July 20, 1948. W. ROTH 2,445,457

POT FURNACE

Filed April 21, 1945

Fig. 1.

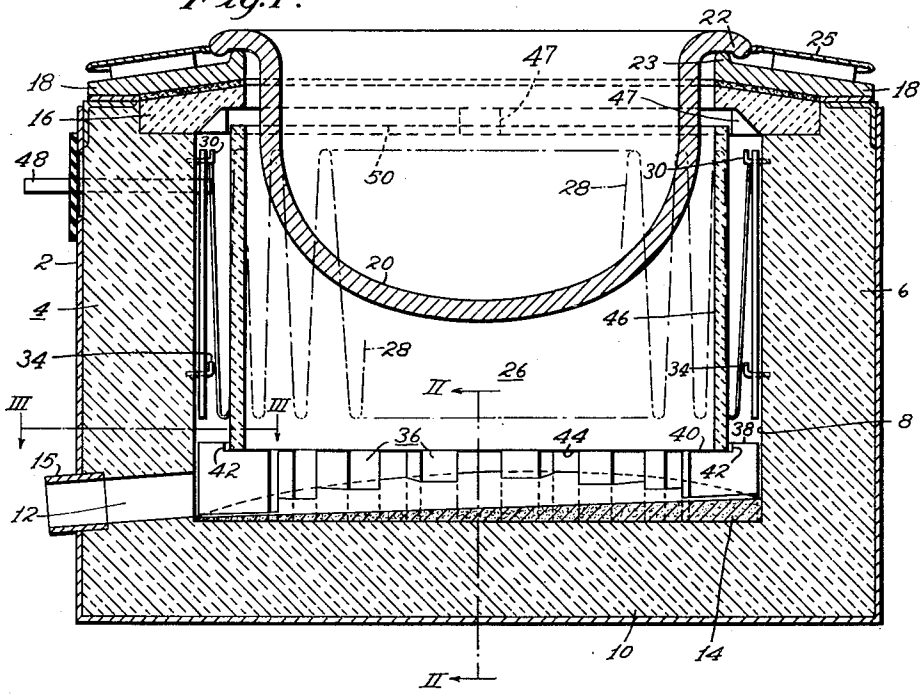


Fig. 2.

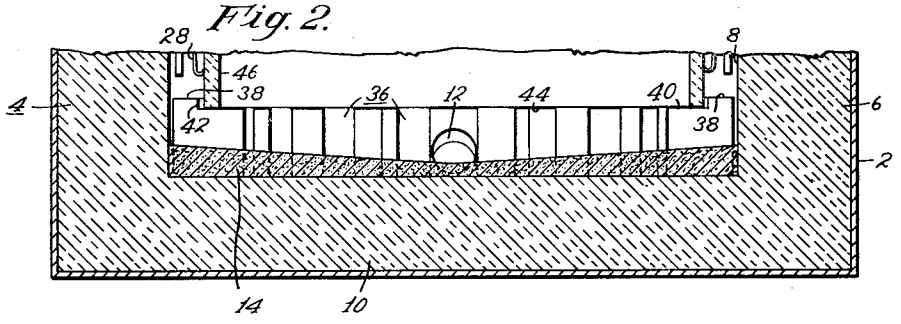
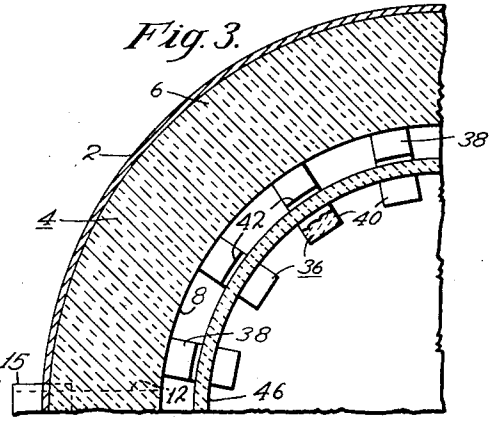


Fig. 3.



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POT FURNACE

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3 Claims. (Cl. 13—22)

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My invention relates broadly to pot-type furnaces having a pot or vessel in which a metal, or other substance, is kept molten and removed as needed from the open top of the vessel. A preferred form of my invention is directed to pot-type furnaces used extensively in die-casting with aluminum, aluminum alloys, or similar metals.

Such a furnace comprises an insulated hollow open-top structure which supports an open vessel so that its top is about on a level with the top of the furnace. Such vessels are commonly made of alloy cast-iron or a ceramic such as silicon carbide, and are heated by heating means inside the furnace. Iron vessels become corroded in time by the molten charge they contain, springing leaks or cracks through which the molten metal can pass; and ceramic vessels frequently break because of fragileness. These operational hazards have discouraged the use of electrical heating means which are usually sinuously-wound ribbons or strip of heat-resistant nickel and its alloys that are corrosively attacked or otherwise damaged by molten aluminum.

It is an object of my invention to provide a furnace of the type described which will not be harmed should any molten substance pass into its heating chamber in which the furnace heating means is disposed.

It is an important object of my invention to provide an electrically heated pot-type furnace for molten aluminum and other die-casting metals, having low-upkeep expense.

Other objects, features, innovations, details and methods of my invention will be discernible from the following description of a preferred form thereof, which is to be taken in conjunction with the accompanying drawing, in which:

Figure 1 is a vertical section centrally through a furnace embodying my invention;

Fig. 2 is a partial vertical sectional view of the bottom of the furnace, substantially at right-angles to Fig. 1; and

Fig. 3 is a sectional view, taken substantially on the line III—III of Fig. 1.

Referring to the drawing, the pot-type furnace comprises an outer metallic casing 2 around heat insulation and refractory-tile wall means 4 of such shape and arrangement as to provide an upstanding circular side wall 6, having a cylindrical inner surface 8, and a bottom wall 10. The bottom wall 10 is sloped downwardly to a drain-hole 12, the bottom of which is lower than the lowermost point of the top surface of the bottom wall 10. In order to facilitate drainage into the drain-hole, the top of the bottom wall comprises a cement layer 14 sloped to provide a central trough sloping downwardly to the drain-hole 12, as shown. The drain-hole 12 passes through the wall means and casing 2 and terminates in a spout 15.

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A furnace of the pot-type has a top opening in which a vessel is received; and, in the furnace shown, the top opening is defined by an upper circular refractory tile in the form of a ring 16. The ring may be either of one piece or several segmental pieces. Close to, and above, the ring 16 is a top casting for the furnace, comprising a metal ring 18, for removably supporting a vessel 20. The bottom of the vessel is semi-spherical and its top is provided with a peripheral downwardly-curved lip 22 which rests on an upwardly directed peripheral lip 23 on the ring 18. A safety and heat-shielding means in the form of a raised circular metal shield 25 is provided, carried by spaced supports on ring 18 so as to permit ventilation therebetween. The shield remains cool and prevents operators from coming in contact with the hot metal ring 18.

The wall means 4 defines a heating chamber 26 which is closed by the bottom side of the vessel 20. The circular refractory ring 16 extends inwardly beyond the inner surface 8 of the side wall 6, so as to be over electrical heating elements 28 supported in the heating chamber 26 by hanger-pins 30 supported at the top of the side wall 6. The electrical heating means is of the well-known type, comprising ribbons wound up and down, with return bends, and is hung close to the surface 8 of the side wall 6. Spacers 34 keep the turns of the heater ribbon separated.

The wall means also comprises a plurality of spaced tile-blocks 36 each of which has a stepped upper surface 33, forming a ledge 40 with an upright surface 42. The tile-blocks 36 are circularly arranged below the resistor ribbons 28, with their upright surfaces 42 inwardly thereof. The horizontal surfaces of the ledges are arranged in substantially the same plane for receiving a lower edge 44 of a hollow cylindrical protective wall 46 which extends upwardly above the top of the electrical heating resistor ribbons but stops short of the refractory ring 16. The shield encompasses most of the vessel 20 and serves as a barrier between the vessel and the electrical heating resistor ribbons. The protective wall 46 should be heat-resistant material, and a refractory such as silicon carbide has been found satisfactory. Spacing lugs 47 may be provided on the ring 16 for positioning the top of the protective wall 46.

In the operation of the furnace, electrical en-

ergy is supplied in any suitable manner to the electrical heating means **28**, a terminal **48** having been shown as a part of any suitable means for conducting electricity through the furnace walls; it being understood that as many terminals as may be desired can be used. The electrical heating means radiates heat for heating the protective wall **46** which, in turn, radiates heat to the vessel **20**. The vessel **20** is also heated by convection within the heating chamber **26** of the furnace, the convection currents flowing upwardly in the space between the protective wall **46** and inner surface **8** of the side wall **6**, around the top edge **50** of the protective wall **46**, downwardly within the protective wall and in contact with the exposed surface of the vessel **20**, around the portions of the lower edge **44** of the protective wall **46**, which span the spaces between the refractory-tile blocks **36**, and back into the space between the walls **6** and **46**.

The protective wall **46** introduces a resistance to heat-flow for directly heating the vessel by radiation from the electrical heating means so that it is desirable to use a two-zone temperature control having a temperature-responsive means, or thermocouple, within the bath or liquid inside the vessel, and another in proximity to the electrical heating means.

Should the vessel **20** become damaged for any reason, molten aluminum will fall to the bottom of the chamber **26**. However, the protective wall **46** will prevent the molten metal from spattering or otherwise contacting the metallic electrical heating resistor ribbons **28**. Instead the molten metal will flow downwardly along the trough of the bottom wall **10** and through the drain-hole **12**.

The drain-hole **12** is preferably open so as to permit observation of any leakage of metal from the vessel, and thus an indication can be obtained when the vessel begins to leak or is otherwise defective.

In a practical embodiment of my invention, the protective inner wall, equivalent to the wall **46**, was about 16 inches long and had an internal diameter of 24½ inches and wall thickness ¾ inch. This wall was inside a heating chamber of 29½ inches in diameter, and substantially symmetrically disposed with respect to a return-bend resistor ribbon 13 inches high.

While I have described my invention in a preferred form, it is obvious that it is subject to wide modification for incorporation into different embodiments utilizing the teachings of my invention and which come within the scope thereof.

I claim as my invention:

1. A pot-type furnace of a type described, comprising wall means including side and bottom walls defining a vessel-heating chamber, said furnace having a top opening for receiving a vessel

adapted to hold molten material, electrical heating means in said chamber, whereby to heat the vessel and its contents, said bottom wall sloping downwardly to a drain below said electrical heating means, and a protective refractory wall between said electrical heating means and the portion of said chamber for said vessel, said refractory wall being of less height than said chamber, and means for supporting said refractory wall so that convection currents can pass around its top and bottom edges.

2. A pot-type furnace of a type described, comprising wall means including a cylindrical side wall and a bottom wall, said wall means having an upper ring provided with a circular lip, a vessel inside said upper ring, having a circular upper lip adapted to rest on said ring-lip, electrical resistor heating means supported at said side wall along its inner surface, said vessel having a bottom portion below the top of said heating means, an upstanding hollow cylindrical non-metallic refractory tube having a solid wall between said vessel and said heating means, means for supporting said refractory tube so as to provide for convection around its upper and lower edges, said bottom wall being sloped downwardly to a drain passing through said furnace below said heating means.

3. A pot-furnace of a type described comprising a bottom wall and a side wall having a cylindrical inner surface, spaced blocks extending above said bottom wall, a hollow refractory tube having a solid wall carried by said spaced blocks in spaced relation to said side wall, said bottom wall sloping downwardly to a drain, and electrical heating means between said tubular refractory wall and said side wall.

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