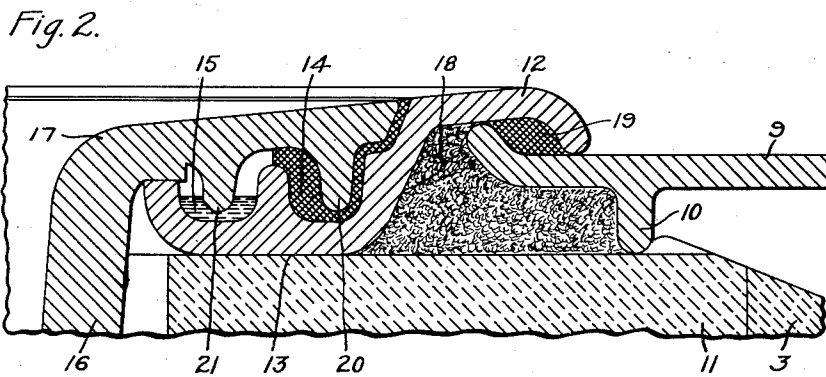
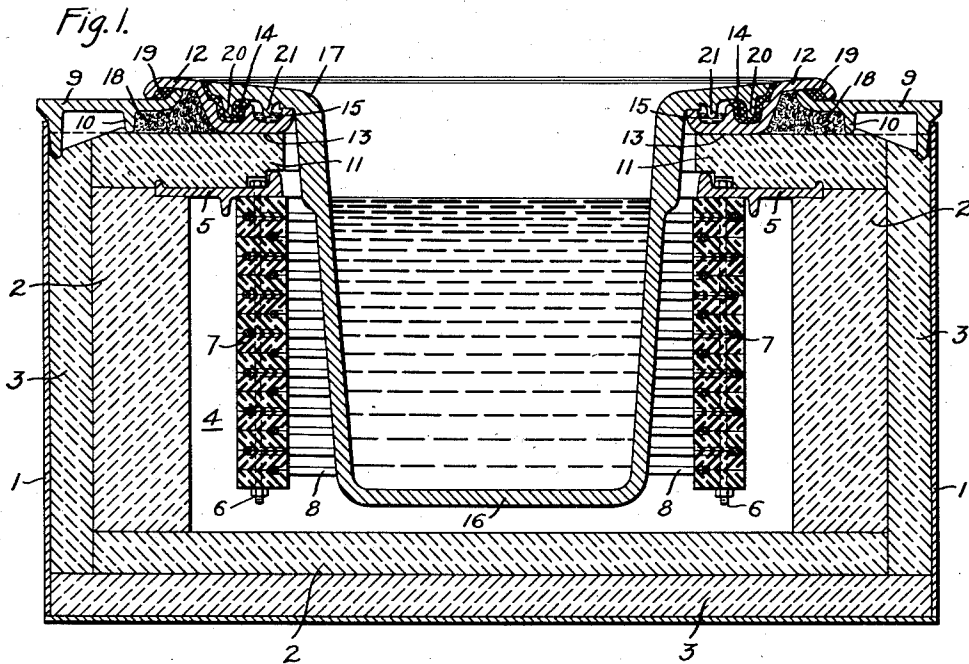


April 2, 1929.

J. C. WOODSON
HEAT TREATING FURNACE
Filed Feb. 14, 1928

1,707,294



INVENTOR
James C. Woodson.

BY
Wesley C. Barr
ATTORNEY

UNITED STATES PATENT OFFICE.

JAMES C. WOODSON, OF MANSFIELD, OHIO, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

HEAT-TREATING FURNACE.

Application filed February 14, 1928. Serial No. 254,205.

My invention relates to furnaces and more particularly to electrically heated heat-treating furnaces of the pot type.

In furnaces of the above-mentioned type, a crucible is suspended in a heating chamber by engagement of the rim portion thereof with the side walls of the chamber, an electrical heating element is disposed within the chamber to effect the heating thereof, and a bath comprising a fused salt, usually a cyanide, constituting the heating medium is contained in the crucible.

The fused salt, tends to creep, responsive to capillary attraction, over and beyond the rim of the crucible and over adjacent furnace parts. The action of the fused salt in this respect is similar to that of hot oil, and the creepage continues until the temperature of the salt is sufficiently reduced to effect the solidification thereof.

The fused salt, particularly in the case of a salt containing cyanide, has a marked deleterious effect upon the outer surface of the crucible, adjacent refractory furnace parts, and the electrical heating element, resulting in the corrosion and subsequent failure thereof.

It is an object of the present invention, therefore, to provide, in a heat-treating furnace, an improved construction whereby the creeping action of the salt beyond the rim of the crucible and into the furnace chamber is substantially prevented.

In practicing my invention, I provide a crucible operatively supported at the rim portion thereof in a heating chamber, and cooperating means between the crucible rim and supporting structure for preventing the passage of the molten salt therebetween.

In the drawing,

Figure 1 is a view, in vertical section, of a heat-treating furnace embodying my invention, and

Fig. 2 is an enlarged view, in section of the sealing means constituting my invention, portions of the furnace and crucible being broken away.

Referring more particularly to the drawing, the furnace embodying my invention comprises a metallic casing 1 and a plurality of layers of refractory heat-insulating material 2 and 3, disposed therein, defining a cylindrical heating chamber 4.

An annular plate 5 of suitable refractory metallic material is supported upon the upper face of the side wall portion 2, and is adapted to support, in spaced relation, a plurality of depending bolts 6. A plurality of blocks 7 of refractory electric-insulating material, provided with aligned apertures, are adapted to be maintained in operative superposed relation on the bolts 6. The cooperating faces of the blocks 7 are laterally grooved to receive the convolutions of an electrical resistance element 8, which is wound in the form of a double helix, coaxial with the axis of the heating chamber.

Since the structure above described constitutes no part of the present invention, a more detailed description thereof is not deemed necessary.

An annular cast-metallic plate 9 is operatively supported by engagement with the upper peripheral edge of the furnace casing 1, and is provided with depending portions adapted to rest upon an annular refractory block 11, constituting a portion of the refractory wall of the furnace. The inner periphery of the plate 9 is provided with an upwardly extending bead which cooperates with a downwardly extending bead formed on the outer periphery of a second cast metallic plate 12.

The plate 12, as shown more particularly in Fig. 2, is cast to provide a horizontally extending portion 13, adapted to rest upon the refractory block 11, and having, in the upper face thereof, a pair of parallel annular channels 14 and 15 adapted to be filled with a suitable sealing material, as herein-after described.

A crucible 16 of suitable heat resisting material is provided with an out-turned rim 17 adapted to cooperate with the inner peripheral edge of the horizontally extending portion 13 of the plate 12, to support the crucible in operative position. As shown more particularly in Fig. 2, the point of engagement between the crucible rim and the periphery of the portion 13 is such that relative expansion therebetween is permitted.

A suitable heat insulating material 18, such as asbestos packing, is disposed between the plates 9 and 12 and the refractory block 11, and a suitable heat resistant cement

19 substantially fills the space between the cooperating beads on the plates 9 and 12.

On the under surface of the crucible rim 17 are provided a pair of depending annular flanges 20 and 21, cast integral therewith, which are adapted to depend into the channels 14 and 15, respectively.

The channel 14 is substantially filled with a heat-resistant cement, similar to the cement 19, constituting a relatively close joint between the periphery of the rim and the plate 12.

In the channel 15 is disposed a liquid which is adapted to chemically react with the fused salt, which may creep therein, to alter the physical and chemical characteristics of said salt, to prevent the further creepage thereof.

It is within the contemplation of my invention to provide a material in the channel 15 which will either chemically react with the creeping salt to form a slag, which will not fuse at the operating temperature of the furnace parts, or to effectively chemically neutralize the salt. The material may be either a liquid or a fusible salt adapted to be maintained in a fused condition at the operating temperature of the adjacent furnace parts.

Although the mechanical bond between the rim 17 and the plate 12 is substantially liquid-tight when constructed, there will be a tendency for the cement therebetween to crack responsive to the relative expansion between the crucible rim and plate 12, so that upon continued operation of the furnace a small amount of the fused salt will creep therethrough into the channel 15, and come in contact with the liquid disposed therein.

When a sufficient amount of the creeping salt has passed into the channel 15 either to exhaust the supply of material therein or to substantially fill the space between the plates 17 and 12, any additional salt will tend to flow between the point of support of the crucible rim 17 upon the inner periphery of the plate 12. When this condition obtains, the crucible must be removed and the materials in the channels 14 and 15 must be renewed.

In furnaces of the above type wherein a fused salt is employed as the heating medium, the action and the creeping thereof, responsive to capillary attraction, into the heating chamber will occur even though the joint between the crucible and supporting structure is substantially mechanically perfect. By my invention, however, I have provided means whereby the creeping salt must first pass through a mechanical seal or joint, and then through a liquid seal before it can enter the heating chamber of the furnace. The effect of my construction is to reduce to a minimum, by means of a me-

chanical seal, the amount of fused salt which may creep into the liquid seal, whereby the effectiveness of the liquid seal is materially increased.

Obviously, many changes may be made in the structure disclosed, depending upon the requirements of a particular installation, but it is within the scope of my invention to provide a combined mechanical and liquid seal so disposed in the path of creeping cyanide that the creeping thereof into the heating chamber is substantially prevented.

Modifications may be made in my invention without departing from the spirit and scope thereof, and I desire, therefore, that only such limitations shall be placed thereon as are disclosed by the prior art and imposed by the appended claims.

I claim as my invention:

1. In a heat-treating furnace, the combination with a crucible adapted to contain a fused salt liquid heating medium, of means constituting a combined liquid and mechanical seal for preventing the creeping of said medium over the outer surface of said crucible.

2. In a heat-treating furnace, the combination of a crucible adapted to contain a bath of fused material and means for supporting said crucible, of cooperating means between said crucible and support constituting a combined mechanical and liquid seal for preventing the creeping of said fused material therebetween.

3. In a heat-treating furnace, a crucible adapted to contain a fused salt, a peripheral rim on said crucible, a support engaging said rim, and cooperating means between said rim and support constituting a combined liquid and mechanical seal for preventing the creeping of said salt therebetween.

4. In a crucible adapted to contain a fused salt, means adjacent the rim of said crucible constituting a liquid seal for preventing the creeping of said salt over the outer surface of said crucible, and means for restricting the amount of salt creeping into said liquid seal.

5. In a heat-treating furnace embodying a crucible adapted to contain a fused salt, means adjacent to the rim of said crucible constituting a liquid seal for preventing creepage of said salt therethrough, comprising a liquid of a composition adapted to chemically react with said salt to alter the physical and chemical characteristics thereof, and means between the rim and the liquid seal for reducing the amount of salt creeping into the liquid seal.

6. In a heat-treating furnace comprising a crucible adapted to contain a fused liquid heating medium and means engaging the rim of said crucible to support the same in

a heating chamber, a plurality of annular channels in said supporting means beneath said crucible rim, annular depending flanges on said rim adapted to cooperate with said
5 channels, means in one of said channels constituting a mechanical seal in the path of creepage of said liquid, and means in an-

other of said channels for chemically reacting with said creeping liquid to alter the characteristics thereof.

In testimony whereof, I have hereunto
subscribed by name this 9th day of February, 1928.

JAMES C. WOODSON.

10