T. F. BAILY.

ELECTRIC FURNACE.

APPLICATION FILED SEPT. 7, 1909.

960,773.

Patented June 7, 1910.

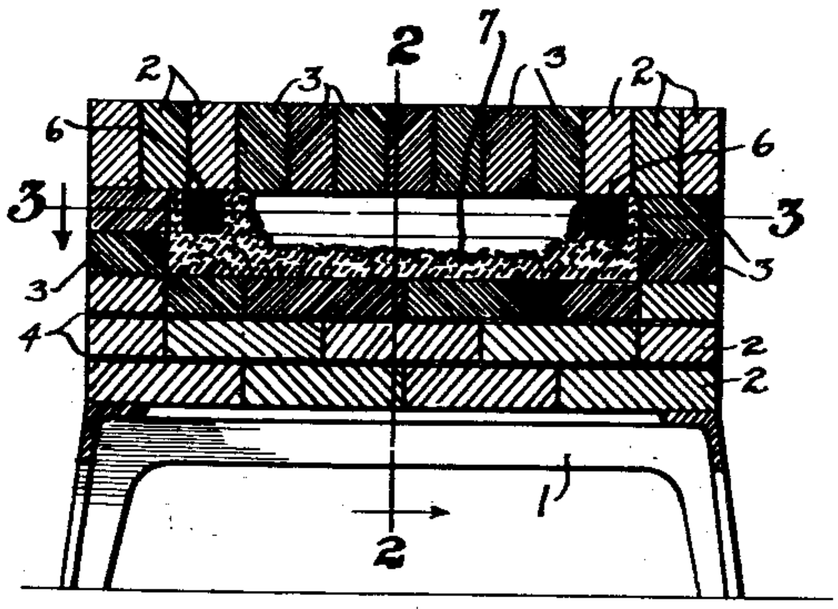

Fig. 1.

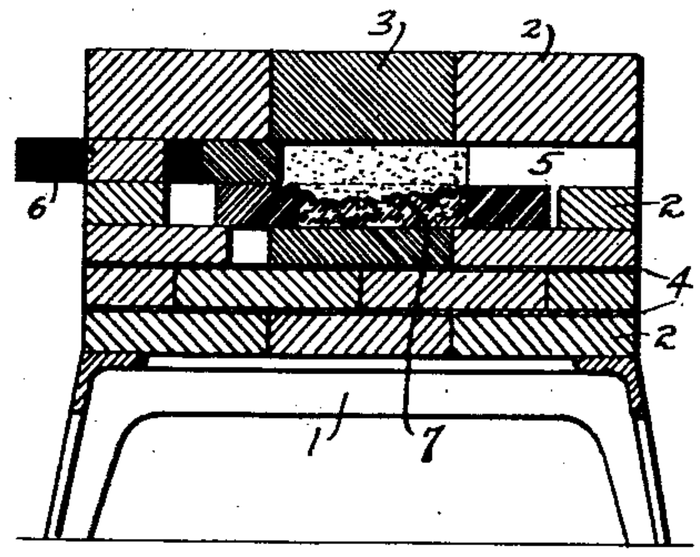

Fig. 2.

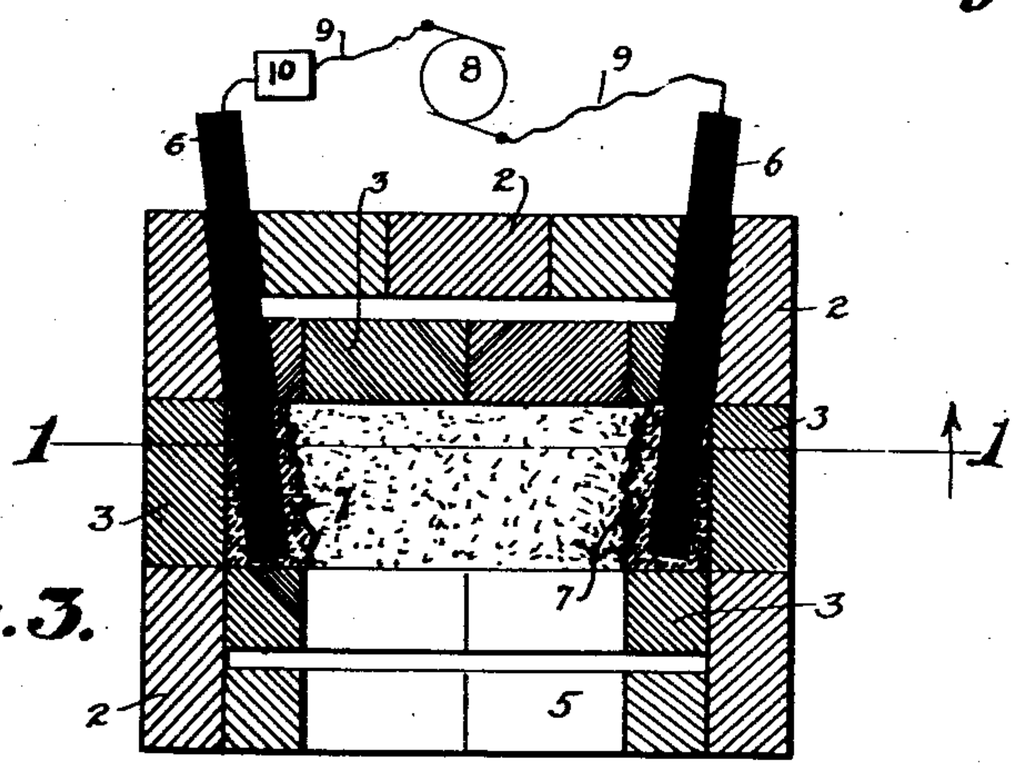

Fig. 3.

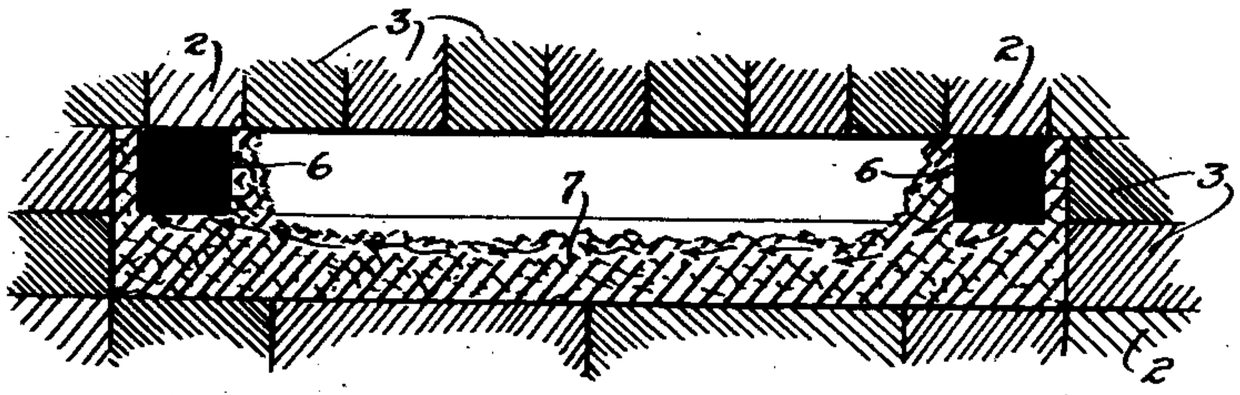

Fig. 4.

Witnesses

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ELECTRIC FURNACE.

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To all whom it may concern:

Be it known that I, THADDEUS F. BAILY, a citizen of the United States, residing at Alliance, in the county of Stark and State of Ohio, have invented a new and useful Electric Furnace, of which the following is a specification.

My invention relates to improvements in furnaces wherein a current of electricity passed through resistance material is employed to produce the necessary heat; and the objects of my improvement are to generally improve such electric furnaces, to more properly distribute the heat therein, to economize both in the amount of the current necessary and in the wear or oxidation of the furnace parts and resistance material by more perfectly controlling the path of current through the portion of the furnace constituting the resistance, and to attain other objects readily apparent to those skilled in the art. These objects I accomplish by the construction illustrated in the accompanying drawing, in which—

Figure 1 is a transverse vertical section through a furnace embodying my invention, said section being taken on the line 1—1 of Fig. 3. Fig. 2 is a vertical section through the furnace from front to rear thereof, said section being taken on the line 2—2 of Fig. 1. Fig. 3 is a horizontal section through the entire furnace taken on the line 3—3 of Fig. 1. Fig. 4 is an enlarged fragmentary sectional view illustrating a vertical transverse section of the heating chamber, the same being substantially the same as the section of said portion of the device illustrated in Fig. 1.

Throughout the several views similar numerals of reference indicate similar parts.

The numeral 1 indicates a base or foundation adapted to support the furnace. The said base is not claimed as a portion of the present invention and may be of any suitable form and structure to constitute a support for the furnace. The furnace is preferably constructed of bricks 2 and fire bricks 3, strips of asbestos 4 or its equivalent being preferably arranged between adjacent courses of bricks at the bottom of the furnace structure to more thoroughly insulate the furnace from the base 1. While I have illustrated the furnace as composed of bricks 2 and fire bricks 3, I desire to be unlimited in this respect, as the furnace walls may be composed of any suitable non-electrical conducting and heat resisting material. The bricks 2 and 3 are arranged to form a heating chamber with a suitable opening 5 preferably in the front walls of the furnace to provide a means of access to the said heating chamber.

The heating chamber may be constructed of various dimensions, but the preferable form, and the form best adapted for forge work of ordinary description is that illustrated in the drawings in which it will be seen that the said chamber is greater in dimension from front to rear than it is from top to bottom and considerably longer from side to side than it is from front to rear.

Extending through the furnace walls, preferably from the rear, are the electrodes 6, one of which is arranged at each end of the heating chamber, and the said electrodes extending across the heating chamber substantially to the front side thereof and arranged closer to each other at their forward ends adjacent the opening 5 than at the rear of the heating chamber. The said electrodes may thus be said to be convergent toward the said opening 5, the purpose of which will hereinafter be fully explained. It should be noted that the said electrodes 6 are arranged adjacent the top of the heating chamber, or are spaced from the floor of said chamber, as clearly illustrated in Figs. 1 and 4.

The resistance material 7 consists preferably of a carbonaceous substance in granular form, crushed coke or its equivalent preferably constituting the principal part of said material. It should be noted that the said resistance material being in granular form may readily be arranged within the heating chamber as desired, and renewed from time to time as it becomes oxidized by throwing in and leveling down additional material in a somewhat similar manner to the operation of replenishing a blacksmith's fire.

From an inspection of Figs. 1 and 4 it will be noted that the resistance material at the ends of the heating chamber is banked up around the electrodes 6, the same forming electrical contact with as much of the surface of said electrodes as possible and the body of resistance material at the ends of the heating chamber adjacent the electrodes 6 being of relatively great cross-section. Intermediate the ends of the heating chamber the resistance material is leveled down until

the general top surface of said resistance material intermediate the ends thereof is substantially in line with or slightly below the lower surface of the electrodes 6. The cross-section of said material intermediate the ends will therefore be considerably less than the cross-section of said material adjacent the electrodes and the portion intermediate said electrodes having said reduced cross-section may be termed the heating body.

It will be understood that the electrodes 6 should be arranged in an electric circuit, and any suitable generator may be employed, such generator being diagrammatically illustrated at 8 in the drawings and the wires 9 being arranged to complete the circuit. When current is supplied to the electrodes 6 the current will be conducted from one electrode to the other through the resistance material. In accordance with a well known characteristic of the electric current the shortest path from electrode to electrode will be sought, and as a result the greater portion of the current will be caused to pass through the upper portion of the heating body, as illustrated by the arrows in Fig. 4. It will of course be understood that the current will not follow a single narrow path through the resistance material but by far the greater portion of the current will traverse the said material adjacent the upper surface of the heating body, thus raising the said heating body in its upper portion to an intense heat, protecting the hearth or floor of the heating chamber from unnecessarily high temperature, and concentrating the heat in the upper surface of the heating body where it will be most serviceable.

The opening 5 being arranged in the front wall of the furnace and opening directly into the heating chamber, the front side of the heating body will become cooled more readily than the rear of said body because of the escape of heat from the forward portion of said body through the said opening. It is for the purpose of counter-acting this tendency that the electrodes are arranged convergent as hereinbefore described. It will be understood that the electrodes 6 are composed of bars of carbon or other suitable material having good conducting qualities and that the current supplied to said electrodes will be conducted to the extreme ends thereof practically as readily as to points intermediate said ends. The forward ends of said electrodes adjacent the opening 5 being arranged closer to each other than the portion of said electrodes at the rear of said heating chamber, the current will have a tendency to seek the shortest path from electrode to electrode through the heating body at the forward or front side of the heating chamber. It will be understood that from front to rear the heating body will conduct the current with a certain degree of uniformity but that by reason of the convergent position of the electrodes a sufficiently greater amount of the current will pass between the forward ends of the electrodes to increase the heating power adjacent the opening 5 and thus counter-act the cooling effect of said opening just mentioned. It will thus be seen that by the arrangement of the electrodes in such position with reference to the heating body as to cause the shortest path from electrode to electrode to lie adjacent the upper surface of the heating body and by arranging the electrodes convergent at their forward ends adjacent the opening in the furnace wall an even distribution of heat will be produced at the point most advantageous in use.

It will be understood that by varying the degree of convergence of the electrodes 6 the temperature of the forward portion of the heating body may be increased as desired. It may be desirable to have the portion of said body adjacent the opening 5 at an even greater temperature than the remainder of the body because of the fact that in forging it is often desirable to use long bars of metal from which short pieces of the heated end only are used for the forming of the articles desired. As each small portion is cut from said bar and the bar returned to the furnace for heating, the extreme end of the bar from which said small portion has been cut will be of a higher temperature than the portion of the bar intermediate said extreme end and the end of the bar extending outside of the furnace. In order to heat the next small portion to be used to a uniform temperature in a short length of time it may therefore be desirable to have the forward side of the heating body adjacent the opening 5 at a higher temperature as just above described.

It should be noted that by reason of the increase of cross-section of the body of resistance material adjacent the electrodes 6 and by reason of the comparatively large surface of contact between said electrodes and said resistance material the ends of said body of resistance material will remain at a low temperature as compared with the heating body, thus avoiding the rapid wear or oxidation of the electrodes as well as the rapid burning out of the resistance material at the ends of the heating chamber where it is not difficult to properly arrange said material or to replenish the same during the operation of the furnace.

Arranged in the circuit of the wires 9 is a current regulator 10 which may be of any of the well known forms of current regulators to regulate the amount and intensity of the current supplied to the electrodes 6, thus providing a ready means of controlling the temperature of the heating body. The

details of construction of the current regulator or controller are not claimed in this application and the same is therefore shown diagrammatically.

I claim:—

1. An electric furnace comprising walls of non-conducting, heat resisting material, said walls arranged to form a heating chamber and provided with an opening constituting a means of access to said heating chamber, spaced electrodes extending across said heating chamber and arranged in a convergent position, the said electrodes being nearer to each other adjacent said opening than at other points in said chamber, and granular resistance material located in the heating chamber and in contact with said electrodes.

2. An electric furnace comprising walls of non-conducting, heat resisting material, said walls arranged to form a heating chamber and provided with an opening constituting a means of access to said heating chamber, spaced electrodes extending across said heating chamber and arranged in a convergent position, the said electrodes being nearer to each other adjacent said opening than at other points in said chamber, and resistance material located in the heating chamber and in contact with said electrodes.

3. An electric furnace comprising walls of non-conducting, heat resisting material, said walls arranged to form a heating chamber and provided with an opening constituting a means of access to said heating chamber, spaced electrodes extending across said heating chamber and arranged in a convergent position, the said electrodes being nearer to each other adjacent said opening than at other points in said chamber, granular resistance material located in the heating chamber and in contact with said electrodes, and the portion of said resistance material adjacent said electrodes of relatively great cross-section and the portion intermediate said electrodes being of relatively small cross-section.

4. An electric furnace comprising walls arranged to form a heating chamber, said walls provided with an opening constituting a means of access to said chamber, a body of resistance material located in said heating chamber and having an upper general surface, spaced electrodes in contact with said resistance material and so located with reference thereto that the electrical pathway of least resistance between said electrodes will lie in that portion of said resistance material adjacent the said top surface.

5. An electric furnace comprising walls arranged to form a heating chamber, said walls provided with an opening constituting a means of access to said chamber, a body of resistance material located in said heating chamber, spaced electrodes in contact with said resistance material and extending for a distance across the same, said electrodes so located with reference to each other that the path-way of the electric current from electrode to electrode through said resistance material will be shorter in one portion of the body of material than in another portion thereof.

6. An electric furnace comprising walls arranged to form a heating chamber, said walls provided with an opening constituting a means of access to said chamber, a body of resistance material located in said heating chamber, spaced electrodes extending across said heating chamber and in contact with said resistance material, and said electrodes arranged closer to each other adjacent said opening than at other points within said chamber.

7. An electric furnace comprising walls arranged to form a heating chamber, said walls provided with an opening constituting a means of access to said chamber, a body of resistance material located in said heating chamber, spaced electrodes in contact with said resistance material, said electrodes located with reference to said resistance material closer to one of the surfaces of said material intermediate said electrodes than to the other surface thereof, whereby the pathway of the electric current from electrode to electrode through said material will be shorter through that portion of said material adjacent the first mentioned surface.

8. An electric furnace comprising walls arranged to form a heating chamber, said walls provided with an opening constituting a means of access to said chamber, a body of resistance material located in said heating chamber, spaced electrodes extending across said heating chamber and arranged in convergent position toward said opening, said resistance material banked around said electrodes, the portions of said material adjacent the electrodes being of relatively great cross-section, the portion of said resistance material intermediate said electrodes of less cross-section and constituting a heating body, the said electrodes located nearer to the plane of one surface of said heating body than to the plane of the other surface thereof, whereby the shortest path from electrode to electrode through said heating body will lie adjacent the first mentioned surface.

9. In a device of the character described a body of resistance material, spaced electrodes in contact with said resistance material and extending for a distance across said body, said electrodes so located with reference to each other that the pathway of the electric current from electrode to electrode through said resistance body will be shorter in one portion of said body than in another portion thereof.

10. In a device of the character described a body of resistance material, spaced electrodes in contact with said body, said electrodes located with reference to said body closer to one of the surfaces of said body intermediate said electrodes than to the other surfaces of said material intermediate said electrodes, whereby the pathway of an electric current from electrode to electrode through said body will be shorter through that portion of said body adjacent the first mentioned surface.

11. In a device of the character described a body of resistance material, spaced electrodes in contact with said body, extending across the same, and arranged in convergent position, said resistance material banked around said electrodes, the portions of said material adjacent the electrodes being of relatively great cross-section, the portion of said resistance material intermediate said electrodes of less cross-section and constituting a heating body, the said electrodes located nearer to the place of one surface of said heating body than to the plane of the other surface thereof.

12. A device of the character described comprising a furnace having walls of non-conducting, heat resisting material, said walls arranged to form a heating chamber and provided with an opening constituting a means of access to said heating chamber, spaced electrodes extending across said heating chamber and arranged in a convergent position, the said electrodes being nearer to each other adjacent said opening than at other points in said chamber, granular resistance material located in the heating chamber and in contact with said electrodes, means for supplying an electric current, means for controlling said electric current, said supplying means, said controlling means, said electrodes and said resistance body being arranged in circuit.

In testimony that I claim the above, I have hereunto subscribed my name in the presence of two witnesses.

THADDEUS F. BAILY.

Witnesses:
WILLIAM H. MILLER,
IRENE LUTZ.