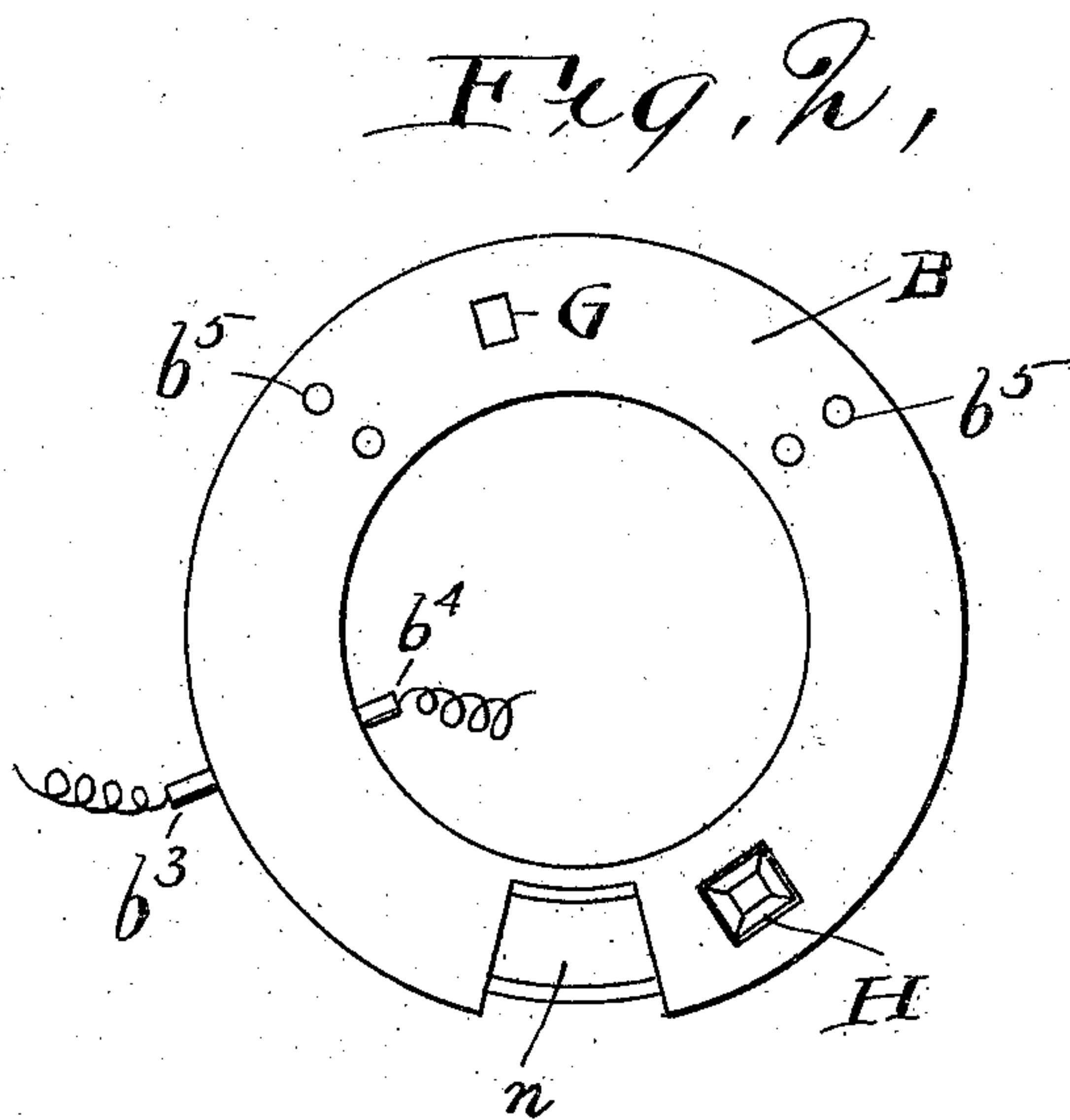
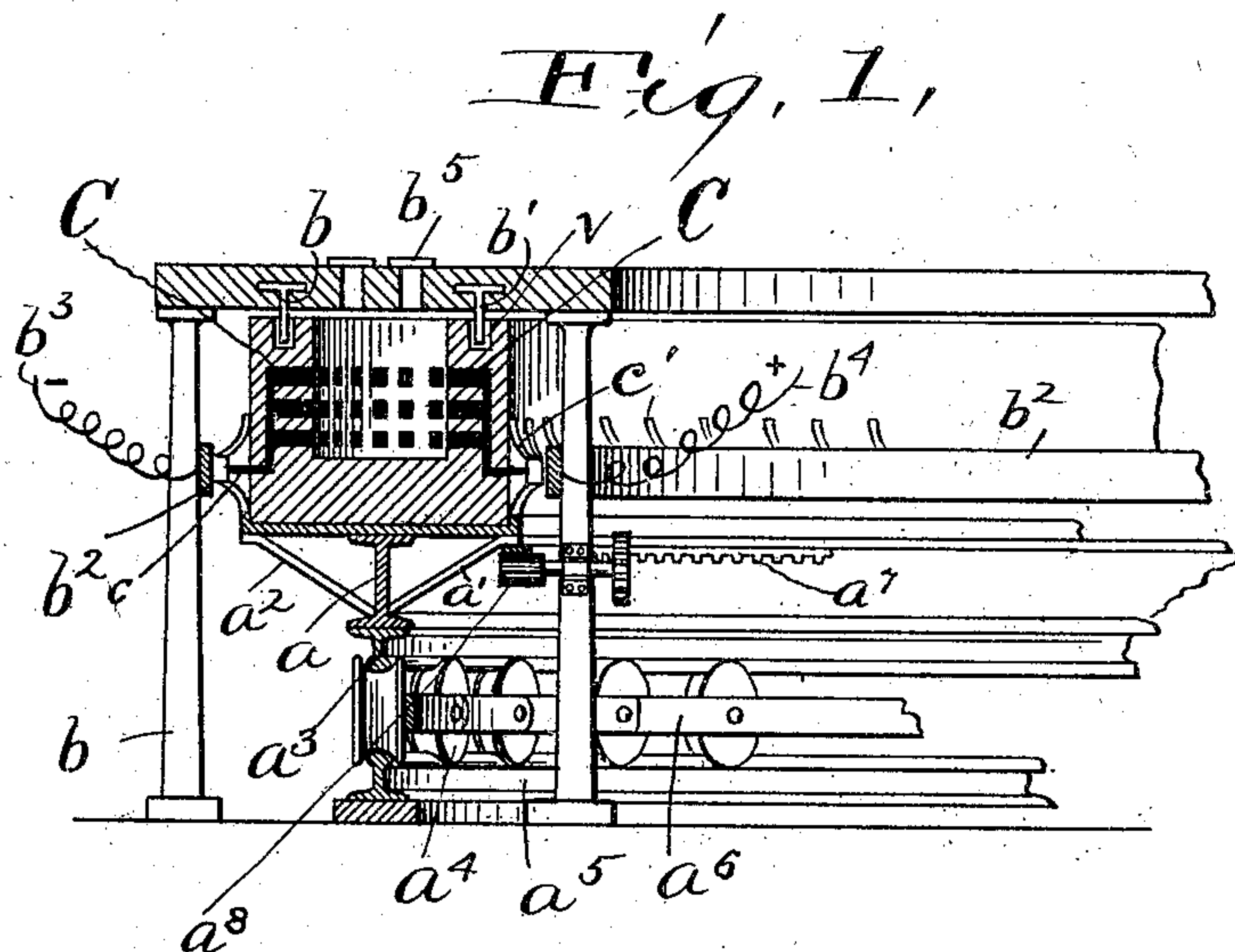


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PATENTED JULY 11, 1905.

C. L. SAUNDERS.  
ELECTRIC FURNACE.

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## ELECTRIC FURNACE.

SPECIFICATION forming part of Letters Patent No. 794,255, dated July 11, 1905.

Application filed February 15, 1901. Renewed November 18, 1903. Serial No. 181,739.

*To all whom it may concern:*

Be it known that I, CECIL L. SAUNDERS, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Electrical Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in electrical furnaces, in which term I include all furnaces in which the heating, reducing, or separating power of the electric current is employed to effect any change in the physical or chemical condition of the material operated upon—such, for instance, as changing other forms of carbon into graphite, baking or otherwise changing by the effect of heat formed articles—such as battery-carbons, &c.—reducing ores and causing chemical changes and combinations in elements, compounds, and substances—as, for instance, the manufacture of carbids, chlorids, &c., and the separation of compounds by electricity.

The object of my invention is to increase the efficiency of furnaces and operations in which electricity is employed in any of the above-mentioned class of operations and to secure economy of construction and operation, all as hereinafter described. This object I purpose to accomplish by means of the mechanism hereinafter described or its equivalent, whereby such operations can be carried on continuously and with greater economy, and hence at lower cost, than heretofore.

In general terms my invention consists in employing a continuously-moving electrical hearth combined with provisions for continuously feeding the raw materials into such hearth or cell, electrically treating the same thereon, and removing the finished product from such continuously-moving hearth. For this purpose I employ by preference a circular or annular cell, furnace, or hearth of fire-clay or fire-brick, provided with means for continuously rotating the same at any desired rate of speed, and I combine with said hearth means for continuously charging the same with the material to be treated suitable elec-

trodes and electrical connections whereby a given zone or area of said hearth or furnace is brought into electrical circuit and the current caused to traverse that portion of the materials occupying such zone or area and to effect the desired operation thereon during the progress of such hearth, zone, or area through the field of electrical effect, and means for continuously discharging from said hearth or cell the treated and finished portions of the material thereon, all in substantially the manner hereinafter described or in an analogous and equivalent manner.

It is obvious that the construction of the furnace admits of a certain amount of variation without departing from the essence of my invention or sacrificing the substantial advantages derived therefrom.

In the drawings hereto annexed I have shown a form of furnace adapted to carrying out the kind of operations hereinabove described according to my invention.

Figure 1 is a cross-section of a hearth constructed according to my invention, and Fig. 2 is a top plan view of the same.

In the figures, A represents an annular rotating hearth which may be of any suitable construction. This hearth is provided on its under side with a supporting-frame composed of the I-shaped beam  $a$  and the two bracing-beams  $a'$   $a''$ . A rail  $a^3$  is secured to the I-beam  $a$  and is adapted to travel upon grooved rollers  $a^4$ . These rollers in turn run upon a rail  $a^5$ , secured to the foundation, and are coupled together by means of links  $a^6$ . On one of the bracing-beams  $a'$  is a rack  $a^7$ , which engages a pinion  $a^8$ , mounted in any preferred manner for rotating the hearth. In the sides of the hearth are a plurality of electrodes C C, which may be arranged in any manner, as desired, three rows, one above the other, being shown in Fig. 1. These electrodes are flush with the inner side of the side walls of the hearth and are connected by means of short connections  $c$  with contact-blocks  $c'$ . Grooves  $b$  are provided in the upper edges of the hearth for the purpose of containing the sand or other material which forms a seal.

Above the hearth A and in close proximity to the upper edge thereof is a cover B, adapted



ed to extend over the portion of the hearth which is under the influence of the electric current, or it may be as shown in Fig. 2, covering almost the entire hearth with the exception of a small portion at *n*, where the material is taken from it. Pillars or standards *b* are arranged to support the cover B, as shown. A hopper H is provided near one end of the cover for the introduction of material into the hearth, and a suitable pipe G is also provided in the cover for conducting away the gases generated by the action of the current upon the material in the hearth. Any suitable means may be provided for drawing off these gases through the pipe G.

Mounted in the cover B and in a position so that they will project into the grooves *v* are plates *b'*, which with the sand or other material form a complete seal between the cover and the hearth.

Secured to the standards *b* are contact-rails *b''*, which are connected to a source of electricity by means of the wires *b'''* *b''''* and are so placed that they will contact with the blocks *c'*, thereby conveying the current to the material upon the hearth.

Openings *b<sup>5</sup>*, having suitable covers, may be provided for the introduction of reagents which are to act upon the material in the hearth.

The length of the rails *b''* is determined by the length of the field of action which is required to reduce the material on the hearth.

The operation of the device is as follows:  
After the hearth is set in motion material is fed through the hoppers into it and permitted to pass into the field of electrical action, where the reducing of the material takes place, the gases given off being conducted from above the hearth through the pipe G into the open air or into a reservoir. If the charge is to be treated with reagents, they may be introduced through the openings *b<sup>5</sup>*. The material is then carried on from the field of electrical action and removed from the hearth.

Having described my invention, I claim—

1. In an electrical furnace, the combination with a horizontal continuous annular trough forming a hearth, of means for continuously rotating the same, positive and negative electrodes supported on said hearth and adapted to convey current to and from the material thereon, stationary contact-pieces with which said electrodes make temporary contact, and connections from said contact-pieces to the source of electricity.

2. In an electrical furnace, the combination of a horizontal continuous annular trough forming a hearth, means for continuously rotating the same, positive and negative electrodes embedded in said hearth and adapted to convey current to and from the material thereupon, contact-pieces carried by said hearth and electrically connected to said electrodes, stationary contact-pieces with which

the contact-pieces of the electrodes make temporary contact and connections from said stationary contact-pieces to an electric circuit.

3. In an electrical furnace, the combination of an annular revolving hearth, positive and negative electrodes attached thereto in position to make contact with the contents of said hearth, a cover inclosing a portion of said hearth and provided with means for educting the gases generated in said hearth, contact-pieces on said hearth and connected to said electrodes, stationary contact-pieces connected with the electrical circuit and adapted to be engaged in moving contact by the contact-pieces on the hearth, substantially as described.

4. In an electrical furnace the combination of an annular revolving hearth, positive and negative electrodes attached thereto in position to make contact with the contents of said hearth, a cover inclosing a portion of said hearth and provided with means for educting the gases generated in said hearth, contact-pieces on said hearth and connected to said electrodes, stationary contact-pieces connected with the electrical circuit and adapted to be engaged in moving contact by the contact-pieces on the hearth, and means for charging material into said hearth, substantially as described.

5. In an electrical furnace the combination of an annular revolving hearth, positive and negative electrodes attached thereto in position to make contact with the contents of said hearth, a cover inclosing a portion of said hearth and provided with means for educting the gases generated in said hearth, contact-pieces on said hearth and connected to said electrodes, stationary contact-pieces connected with the electrical circuit and adapted to be engaged in moving contact by the contact-pieces on the hearth, and means for charging material into said hearth, and removing the same therefrom, substantially as described.

6. In an electrical furnace, the combination of an annular revolving hearth, positive and negative electrodes attached thereto in position to make contact with the contents of said hearth, a cover inclosing a portion of said hearth and provided with means for educting the gases generated in said hearth, contact-pieces on said hearth and connected to said electrodes, stationary contact-pieces connected with the electrical circuit and adapted to be engaged successively in moving contact by the contact-pieces on the hearth, substantially as described.

7. In an electrical furnace, the combination with a trough forming a hearth, of means for moving the same, positive and negative electrodes both mounted upon said hearth and adapted to convey current to and from the material thereon, and means for conveying current to and from said electrodes.

8. In an electrical furnace, the combination



with a horizontal trough forming a hearth, means for continuously moving the same, positive and negative electrodes embedded in said hearth and adapted to convey current to  
5 and from the material thereon, and means for conveying a current to and from said electrodes.

9. In an electrical furnace, the combination with a horizontal continuous annular trough  
10 forming a hearth, means for continuously rotating the same, positive and negative electrodes upon the side of said hearth and adapted to convey current to and from the material thereon, and means for conveying a current to and from said electrodes.  
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10. In an electrical furnace, the combination with a horizontal continuous annular trough

forming a hearth, means for continuously rotating the same, positive and negative electrodes mounted on opposite sides of said  
20 hearth and traveling therewith, a series of contact members adapted to make successive contacts with the electrodes as the hearth travels and thereby pass successive currents through the material increasing its heat and  
25 decreasing its resistance throughout substantially the whole of the material on the hearth.

In testimony whereof I hereto affix my signature in presence of two witnesses.

CECIL L. SAUNDERS.

Witnesses:

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