

A. EIMER.
ELECTRIC SECTIONAL FURNACE.

APPLICATION FILED MAY 28, 1903.

NO MODEL.

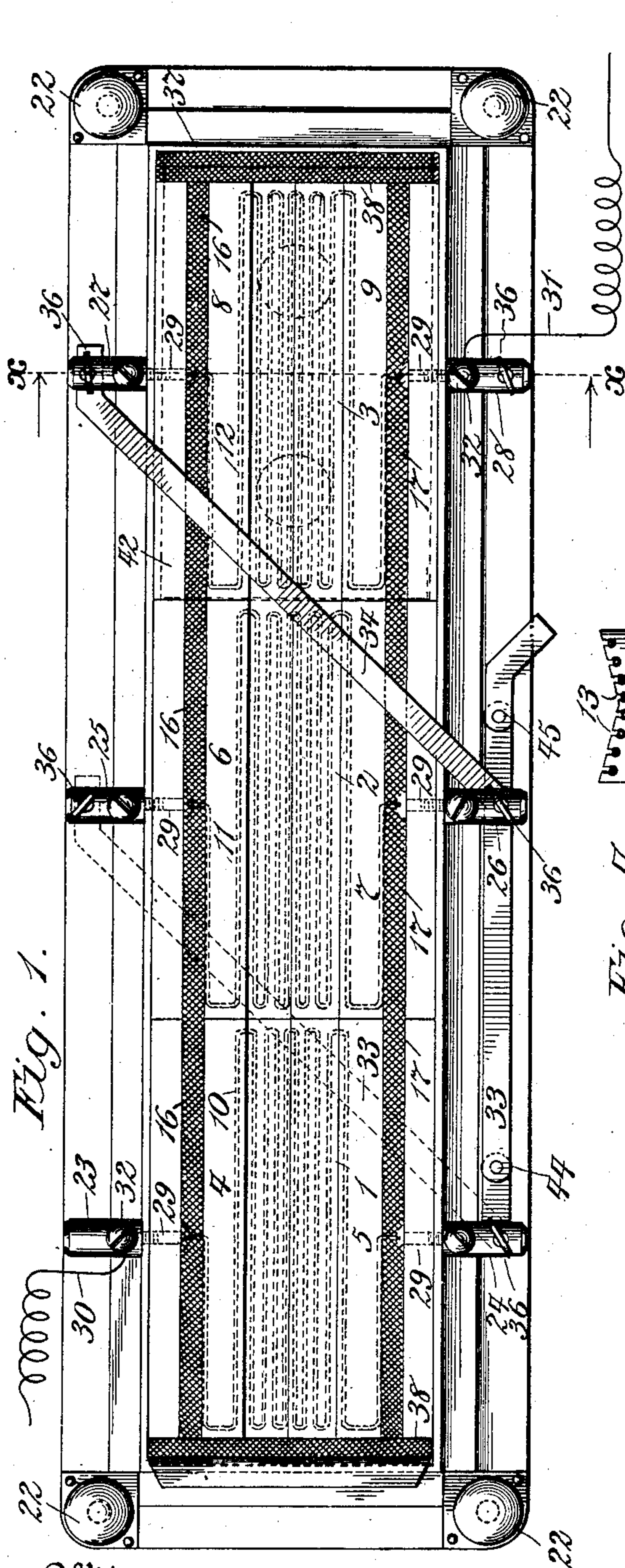


Fig. 1.



Fig. 4.

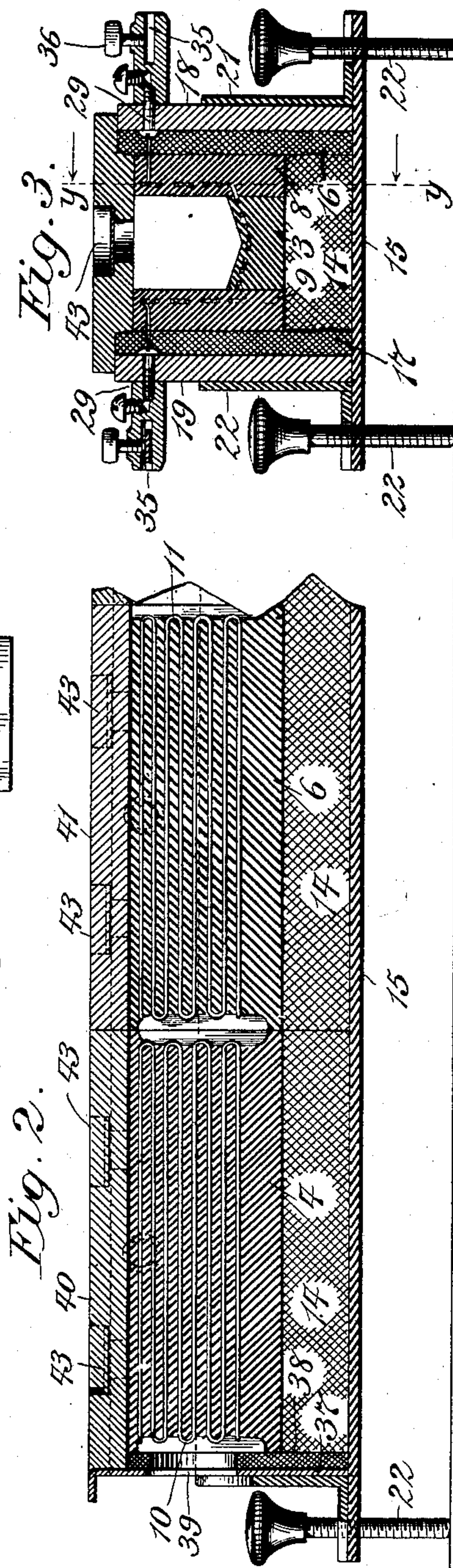


Fig. 2.

Fig. 3.

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UNITED STATES PATENT OFFICE.

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ELECTRIC SECTIONAL FURNACE.

SPECIFICATION forming part of Letters Patent No. 736,917, dated August 18, 1903.

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To all whom it may concern:

Be it known that I, AUGUST EIMER, a citizen of the United States of America, and a resident of the borough of Manhattan, in the city, county, and State of New York, have invented certain new and useful Improvements in Electric Sectional Furnaces, of which the following is a specification.

This invention relates to electric furnaces for use in conducting chemical reactions for analyses and for divers purposes wherein herein heat is required to be applied, either progressively or over a given sectional area; and the object of my invention is to provide an electric heating apparatus having a plurality of separate resistance-conductors arranged about said apparatus, with means for connecting said conductors in different series or separate relations, whereby any one or more sections of said furnace may be placed in or cut out of circuit.

To this end my invention consists, broadly, in an elongated trough-like apparatus composed of opposite side sections of refractory material with corresponding longitudinal base and cover sections, each set of side and base sections being provided with a resistance-conductor with means for connecting in series and disconnecting any two or more of said sets of sections to provide electrical heat to any extended or restricted portion of the apparatus. The apparatus is further provided with suitable exterior non-conducting or heat-confining members and with sectional removable covers having protected observation-apertures and is also provided with a suitable supporting-frame having means of vertical adjustment to different angles to suit the various conditions required in an apparatus of this nature.

In the drawings accompanying this application, Figure 1 is a top plan view, partly in horizontal section, of my said apparatus. Fig. 2 is a longitudinal vertical sectional view taken on the line *y y* of Fig. 3. Fig. 3 is a cross-sectional view taken on the line *x x* of Fig. 1, and Fig. 4 is a detail view of a modified form of base sectional member.

While in the following description it is my purpose to describe my improved sectional or progressive electric furnace as applied to a trough-like elongated apparatus to receive

a chemist's combustion-tube or the like and capable of assuming incandescence or a lower temperature over any one or more different lengthwise sections thereof, yet I do not limit my invention to the production of such form of apparatus, intending also to apply the principle of sectionally or progressively heating an apparatus of any desirable conformation and area capacity.

In producing an apparatus substantially as illustrated in the drawings I provide a series of abutting or conterminous trough-like heating-sections, each either of integral structure or preferably composed of a base member of refractory material, as 1 2 3, the member 1 having the flanking members or side walls, as 4 5, also of refractory material, the member 2 having the flanking members 6 7, and the member 3 having the flanking members 8 9. Thus the number of heating-sections, such as that composed of the members 1 4 5, may be diminished or increased to suit requirements. Each heating-section is provided with a separate resistance-conductor, such conductors being indicated in the respective heating-sections, as by the numerals 10, 11, and 12. As seen in Figs. 1, 2, and 3, the resistance-conductors are embedded within the material of the sectional members, preferably near the inner surfaces thereof, and said conductors being threaded through some or all of a series of longitudinal transverse or other perforations formed through the material of said sections; but instead of being embedded within said sections the conductor, as 10, may be sunk or located in longitudinal or other depressions or grooves, as 13, (see Fig. 4,) formed in the inner surface of the sections, which depressions or grooves partly inclose the conductor, while leaving it partly exposed to permit a more intense radiation of its incandescence within the furnace. Separate adjacent sets of sections, as 1 4 5 and 2 6 7, may, if desired, be insulated from each other at their abutting ends, as by an asbestos or other packing. (Not shown.) The furnace-sections are mounted upon a strip of asbestos or other non-conducting material, as 14, which in turn is supported by a base-plate, of metal or other substantial material, as 15, and the opposite side sections 4 6 8 and 5 7 9 are respectively inclosed by walls 16 17, of as-

bestos or other non-conducting material. These walls 16 and 17 are in turn flanked, respectively, by rigid walls 18 and 19, while exterior angles, as 20 21, mounted upon base 15, clamp together and determine the relative positions of the various elements of which the furnace is composed.

The furnace is supported above the plane of the surface upon which it is imposed by means of four vertical set-screws 22, threaded through the four corners of the base 15 and adapted when turned separately by their knurled heads to vary or adjust the height of opposite corners of the apparatus above the supporting plane surface.

The different sets of heating-sections are provided each with a pair of opposite terminal connections for their respective conductors. These terminal connections may be of any desired form; but I have shown them as binding-posts adapted to suit the requirements of the particular form of apparatus illustrated. The binding-posts 23 24 constitute a pair of terminal connections for the conductor 10, 25 26 a like pair for conductor 11, and 27 28 a like pair for conductor 12. Said binding-posts are preferably each respectively held to the members 18 19 by binding-screws, as 29, which are passed through said latter members and screwed into said binding-posts, thus connecting the respective terminals of the conductors thereto, while the terminals, as 30 31, of the electric circuit are preferably connected, as by binding-screws 32, respectively, with the binding-posts 23 28, thus permitting the inclusion in series arrangement, with the aid of suitable intermediary connections between conductors 10, 11, and 12 or between certain of the binding-posts, of any one or more or all of said conductors in said circuit. The aforesaid intermediary connections consist, preferably, of strips of conductive metal, as 33 34, adapted to fit at their opposite ends within slots 35, provided in each of the binding-posts and having binding-screws 36.

The ends of the furnace are reinforced, as by plates 37, and a packing 38 of non-conducting material, as asbestos, is interposed between each end plate and the adjacent end of a heating-section. At one or both ends said plate and packing is provided with an aperture, as 39, to permit the introduction and withdrawal of a combustion-tube or other body or matter to be heated into or from the furnace.

The furnace-cover is preferably formed in sections corresponding to the several heating-sections and consists of the cover-plates 40 41 42, preferably of refractory material, being adapted to fit upon and close the opening between the opposite side heating-walls of the furnace. Said cover-sections are each preferably provided with one or more observation-apertures, as 43, closed by disks of quartz, mica, or other suitable transparent material, through which the color of the fir-

ing and progress of the operation being performed can be witnessed.

It will be observed that I form the surface of the base heating-sections 1 2 3 with longitudinal depressions concave in cross-section, this form being preferred by me because it serves to centralize the location of the combustion-tube or like body placed within the furnace.

In the operation of my invention it will be understood that the terminals 30 31 are connected in circuit with a source of electrical energy and that a rheostat is located in said circuit in the path, we will say, of the current flowing to the furnace through terminal 30. Assuming that it is desired to render incandescent all of the heating-sections comprising the furnace, then the conductor-strip 33 will be in contact with the binding-posts 24 25, as shown in dotted lines in Fig. 1, and the conductor-strip 34 will be in contact with the binding-posts 26 27. By this means all of the resistance-conductors 10, 11, and 12 are connected in series, and in consequence the entire length of the furnace becomes heated. If desired to heat only the opposite ends of the apparatus, leaving the middle section cut out, then the strip 33 is placed to connect binding-posts 24 26 and the strip 34 is placed to connect binding-posts 26 27, this form being indicated in full lines in Fig. 1. Similarly by suitably arranging the strips 33 34 the central heating-sections only may be heated or other sectional or progressive heating effects may be produced, as will be clear to those familiar with the art.

I may provide pivotal joints, as 44 45, for the connectors 33 34, whereby the latter when fast at one end to a binding-post may without disconnection therefrom be swung about the apparatus to connect at its opposite end to another binding-post.

While I have shown the resistance-conductors as arranged for connection in series, it is evident that same may also be connected in multiple, and, further, instead of using a single conductor with one heating-section I may employ two or more conductors, connecting the same either in series or in multiple. I may also when desirable extend one or more single conductors over two or more adjacent heating-sections, as is obvious.

A further important use to which my improved furnace may be applied is in annealing metal in strip or other form, and when performing such annealing sectionally the separate resistance-conductors in adjacent heating-sections should preferably be insulated from each other.

Having now described my invention, I declare that what I claim is—

1. An electric furnace composed of a plurality of abutting sections, disposed approximately in a horizontal plane, and means for heating any one or more of said sections.

2. An electric furnace composed of a plurality of abutting sections disposed approxi-

mately in a horizontal plane, and each having a separate heating-conductor, and means for sectionally electrifying said furnace.

3. An electric furnace composed of abutting sections disposed in an approximately horizontal plane, and having means for introducing heat to a limited portion of its interior area.

4. An electric furnace composed of abutting sections disposed in an approximately horizontal plane, and having means for progressively heating its interior area.

5. In an electric furnace composed of abutting sections disposed in an approximately horizontal plane, a plurality of resistance-conductors, a circuit, and means for including any one or more of said conductors in said circuit.

6. In an electric furnace composed of abutting sections disposed in an approximately horizontal plane, a plurality of resistance-conductors, a circuit, and means for including any two or more of said conductors in series relation in said circuit.

7. In an electric furnace composed of a plurality of abutting refractory sections disposed in an approximately horizontal plane, and each having a separate resistance-conductor, a circuit, and means for including any one or more of said conductors in said circuit.

8. In an electric furnace composed of a plurality of abutting refractory sections, each having a separate resistance-conductor, a circuit, and means for including any two or more of said conductors in series in said circuit.

9. An electric furnace composed of a plurality of refractory, trough-like, heating-sections arranged end to end in an approximately horizontal plane, a separate resistance-conductor for each of said sections, a circuit, and means for including any one or more of said conductors in said circuit.

10. An electric furnace including a trough-like heating apparatus having a resistance-conductor, the base of said apparatus having its upper surface of concave formation in cross-section.

11. An electric furnace composed of a plurality of heating-sections arranged end to end in trough-like conformation, each of said heating-sections comprising a separate base member and opposite side members of refractory material, a resistance-conductor for the members of each heating-section, a circuit, and means for connecting some or all of said conductors in different series relations in said circuit.

12. An electric furnace composed of abutting sections disposed approximately in a horizontal plane and having a resistance-conductor and an upper removable closure, said closure being provided with an observation-aperture closed with a disk of quartz.

13. An electric furnace composed of a plurality of trough-like heating-sections arranged

end to end, a resistance-conductor for each of said sections, and a removable upper closure for each of said sections, said closures each being provided with an observation-aperture having a transparent covering.

14. An electric furnace composed of a plurality of trough-like heating-sections arranged end to end, a resistance-conductor for each of said sections, a frame supporting said furnace about its base, sides, and opposite ends, and packing of non-conducting material intermediate said frame and the base, sides, and ends of said furnace.

15. An electric furnace composed of a plurality of trough-like heating-sections arranged end to end, a resistance-conductor for each of said sections, a frame supporting said furnace about its base, sides, and opposite ends, packing of non-conducting material intermediate said frame and the base, sides, and ends of said furnace, and supports for said frame possessing means for the vertical adjustment of said frame at different angles.

16. An electric furnace composed of a plurality of heating-sections arranged end to end in trough-like formation, a resistance-conductor for each of said heating-sections, and an upper closure, together with opposite end closures for said furnace one of which is provided with a port for the insertion into and withdrawal from the furnace of an object to be heated.

17. In a furnace composed of a plurality of heating-sections arranged end to end in trough-like formation, a resistance-conductor for each of said sections, a circuit, and means for including any one or more of said conductors in said circuit to heat such included conductor or conductors.

18. In a furnace composed of a plurality of heating-sections arranged end to end in trough-like formation, a resistance-conductor for each of said sections, a terminal connection for each pole of each of said conductors, means of contacting one terminal of the circuit with a pole of one of the end heating-sections, and means of contacting the opposite circuit-terminal with the opposite pole of the opposite end heating-section, together with one or more adjustable intermediate connectors to include one or more of the said conductors in series relation in said circuit.

19. In an electric furnace composed of a plurality of abutting sections disposed approximately in a horizontal plane, each of said sections having a resistance-conductor, a circuit, and one or more pivotally-jointed connectors to include any one or more of said conductors in said circuit.

Signed at New York this 20th day of May, 1903.

AUGUST EIMER.

Witnesses:

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