J. THOMSON.

ELECTRIC FURNACE.

APPLICATION FILED SEPT. 1, 1909.

950,882. Patented Mar. 1. 1910.

Fig. 1.

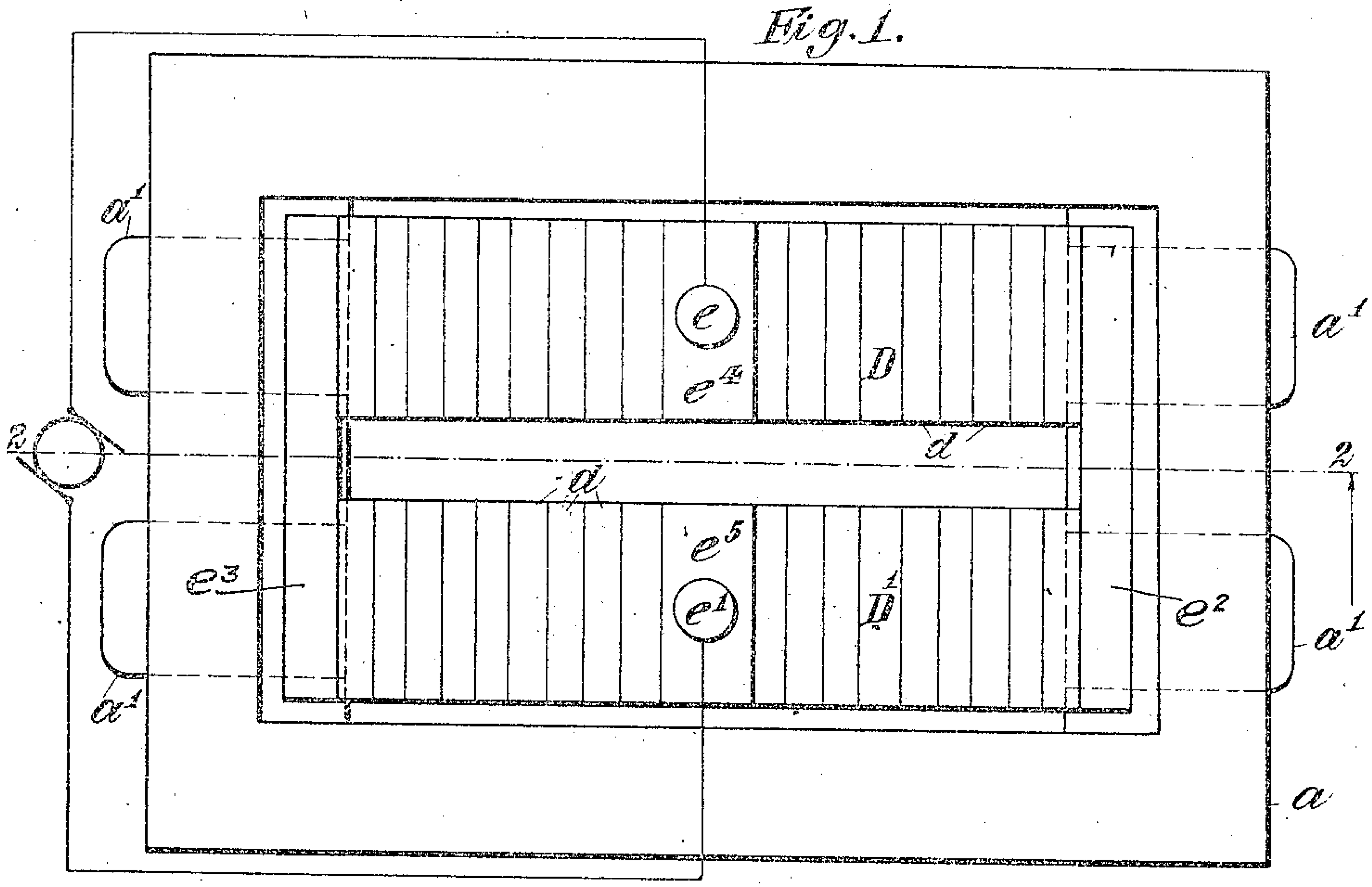
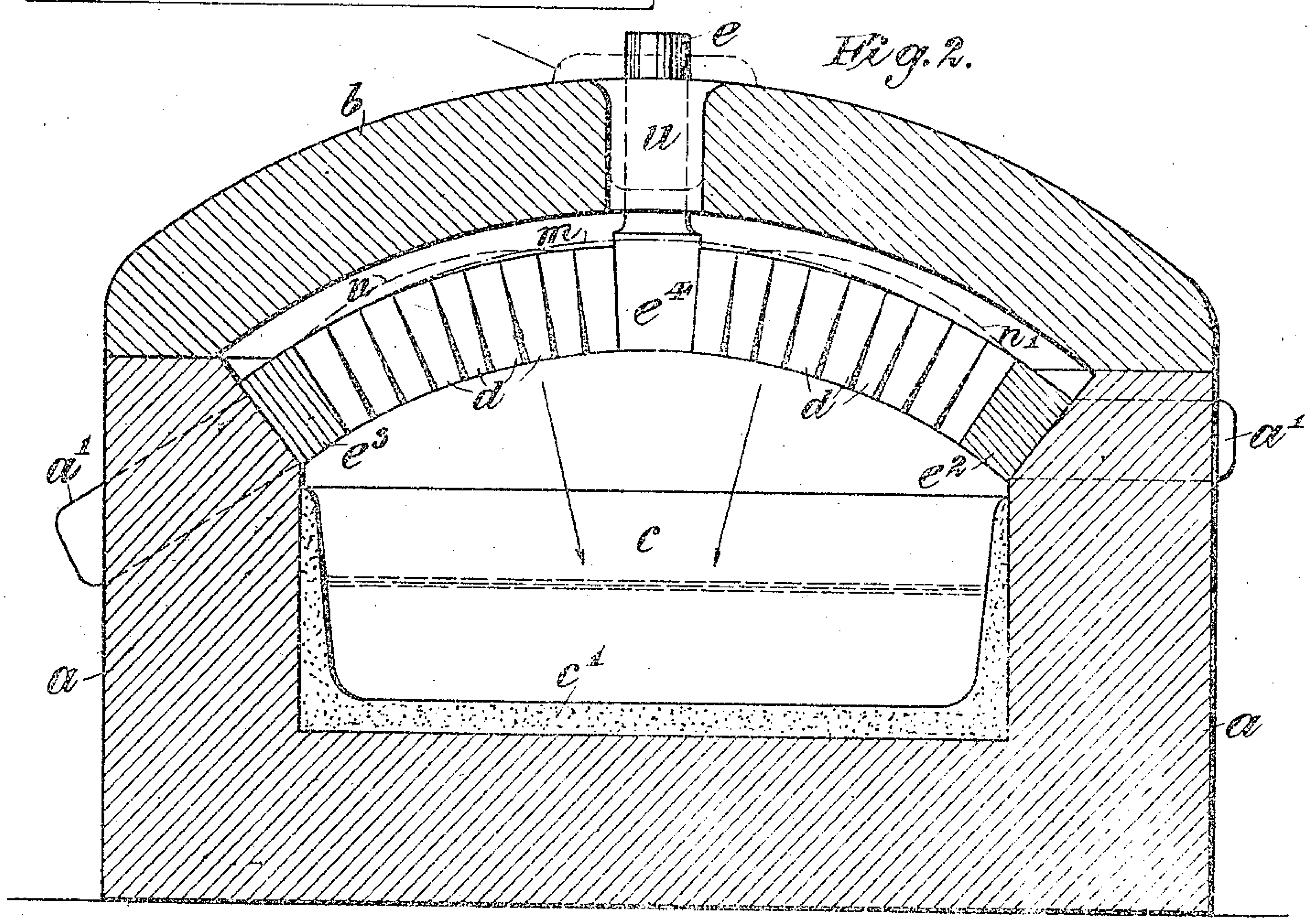


Fig. 2.



Witnesses

Inventor,

John Thomson

By his Attorneys

UNITED STATES PATENT OFFICE.

JOHN THOMSON, OF NEW YORK, N. Y., ASSIGNOR TO IMBERT PROCESS COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

ELECTRIC FURNACE.

950,882. Specification of Letters Patent. Patented Mar. 1, 1910.

Application filed September 1, 1909. Serial No. 515,702.

To all whom it may concern:

Be it known that I, JOHN THOMSON, a citizen of the United States, and a resident of the borough of Manhattan of the city of New York, in the county and State of New York, have invented certain new and useful Improvements in Electric Furnaces, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

In electric furnaces, in which the thermal element is a resister formed of regularly shaped pieces, such as carbon blocks, it often happens that the resister will undergo a deformation when it becomes highly heated by the current, such deformation destroying the uniformity of contact between the several elements of the resister and thus varying the current density between different portions of the resister, and obviously destroying the uniform development and radiation of heat from the resister as a whole. This is particularly so when the thermal element consists of an arched resister, for in such a case the arch when heated will rise along its crown, and if the faces of the blocks or members constituting the arch are primarily in uniform contact, they will open up at the upper surface of the arch, upon becoming heated, and the current will be confined, under such circumstances, to the lower or under surface of the arch.

The object of the present invention is to provide means, either automatic or manual, for compensating the deformation which takes place in an electric resister, under the conditions referred to, whether the resister be built in the form of an arch or in some other form in which a deformation is liable to take place due to thermal changes.

Referring to the drawings,—Figure 1 is a top plan view, with the cover removed, of an electric furnace embodying the invention, and Fig. 2 is a longitudinal central section, the sectional plane being indicated by the line 2—2 in Fig. 1.

In the present case, to illustrate the application of the invention, a double arch resister D, D′, is shown spanning the melting chamber c, the latter being formed by the brick-work a, inclosed by the cover b, and having a lining c' and a charging opening u. The resister arches are supported in each case by the radial or face contact of their extremities.

Now, if the elements or members constituting the arches were regularly formed prismatic blocks in uniform contact with each other and if the ends of the arches rested upon unyielding supports, then the arches would become deformed or distorted by rising along their crowns, when sufficiently heated, with the result that the blocks or elements of the resister would separate along the top surface thereof. Moreover, as in any such form of arch, the lineal length along its upper surface is greater than that along its inner surface, the current density, when such arch is used as a resister, even under good normal conditions of construction, will primarily be the greater at the inner surface; and this condition will be augmented in the ratio of the deformation of the arch and separation of the contacts. And obviously, when a given section of carbon is required to safely carry a given quantity of energy in a given period of time, such a structure does not meet the requirements in that its transmitting section is a maximum at low temperature and a minimum at high.

To obviate the foregoing objection, the members d constituting the arches are formed so that when primarily set, the lower portions of their faces will not be in physical contact, as shown in Fig. 2. The consequence of this is that when the arch is heated, and expands and rises, say as indicated by the broken line m, the lower portions of the blocks d will be forced into physical contact and the entire mass of the resister will be in approximate balance electrically.

The required amount of clearance between the lower portions of the faces of the blocks can be easily determined where any standard manufacture of amorphous carbon is used, whose average coefficient of expansion and contraction within given temperatures has been ascertained with sufficient accuracy; or, in any event, the required amount of clearance can be sufficiently approximated by practical demonstration.

In the foregoing, the arch or arches have been considered as being entirely free at their crowns and supported upon unyielding terminals or other pieces. In the drawings, however, the two arches are shown to constitute a compound resister the ends of which rest upon connectors e^2 and e^3, the latter being supported by the brick-work of the furnace. The terminals e and e' have inner arch-block sections e^4 and e^5, which may be considered as the keystones of the arches respectively. In this wise, the deformation is more uniformly distributed over a greater portion of the areas (note the broken lines n, n') than if the centers were free. Moreover, this affords additional means of compensation, as by slightly withdrawing the keystone terminals; and the latter may also be utilized for forcing the members of the resister together.

The distortion of the arch may be further compensated for by resting the connectors e^2 and e^3 against suitable refractories a', extending out through the brick-work to be manipulated by an operator or to yield against a resilient resistance (not shown).

It will be understood from the foregoing description how the invention may be embodied in other forms of electric furnaces, and it is to be particularly noted that the improvements are not limited to the specific form of resister shown herein.

I claim as my invention:

1. A resister for an electric furnace comprising a plurality of blocks with their faces normally only partially in contact and so constructed and arranged that upon deformation under heat the area of contact between the blocks will increase.

2. In an electric furnace, a curved resister composed of a plurality of members, the lower portions of their side faces being primarily out of contact with each other.

3. In an electric furnace, a curved resister composed of a plurality of members, the lower portions of their side faces being primarily out of contact with each other and brought into physical contact by thermal deformation of the resister.

4. An electric furnace having a curved resister, conducting pieces upon which its ends are supported, and adjustable refractories extending to the exterior of the furnace upon which said pieces rest.

5. An electric furnace having a curved resister the elements of which are blocks narrower at one end than at the other and which blocks are arranged so that the opposing faces at the narrower ends are out of contact with each other.

This specification signed and witnessed this 31st day of August, A. D., 1909.

JOHN THOMSON.

Signed in the presence of—
M. ROLLINS,
G. McGRANN.