,498,632

MANUAL AND SELF-ADJUSTING HEATING-ELECTRODE STRUCTURE FOR DIELECTRIC HEATING

William H. Anderson, Elkridge, and Dean S. Shingler, Baltimore, Md., assignors to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

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31 Claims. (Cl. 219—47)

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Our invention relates, broadly, to dielectric heating apparatus, and more particularly to a supporting structure for the heating-electrodes thereof.

In the use of small dielectric heating units, one or more objects to be heat-treated are placed between a pair of relatively insulated heating-electrodes which is carried directly by the unit, the unit also containing the electronic tubes and high-frequency circuits which generate the high-frequency electrical energy supplied to the heating-electrodes.

The heating-electrodes are usually two small parallel plates arranged one above the other. In order to prevent high-frequency radiation and to provide apparatus in which a dielectric object can be quickly and safely heat-treated and then replaced by another object to be heat-treated and for other reasons, the heating-electrodes are commonly enclosed or surrounded by a two-member metallic cage which carries one of them. One of the cage-members is relatively movable with respect to the other for opening and closing the cage so that work can be readily loaded into the open cage, heated while the cage is closed, and then unloaded.

In prior cages of this type, the heating-electrodes were restricted as to flexibility of adjustment for heating objects or work of different heights and under different conditions.

A purpose or object of our invention is to make a small portable self-contained dielectric heating unit of a type described more universal by building it so that it can successively heat a plurality of objects with the upper heating-electrode pressing heavily on each object, or resting more lightly on each object, or spaced from the top of each object so as to provide an air space thereabove. To this end we provide a heating-electrode structure of a type described which is both manually and automatically adjustable. Slight variations in the heights of objects manufactured on a mass production basis as a single batch are automatically taken care of by the supporting means for one of the heating-electrodes. Wide differences in the heights of objects of different batches are accommodated by manual adjustments.

A further purpose of our invention is to provide an adjustable heating-electrode structure of a type described in which the rough adjustments can be made by an operator from outside the cage which encloses the heating-electrodes, with the structure having means such that finer variations in the heights of objects are automatically

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accommodated without attention from the operator.

A more particular purpose of our invention is to provide a cage-structure for dielectric heating units of a type described, the cage-structure having a raisable member which floatingly supports an upper heating-electrode in any desired position with in the cage. This heating-electrode can be adjusted through a comparatively wide range without altering its axial alignment with the cooperating lower heating-electrode upon which an object rests for heat-treatment by the high-frequency electric field between the heating-electrodes.

Specifically we achieve the foregoing and other objects of our invention by providing a cage member which carries one end of a pantographic linkage that is movable in a vertical plane. The other end of the linkage floatingly carries an upper heating-electrode. A stop is provided which prevents the heating-electrode from dropping below a predetermined point which may be at or near the top of the object to be heat-treated. However, by lowering the supported end of the linkage, the upper heating-electrode can be made to press more firmly on the top of the object being heat-treated; and by raising the supported end any desired air gap or separation can be provided between the upper heating-electrode and the object. In the preferred embodiment of our invention herein described, the cage-member which carries the pantographic linkage and upper heating-electrode is hinged to the other cage-member and is movable. In another embodiment shown in the copending W. H. Anderson application, Serial No. 139,547, filed January 20, 1950, a stationary cage-member adjustably carries the pantographic linkage.

In accordance with the preferred embodiment herein described, the hinged cage-member has wall-means that extends above the other cage-member. This wall-means carries an adjustable support or end member to which an end of the pantographic linkage is pivotally attached. By adjusting the support vertically, the position of such end of the linkage is changed correspondingly. Specifically, the support means includes a threaded member which can be turned from outside the cage in order to make the desired adjustments for placing the upper heating-electrode that is carried by the pantographic linkage in desired relation to the work on the lower heating-electrode.

Further features, innovations and combinations of our invention, in addition to the fore-

going, will be discernible from the following description of a preferred embodiment thereof which is to be taken in conjunction with the accompanying drawings. Several figures of the drawings are drawn on different scales, but each figure has its parts drawn to scale. In the drawings:

Figure 1 is a vertical sectional view of a dielectric heating unit embodying our invention, the solid lines showing the operating position of the cage of the unit when an object is heat-treated with an air gap above it, and the broken lines showing the raised position of a part of the cage;

Fig. 2 is a plan view of a linkage arrangement inside the cage, which floatingly supports the upper heating-electrode;

Fig. 3 is a front elevational view of the apparatus of Fig. 2, the front being at the left of Fig. 2;

Figs. 4 and 5 are vertical sectional views substantially on the lines IV—IV and V—V, respectively, of Fig. 2; and

Fig. 6 is a partially vertical sectional view of apparatus embodying our invention, but adjusted to have the upper heating-electrode press on the top of an object to be heat-treated.

Referring more particularly to Fig. 1, a top wall 2 very sketchily represents the outer metallic casing of a high-frequency generating unit that includes equipment, within the casing, for generating high-frequency power. A suitable circuit for delivering the power includes an insulated conductor 4 which passes centrally through an insulating bushing 6 in the top wall 2 and is connected to a lower heating-electrode 8 carried by the bushing.

The other side of the circuit is connected to a second upper heating-electrode 10 which is above the heating-electrode 8. The connection can be made in any suitable manner, such as, for example, by solidly grounding both the heating-electrode 10 and the associated side of the energizing circuit to the casing of the generator unit. Accordingly, a pair of heating-electrodes is provided, one above the other, which are relatively insulated. Such heating-electrodes usually, but not necessarily, comprise flat metal plates having a square, circular or other contour.

The upper heating-electrode 10 is supported by a pantographic linkage indicated in its entirety by the reference numeral 12. The linkage is in turn carried from a supporting frame which encloses or surrounds the heating-electrodes 8 and 10 and the pantograph linkage 12.

As shown in Fig. 1, the supporting frame comprises the top wall 2 and a metal cage-structure of more or less conventional form. The cage-structure comprises a lower member 16 fixed to the top wall 2 and an upper raisable member 18 which is movable with respect to the lower member.

In a horizontal cross section of the preferred embodiment shown in the drawings, to which our invention is obviously not limited, the cage-members 16 and 18 appear rectangular. The walls of the cage-members are apertured for ventilation, an apertured section being indicated at 20. The cage-members 16 and 18 are hinged together by a hinge 22 along the back side of the cage. Preferably the hinge 22 is of a type that can automatically retain the cage-member 18 in a raised position, such as shown in the broken lines of Fig. 1, without the help of an operator; but can be readily released and lowered by an operator. A counterweight can be provided if desired for balancing the weight of the cage-member 18 about the hinge 22.

The joint between the two cage-members 16 and 18 slopes downwardly to the front so as to provide an extensive front wall on the movable cage-member 18. Preferably this joint is electrically sealed; and to this end, the joint is formed of nestable lips 24 and 26, one of which frictionally carries for its full length, a springy channel 28 that slidably engages the other, as more particularly described in our application Serial No. 51,246, filed September 25, 1948.

The upper cage-member 18 is raisable through a handle 30 on its front wall. Opening of the cage operates a switch 32 for preventing the application of electrical power across the heating-electrodes 8 and 10. Closing of the cage restores the switch 32 to normal so that power can again be applied to the heating-electrodes.

The front wall of the cage-member 18 is provided with a relatively large rectangularly dished portion 34 within which an upright lead screw 36 is carried for rotational, but not for axial, movement. The lead screw 36 had one end projecting through the top of the cage-member 18 for receiving a handle 38 for turning the lead screw. A releasable tightening nut 40 can be screwed tightly against the top of the cage-member for locking the lead screw against accidental rotation.

The raisable cage-member 18 adjustably carries the pantographic linkage 12 through the lead screw 36, so that the last constitutes, in effect, a support member for the lead screw. The pantographic linkage comprises a bar or end member which forms an end of the linkage and is indicated in its entirety by the reference numeral 42. As shown more particularly in Figs. 2 and 3, the bar member 42 comprises a backwardly extending bar 43 having a central threaded hole receiving the lead screw 36, and a pair of horizontal bars 44 extending laterally from the lateral vertical sides of the bar 43. The far ends of the bars 44 have projections 45 which slide along or are very close to the adjacent parts of the dished portion 34 of the front wall of the cage member 18 so as to keep the pantographic linkage 12 in aligned position for different adjustments on the lead screw 36. Accordingly, this dished portion 34 is in the nature of a guide for the pantographic linkage as the latter is raised or lowered by the lead screw 36.

Referring also to Figs. 2–5, the bar 43 of the carriage or bar member 42 comprises a comparative thick plate which extends backwardly from the lead screw 36. This rearward portion of the bar 43 carries the rest of the pantographic linkage. To this end, it is provided with vertically aligned holes adapted to receive journals, or the equivalent, for a lower pivot 46 and an upper pivot 47. The lower pivot 46 is longer than the upper pivot 47. Lower links 48′ and 48″ are secured to opposite ends of the lower pivot 46; and upper links 50′ and 50″ are secured to opposite ends of the upper pivot 47. Accordingly, the portion of the bar 43 between the pivot 46 and 47 also constitutes a vertical link or rod for the pantographic linkage 12, this link or rod being integral with the portion of the bar member 42 that engages the lead screw 36. Since the group of links 48′, 48″, 50′ and 50″ extend generally horizontally away from the vertical link of the pantographic linkage 12 provided by the bar 43, the said group of links can

be generally designated as horizontal links although it should be understood that in operation they will assume positions which are not absolutely level but may be at a considerable angle to a line which is absolutely horizontal. Accordingly, it should be understood that the term "horizontal" as used in connection with the links embraces more than a direction at 90° to an absolutely vertical line.

More specific details of the manner in which the horizontal links are pivotally supported from the bar 43 are shown in Fig. 5. The bar 43 has a horizontal lower hole and a horizontal upper hole for the pivots 46 and 47, respectively. Bearing 52 is fixed in the lower hole and extends outwardly therefrom. The pivot 46 comprises a short shaft which rotates in this bearing. The front ends of the links 48′ and 48″ are fixed to this shaft by bolt-means 54 and 56 so as to swing together. The upper pivot 47 comprises a through-bolt journalled in a bearing 57 fixed in the upper hole of the bar 43. The front ends of the links 50′ and 50″ are fixed to the bolt by a nut and washer means 58 so that these parts also swing as they group.

The joint-acting lower links 48′ and 48″ and the joint-acting upper links 50′ and 50″ are parallel and extend backwardly to a pair of rear pivots 60 and 62 respectively, to which they are fixed by bolt and nut means 64 and 66, respectively. The lower pivot 60 and the upper pivot 62 are rotatably carried, in a suitable manner, in lower and upper horizontal superimposed holes in a bar 68.

The bar 68 extends downwardly below the pivots 60 and 62 and has a portion to which the metal plate of the upper heating-electrode 10 is secured so that the bar 68 and the heating-electrode 10 move as a single group or unit. Hence the bar 68 can be considered to be a unitary part of the heating-electrode 10; and its portion between the pivots 60 and 62 can be considered to be an end link or rod of the pantographic linkage 12, which link or rod is carried by the heating-electrode 10.

From the foregoing, it is apparent that the pantographic linkage comprises the first bar or end member 42 at one end, the horizontal links 48′, 48″, 50′ and a second end member at the other end, comprising 50″, and the vertical bar 68 at such other end. One end of the linkage—that including the bar 42—is adjustably carried by the lead screw 36. The other end of the linkage floatingly carries the heating-electrode 10. In order to provide greater lateral rigidity to the linkage so as to prevent it from weaving from side to side, the intermediate portions of the lower links 48′ and 48″ are provided with an integral crosspiece 72.

One of the swingable links, more particularly the lower link 48′, has an angle bar 74 secured to its front end. This angle bar 74 projects in a direction toward the lead screw 36 and is adapted to abut a stop screw 76 which is threaded in a hole in a guide piece 44 of the carriage or bar member 42. The angle bar 74 on the linkage 12, and the stop screw 76 on the bar member 42, form a stop means which limits downward movement of the linkage by the weight of the linkage, the heating-electrode 10 or other force. The stop screw 76 is adjustable and preferably it is adjusted so that the swingable links 48′, 48″, 50′ and 50″ and also the heating-electrode 10 will be substantially level in operative position during heat-treatments.

In order to use the apparatus with the heating-electrode 10 pressing downwardly on an object to be heat-treated, the upper links 50′ and 50″ have lugs 78 projecting laterally outwardly therefrom at a point backwardly of the upper pivot 47. These lugs 78 receive ends of tension springs 80. The other ends of the springs are wrapped around the bearing 52 so that, in effect, ends of the springs are anchored to the carriage or bar member 43 in all positions of this bar member. The anchored ends of the springs are also relatively stationary with respect to any fixed position of the lead screw 36 and the cage-member 18. The springs 80 constitute a force-exerting device which tends to move the upper links 50′ and 50″ clockwise about the upper pivot 47, as viewed in Fig. 1. This means that the whole pantographic linkage and the heating-electrode 10 will also tend to move clockwise until the abutment-stop angle bar 74 reaches the stop screw 76, or until further clockwise movement of the linkage is prevented by resistance of an object for heat-treatment in contact with the lower side of the heating-electrode 10.

Turing the handle 38 of the lead screw 36 moves the heating-electrode 10 up or down in a rectilinear direction, without changing the axial alignment of the two heating-electrodes 8 and 10; and a considerable variation in the spacing between the heating-electrodes can be thus obtained.

In each particular adjustment of the lead screw 36, objects of different heights can be successively heat-treated without further turning of the lead screw 36, provided their heights do not vary more than the distance in which the free end of the pantographic linkage 12 can tilt upwardly. Greater variations in the heights of objects can be taken care of by turning the lead screw. Two typical operating positions of the apparatus are shown in Figs. 1 and 6. In Fig. 1, an article W can be heat-treated with an air gap between it and the heating-electrode 10. The pantographic linkage is in its lowermost position with respect to the stop screw 76, and while in this position, it can be raised or lowered to provide the desired air gap.

Fig. 6 shows an operating position of the apparatus for heat-treating an object W′ with the upper heating-electrode 10 resting on or pressing on the top surface of the object. For such operation, the bar member 43 is first dropped by rotating the handle 38 until the heating-electrode 10 rests on the top of the object W′, and the linkage 12 tilts relatively upwardly on the bar 43 so that the stop screw 76 separates from the angle bar 74 a distance which will allow for the maximum variation in the heights of other similar objects to be heat-treated. By further lowering the bar member 43 to another relatively lower operating position, the pressure of the heating-electrode 10 on the object W′ will be increased. In this lower operating position, the heating-electrode 10 will exert a force on the object W′ which depends on the weight of the heating-electrode 10, the weight of the linkage 12, and the tension on the springs 80 which may be as much as or little as desired.

From the foregoing, it is obvious that by raising and lowering the pantographic linkage 12, a plurality of articles of considerably different heights can be successfully heat-treated with or without an air gap and with or without pressure being applied to the top surfaces of the objects.

While we have described our invention in a

preferred form, it should be obvious to one skilled in the art that its teachings can be applied to other embodiments and forms so that our invention is not necessarily limited to the modifications herein described.

We claim as our invention:

1. A dielectric heating unit of a type described comprising, in combination, a cage having a relatively stationary member and a raisable member, a pair of relatively insulated heating-electrodes in said cage, a first of said heating-electrodes being above the second of said heating-electrodes, and a pantographic linkage in said cage having horizontal links tiltable up and down, said horizontal links being connected by end members, said linkage having an end secured to said first heating-electrode and its other end carried by said raisable cage-member.

2. A dielectric heating unit of a type described comprising, in combination, a cage having a relatively stationary member and a raisable member, a pair of relatively insulated heating-electrodes in said cage, a first of said heating-electrodes being above a second of said heating-electrodes, a pantographic linkage in said cage having horizontal links tiltable up and down, said horizontal links being connected by end members, said linkage having an end secured to said first heating-electrode, and an adjusting means carried by said raisable cage-member for adjustably carrying the other end of said pantographic linkage.

3. An invention including that of claim 2 but characterized further by a stop means for limiting tilting of said horizontal links.

4. A dielectric heating unit of a type described comprising, in combination, a cage having a relatively stationary member and a raisable member, a pair of relatively insulated heating-electrodes in said cage, a first of said heating-electrodes being above a second of said heating-electrodes, a pantographic linkage in said cage having horizontal links tiltable up and down, and end members connecting said links, one of said end members carrying said first heating-electrode, an adjusting means carried by said raisable cage-member for adjustably carrying the other end member of said pantographic linkage, and a spring means having spring-ends connected to anchoring points on said unit, at least one of which is on said linkage, said points being separated different distances depending on the adjustment of said adjusting means.

5. An invention including that of claim 2 but characterized further by a stop means for limiting downward movement of said linkage.

6. A dielectric heating uniit of a type described comprising, in combination, a cage having a relatively stationary member and a raisable member, said raisable member having an upstanding wall, a pair of relatively insulated heating-electrodes in said cage, a first of said heating-electrodes being above a second of said heating-electrodes, a movable bar carrying said first heating-electrode, a pair of vertically separated horizontal links having ends pivoted to said bar, a bar member to which the other ends of said links are pivoted, and means carried by said upstanding wall of said raisable cage-member for in turn carrying said bar member.

7. A dielectric heating unit of a type described comprising, in combination, a cage having a relatively stationary member and a raisable member having an upstanding wall, a pair of relatively insulated heating-electrodes in said cage, a first of said heating-electrodes being above a second of said heating-electrodes, a movable bar carrying said first heating-electrode, a pair of vertically separated horizontal links having ends pivoted to said bar, a bar member to which the other ends of said links are pivoted, means carried by said upstanding wall of said raisable cage-member for in turn carrying said bar member, and a spring anchored to one of said horizontal links and to said bar member.

8. A dielectric heating unit of a type described comprising, in combination, a cage having a relatively stationary member and a raisable member having an upstanding wall, a pair of relatively insulated heating-electrodes in said cage, a first of said heating-electrodes being above a second of said heating-electrodes, a movable bar carrying said first heating-electrode, a pair of vertically separated horizontal links having ends pivoted to said bar, a bar member to which the other ends of said links are pivoted, a spring anchored to one of said horizontal links and to said bar member, and means for carrying said bar member from said upstanding wall of said raisable cage-member, the last said means comprising an adjusting device for adjusting the position of said bar member with respect to said raisable cage-member.

9. A dielectric heating unit of a type described comprising, in combination, a cage having a relatively stationary member and a raisable member hinged to a side of said stationary cage-member, a pair of relatively insulated heating-electrodes in said cage, a first of said heating-electrodes being above a second of said heating-electrodes, a bar secured to said first heating-electrode, a pair of vertically separated links having ends pivoted to said bar, a bar member to which the other ends of said links are pivoted, a guide for said raisable cage-member in which said bar member can slide, and means carried by said raisable cage-member for adjustably positioning said bar member in said guide.

10. A dielectric heating unit of a type described comprising, in combination, a cage having a relatively stationary member and a raisable member, a pair of relatively insulated heating-electrodes in said cage, a first of said heating-electrodes being above a second of said heating-electrodes, an upstanding lead screw, said raisable cage-member having means rotatably supporting said lead screw, a handle device for turning said lead screw, a pantographic linkage having a member engaging said lead screw, said linkage being arranged for vertical tilting, said linkage having another member secured to said first heating-electrode.

11. A dielectric heating unit of a type described comprising, in combination, a cage having a relatively stationary member and a raisable member, a pair of relatively insulated heating-electrodes in said cage, a first of said heating-electrodes being above a second of said heating-electrodes, an upstanding lead screw, said raisable cage-member having means rotatably supporting said lead screw, a handle device for turning said lead screw, a pantographic linkage having a member engaging said lead screw, said linkage being arranged for vertical tilting, said linkage having another member secured to said first heating-electrode, and a force-exerting device connected to said linkage tending to move said linkage so as to press said first heating-electrode downwardly.

12. An invention including that of claim 11 but

characterized, in addition, by a stop for limiting tilting of said linkage.

13. A dielectric heating unit of a type described comprising, in combination, a cage having a relatively stationary member and a raisable member hinged to a side of said stationary cage-member, a pair of relatively insulated heating-electrodes in said cage, a first of said heating-electrodes being above a second of said heating-electrodes, a wall of said raisable cage-member having an upright portion at the side opposite the hinged portion, a lead screw rotatably carried in said upright portion, a handle carried on the outside of said cage for turning said screw, a pantographic linkage having a bar member slidable in said upright portion, said bar member engaging said screw, said linkage also comprising a pair of links pivoted to said bar member and also to said first heating-electrode.

14. Dielectric heating equipment comprising, in combination, a pair of relatively insulated heating-electrodes, a first of said heating-electrodes being above a second of said heating-electrodes, a frame and means for supporting said first electrode by said frame, said means comprising an upright support member, a bar member adjustably carried by said support member, a pair of vertically spaced horizontally extending links pivoted to said bar member, and means pivotally attaching said links to said first heating-electrode, and a force-exerting means for forcing said heating-electrode downwardly.

15. An invention including that of claim 14 but further characterized by a stop means for limiting downward movement of said first heating-electrode.

16. A dielectric heating unit of a type described comprising, in combination, a cage having a relatively stationary member and a raisable member, a pair of relatively insulated heating-electrodes in said cage, a first of said heating-electrodes being above a second of said heating-electrodes, a pantographic linkage in said cage having horizontal links tiltable up and down, and end members connecting said horizontal links, one of said end members carrying said first heating-electrode, and an adjusting means carried by said raisable cage-member for adjusting the position of said pantographic linkage with respect to said raisable cage-member.

17. A dielectric heating unit of a type described comprising, in combination, a cage having a relatively stationary member and a raisable member, a pair of relatively insulated heating-electrodes in said cage, a first of said heating-electrodes being above a second of said heating-electrodes, a pantographic linkage in said cage having horizontal links tiltable up and down, and end members connecting said horizontal links, one of said end members carrying said first heating-electrode, and an adjusting means carried by said raisable cage-member for adjusting the position of said pantographic linkage with respect to said raisable cage-member, said adjusting means comprising an adjusting member above the top of said raisable member.

18. A dielectric heating unit of a type described comprising, in combination, a cage having a relatively stationary member and a raisable member, said raisable member having an upstanding wall, a pair of relatively insulated heating-electrodes in said cage, a first of said heating-electrodes being above a second of said heating-electrodes, a movable bar carrying said first heating-electrode, a pair of vertically separated horizontal links having ends pivoted to said bar, a bar member to which the other ends of said links are pivoted, and means carried by said upstanding wall of said raisable cage-member for in turn carrying said bar member, said adjusting means comprising an adjusting member outside of said raisable cage-member.

19. An invention including that of claim 8 but further characterized by said adjusting device comprising a member extending through said cage and having an adjusting member above said bar member.

20. An invention including that of claim 9 but characterized further by the last said means comprising an adjusting member on the outside of said raisable cage-member.

21. A dielectric heating unit of the type described comprising, in combination, a cage having a relatively stationary member and a relatively movable member, a pair of relatively insulated heat-electrodes in said cage, a first of said heating-electrodes being above the second of said heating-electrodes, and a pantographic linkage in said case having horizontal links tiltable up and down, said horizontal links being connected by end members, said linkage having an end secured to said first heating-electrode and its other end carried by one of said cage-members.

22. A dielectric heating unit of a type described comprising, in combination, a pair of relatively insulated heating-electrodes, a first of said heating-electrodes being above a second of said heating-electrodes, a cage about said heating-electrodes, said cage having a pair of cage-members which are relatively movable to open and close said cage so that work to be heat-treated can be placed between said heating-electrodes, a pantographic linkage in said cage carried by a first of said cage-members and having generally horizontal but tiltable links, end members connecting said links, one of said end members carrying said first heating-electrode, means associated with the second of said cage-member for carrying said second heating-electrode, and a biasing means connected to said pantographic linkage, tending to move said pantographic linkage and said first heating-electrode in a predetermined direction inside said cage.

23. A dielectric heating unit as defined in claim 22 but further characterized by said biasing means comprising a spring having an end anchored to move with said pantograph and an end anchored so as to be substantially stationary with respect to said first cage-member, and adjusting means for adjusting the position of the last said spring-end.

24. A dielectric heating unit as defined in claim 23 but further characterized by said adjusting means for said linkage comprising an adjusting member accessible from outside of said cage when said cage is closed.

25. A dielectric heating unit of a type described comprising, in combination, a pair of relatively insulated heating-electrodes, a first of said heating-electrodes being above a second of said heating-electrodes, a cage about said heating-electrodes, said cage having a pair of cage-members which are relatively movable so that work to be heat-treated can be placed between said heating-electrodes, a pantographic linkage in said cage carried by a first of said cage-members and having generally horizontal but tiltable links, end members connecting said links, means associated with one of said end members for carrying said first heating-electrode, means associated with the

other of said cage-members for carrying said second heating-electrode, and an adjusting means carried by said cage for adjusting the position of the other of said end members of said pantographic linkage and said first heating-electrode inside said cage.

26. A dielectric heating unit of a type described comprising, a pair of vertically-spaced, relatively insulated heating-electrodes, a cage surrounding said heating-electrodes, said cage comprising a pair of cage-members, one of said cage-members being relatively movable with respect to the other of said cage-members, whereby the cage can be loaded and unloaded with said work, a first of said cage-members having wall means extending above a second of said cage-members, a pantographic linkage in said cage having generally horizontal but tiltable links, end members pivotally carrying said links, one of said end members carrying the upper of said heating-electrodes, and means associated with said wall means carrying the other of said end members.

27. A dielectric unit as defined in claim 26 but characterized further by an adjustable stop means limiting downward movement of said pantographic linkage and said upper heating-electrode.

28. A dielectric heating unit of a type described comprising, a pair of vertically-spaced, relatively insulated heating-electrodes, a cage surrounding said heating-electrodes, said cage comprising a pair of cage-members, one of said cage-members being relatively movable with respect to the other of said cage-members, whereby the cage can be loaded and unloaded with said work, a first of said cage-members having wall means extending above a second of said cage-members, a pantographic linkage in said cage having generally horizontal but tiltable links, end members pivotally carrying said links, one of said end members carrying the upper of said heating-electrodes, means associated with said wall means carrying the other of said end members, and an adjustable stop means limiting movement of said pantographic linkage and upper heating-electrode in a downward direction, said adjustable stop means comprising an adjusting member accessible from the outside of said cage when said cage-members are closed.

29. Dielectric heating means of the type described comprising a pair of vertically-spaced, relatively insulated heating electrodes adapted to receive work therebetween, a pantographic linkage having generally horizontal but tiltable links, end members pivotally carrying said links, means associated with one of said end members for dependingly carrying the upper of said heating-electrodes, support means for carrying the other of said end members, said pantographic linkage having biasing means tending to move said pantographic linkage and said upper heating-electrode in the predetermined direction.

30. Dielectric heating means as defined in claim 29 but further characterized by said biasing means comprising a spring having an end anchored to move with said pantographic linkage and said upper heating-electrode and an end anchored on said support means, and adjusting means for adjusting the position of the last said spring-end.

31. Dielectric heating means as defined in claim 30 but further characterized by adjustable stop means for predetermining the position of said pantographic linkage and upper heating electrode with respect to said lower heating electrode.

WILLIAM H. ANDERSON.
DEAN S. SHINGLER.

REFERENCES CITED

The following references are of record in the file of this patent:

"A ¼-kw. H. F. generator," Electronic Engineering, August 1945, page 633.