

Aug. 14, 1923.

1,464,496

C. A. CADWELL

ELECTRIC FURNACE

Filed April 29, 1920

2 Sheets-Sheet 1.

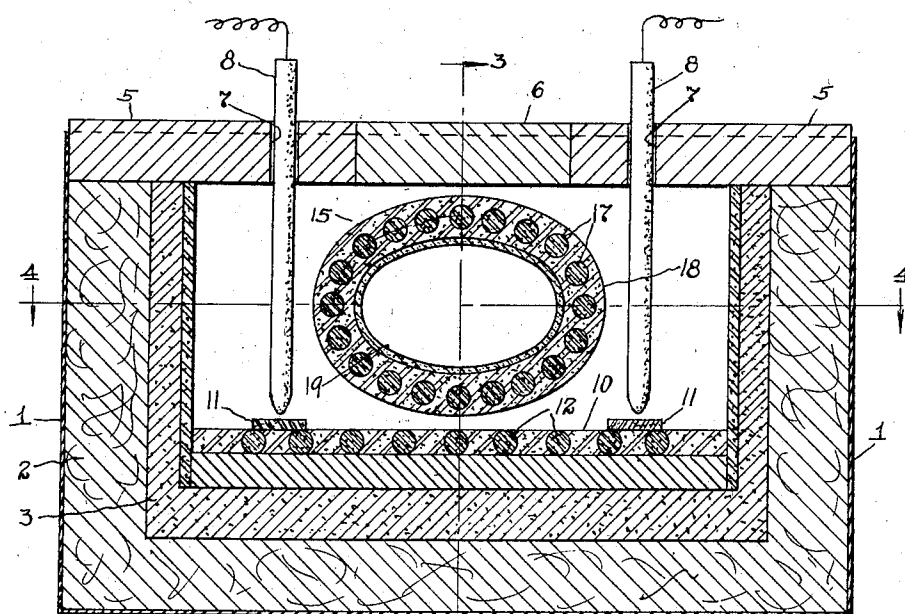


Fig. 2

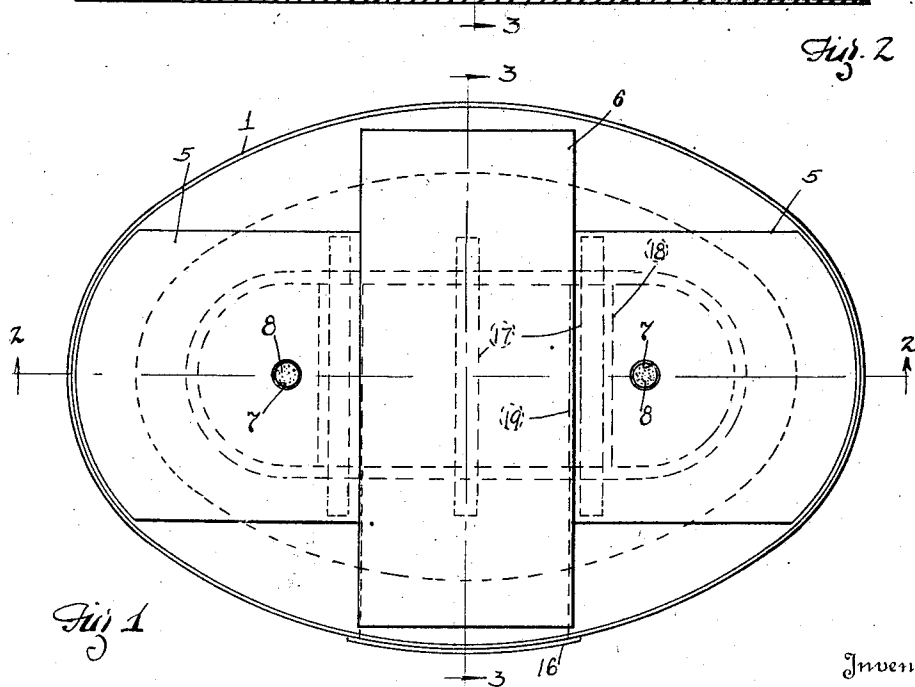


Fig. 1

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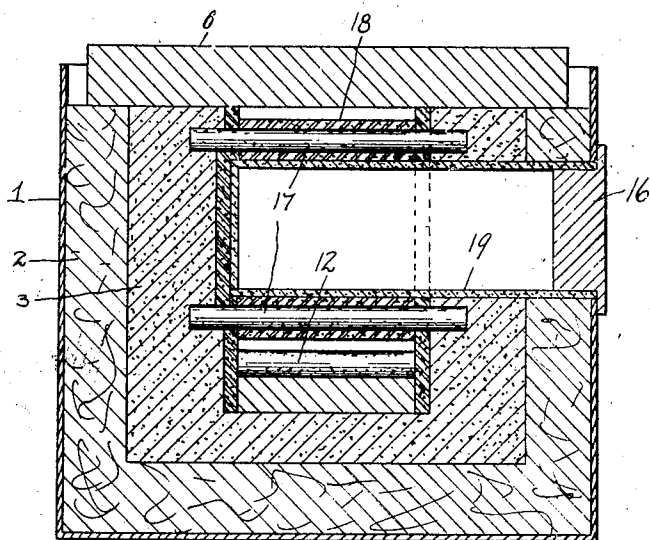


Fig. 3

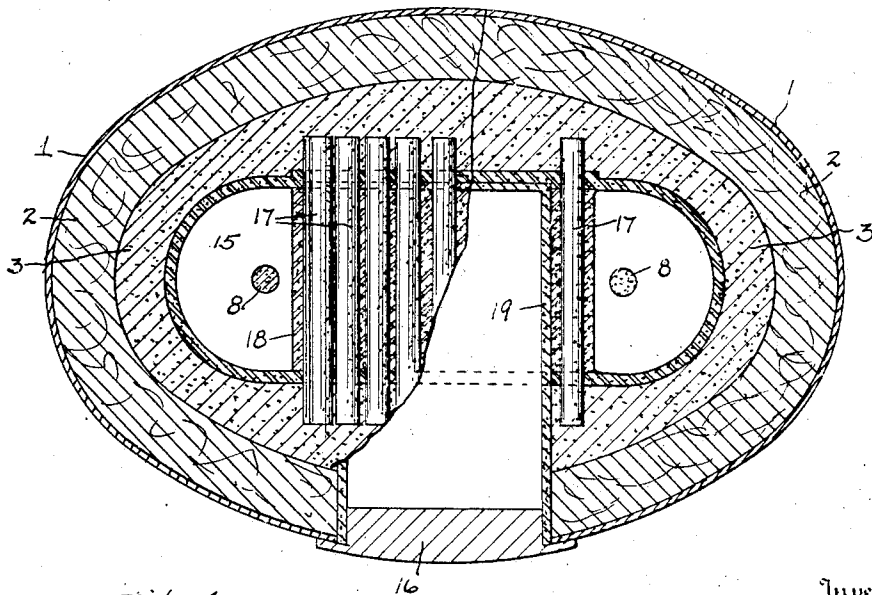


Fig. 4-

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UNITED STATES PATENT OFFICE.

CHARLES A. CADWELL, OF CLEVELAND, OHIO, ASSIGNOR TO THE ELECTRIC RAILWAY IMPROVEMENT COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

ELECTRIC FURNACE.

Application filed April 29, 1920. Serial No. 377,431.

To all whom it may concern:

Be it known that I, CHARLES A. CADWELL, a citizen of the United States, and a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Electric Furnaces, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

The present improved furnace belongs to the type wherein a resistor is employed in conjunction with a plurality of electrodes so disposed relatively to such resistor that arcs are formed from one electrode to such resistor and from the latter to the other electrode. The object of the present invention is to adapt a furnace of this type for use as a muffle or reheating furnace by providing a suitable chamber in the heated zone in which various articles requiring to be exposed to a high temperature may be placed. To the accomplishment of the foregoing and related ends, said invention, then consists of the means hereinafter fully described and particularly pointed out in the claims.

The annexed drawings and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings:—

Fig. 1 is a plan view of a furnace embodying my present improvements; Fig. 2 is a vertical longitudinal section thereof taken on the plane indicated by the line 2—2, Fig. 1; Fig. 3 is a transverse section taken on the plane indicated by line 3—3, Figs. 1 and 2; and Fig. 4 is a plan view of the interior of the furnace with a portion shown in section, in order to more clearly illustrate the construction thereof.

As best shown in the sectional views of Figs. 2 and 3, the furnace comprises an outer casing 1, preferably of sheet metal and of any desired shape and size, although a convenient shape is the elliptical one shown. The sides and bottom of this casing are interiorly lined, first, with a layer 2 of suitable heat insulating material such as infusorial earth, then a second layer 3 of silica. Resting on the side walls of the chamber, but preferably contained within the upper

edge of casing 1, is a suitable cover, which consists as shown, of a plurality of spaced blocks or heavy plates 5 that cover the respective end portions of the furnace chamber, the intermediate opening being closed by means of a third block or plate 6, similarly resting on such side walls and removable when desired, in order to afford access to the interior of the chamber.

Each of said blocks 5 is formed with an aperture 7 through which a carbon electrode 8 is inserted so as to project downwardly with its lower end in contact or close proximity, as desired, with the resistor 10. Any suitable holding means may be provided thus to retain said electrodes in adjusted position, such as shown, for example, in Patent No. 1,290,902 issued to me under date of Jan. 14, 1919. The resistor 10 is principally made up of a substantial layer of material, preferably granular carbon or some similar conducting material of relatively high resistance. The current accordingly, in passing lengthwise through the bed of material composing the resistor, generates heat, due to the resistance encountered, and thus supplements the heating effect of the arcs between the respective electrodes 8 and such resistor. As a matter of fact, blocks 11 of solid carbon or graphite are placed on top of the bed of granular material, thus composing the resistor, directly beneath such electrodes, and it is between the latter and such blocks that the arcs will be formed, such blocks being preferably opposed to the electrodes in order more exactly to define or limit the lowermost positions of the latter.

The resistor also includes in its structure a plurality of cylindrical carbon rods or pencils 12 as shown in Fig. 2, such pencils being disposed transversely of the longitudinal axis of the furnace, or, in other words, transversely of a line passing through the electrodes 8. The function subserved by these pencils is to present a path of least resistance to the flow of current from the one electrode to the other through the resistor that will be spaced from the floor of the furnace chamber proper. This feature of construction, however, forms no part of the present invention, being more fully described and claimed in my co-pending application filed April 29, 1920, Serial No. 377,430.

In other words, the feature of construc-

tion of principal interest in the present furnace is the muffle chamber 15 in which, as previously indicated, the articles or objects to be heated are placed. Chamber 15, as best shown in Fig. 2, is of general elliptical cross-section and extends transversely of the furnace chamber proper between the two electrodes 8, its respective side walls just clearing the latter, and its bottom and top similarly just clearing the resistor 10 and the cover of the furnace chamber. The respective ends of said chamber are imbedded in the side walls of the furnace chamber 1, one such end being closed by the corresponding wall and the other extending through so as to provide an external opening, in order to permit access to the interior of such chamber 15. Such open end is provided with a removable plug 16 that serves as a door, and obviously, if desired, the other end of the chamber 15 may be extended through the furnace wall and be provided with a similar plug so as to permit access from both ends. The walls of chamber 15 are preferably of composite construction, consisting of a plurality of carbon reinforcing rods 17 plastered over, so as to be completely imbedded on all sides, with a layer 18 of carborundum. In addition, the interior of the chamber may be lined with a coating 19 of alundum cement or other highly resistant coating that will withstand exposure to the air, as well as the wear incident to the purpose for which the muffle is used. As shown in Figs. 3 and 4, the carbon rods or pencils 17 are the only parts of the muffle chamber that extend into the side walls of the furnace chamber proper, said rods thus constituting the means of support for the muffle chamber and reinforcing the latter so as to prevent sagging and cracking under the intense heat to which it is subjected.

In operation, assuming the electrodes 8 to be connected in an electric circuit of proper voltage and amperage, said electrodes are adjusted to cause an arc to form between the respective lower ends thereof and the plates 11. The heat of said arcs will obviously be directed inwardly towards the side walls of the muffle chamber 15, while the heat developed by the passage of the current through the resistor 10 will similarly be directed against the under wall of said chamber. The end walls of the furnace chamber, as well as the cover thereof, will reflect and radiate heat onto the sides and top of the muffle chamber so as to more or less uniformly heat the latter throughout its entire circumference. The elliptical shape of such muffle furnace, in other words, is designed to utilize the heat from these several sources within the furnace chamber to best advantage.

Other modes of applying the principle of

my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. In an electric furnace, the combination of an elongate furnace chamber; electrodes extending downwardly into such chamber one at each end; a resistor within said chamber lying on the floor thereof between said electrodes; and a muffle chamber supported at its ends in the respective side walls of said furnace chamber so as to lie over said resistor and between said electrodes.

2. In an electric furnace, the combination of an elongate furnace chamber; electrodes extending downwardly into such chamber one at each end; a resistor within said chamber lying on the floor thereof between said electrodes; and a muffle chamber supported at its ends in the respective side walls of said furnace chamber so as to lie over said resistor and between said electrodes, said muffle chamber being of curved cross-section.

3. In an electric furnace, the combination of an elongate furnace chamber; electrodes extending downwardly into such chamber one at each end; a resistor within said chamber lying on the floor thereof between said electrodes; and a muffle chamber supported at its ends in the respective side walls of said furnace chamber so as to lie over said resistor and between said electrodes, said muffle chamber being elliptical in cross-section.

4. In an electric furnace, the combination of an elongate furnace chamber; electrodes extending downwardly into such chamber one at each end; a resistor within said chamber lying on the floor thereof between said electrodes; and a muffle chamber supported at its ends in the respective side walls of said furnace chamber so as to lie over said resistor and between said electrodes, said muffle chamber being composed of a plurality of carbon rods plastered over with a layer of suitable heat-resistant material.

5. In an electric furnace, the combination of an elongate furnace chamber; electrodes extending downwardly into such chamber one at each end; a resistor within said chamber lying on the floor thereof between said electrodes; and a muffle chamber supported at its ends in the respective side walls of said furnace chamber so as to lie over said resistor and between said electrodes, said muffle chamber being composed of a plurality of carbon rods plastered over with a layer of carborundum.

6. In an electric furnace, the combination of an elongate furnace chamber; electrodes

extending downwardly into such chamber one at each end; a resistor within said chamber lying on the floor thereof between said electrodes; and a muffle chamber supported
5 at its ends in the respective side walls of said furnace chamber so as to lie over said resistor and between said electrodes, said muffle chamber being composed of a plurality of carbon rods plastered over with a layer of carborundum and being lined with wear- 10
resistant material not affected by contact with the air.

Signed by me this 24 day of April, 1920.

CHARLES A. CADWELL.