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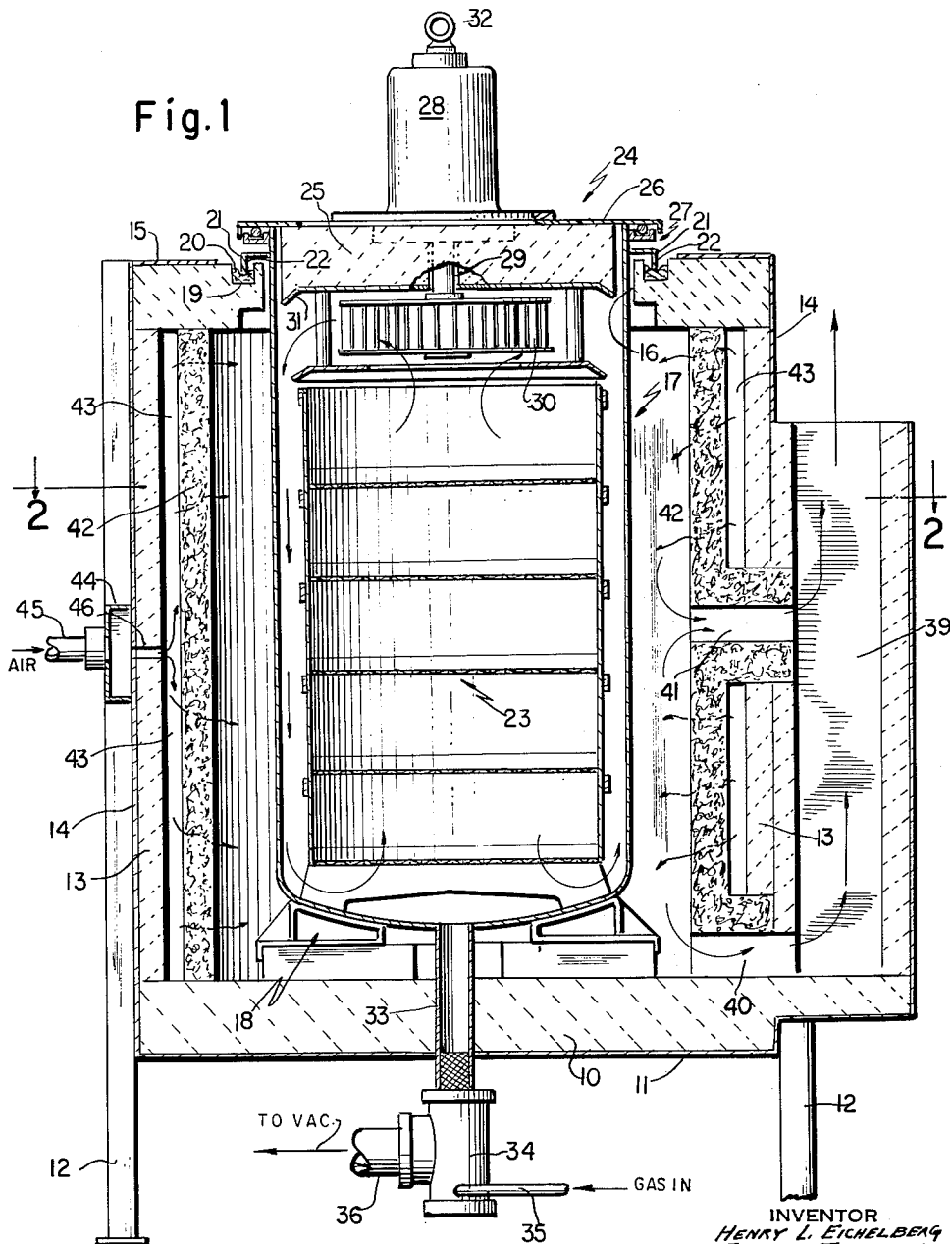
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3,198,503

FURNACE

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2 Sheets-Sheet 1



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Fig. 2

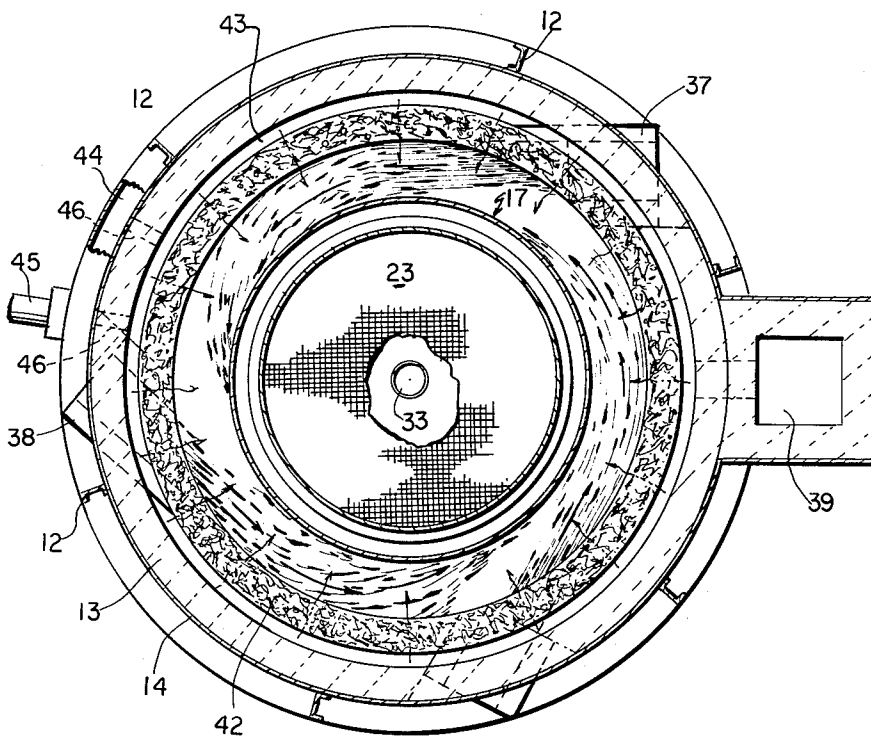
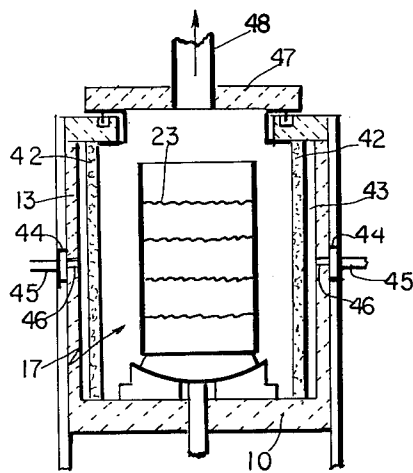


Fig. 3

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This invention relates to furnaces and particularly to a furnace having an improved cooling system.

Prior known closed furnaces where articles can be subjected to controlled or uncontrolled atmosphere during heat treating require an excessive time to cool, which is often unsatisfactory in many metallurgical processes.

The principal object of this invention is to provide a closed or open type furnace where articles can be heat treated in a controlled or uncontrolled atmosphere and wherein, when the heat is turned off, the furnace chamber thereof can be cooled rapidly and evenly throughout, without shock to the refractory lining thereof.

Another object of the invention is to provide such a furnace in which pressurized cooling air can be diffused through insulating refractory for cooling furnace work.

Still another object of the invention is to provide a closed type furnace in which a common stack is employed for the exhausting of heating gases as well as spent cooling air.

In one aspect of the invention, a closed furnace may comprise a base of fire brick or other heat insulating refractory material that is joined in gastight relation to side wall means of the same or similar material. The furnace may be provided with an annular top wall of insulating material, there being a large central hole there-through for receiving a retort having an open end for receiving parts to be heat treated, the chamber making an airtight seal with the furnace top wall.

In another aspect of the invention, a work supporting rack may be located within the retort, and a removable cover may be sealingly located on top of the open end thereof to close the same. There may be provided a circulating fan means integral with the cover to circulate the atmosphere within the retort over the parts being treated.

In still another aspect of the invention, a line may extend through the bottom of the furnace to the interior of the retort for supplying a controlled atmosphere thereto, and heating burners may be located tangential to the side wall means of the furnace and extending through said side wall means to the space within the furnace surrounding the retort.

In still another aspect of the invention, a separate refractory wall may be located within the furnace between the retort and the side wall means of the furnace in a manner to provide an annular sealed plenum chamber between the furnace side wall means and the retort.

In still another aspect of the invention, manifold means may be provided about the exterior of the furnace for supplying cooling air under pressure to the annular plenum between the furnace wall means and the separate refractory wall from where it diffuses through the latter wall to the space between it and the retort, from which space it exhausts through an exhaust stack.

In a still further aspect of the invention, where an open furnace is desired, the retort may be dispensed with and the cover for the furnace, instead of being gastight to the furnace, may omit the circulating means and in its place a stack may be provided.

The above, other objects and novel features of the furnace and cooling means therefor will become apparent from the following specification and accompanying drawings which are merely exemplary.

In the drawings:

FIG. 1 is a sectional elevational view of a closed furnace

to which the principles of the invention have been applied; FIG. 2 is a section taken substantially along line 2-2 of FIG. 1; and

FIG. 3 is a sectional elevational view of an open furnace to which the principles of the invention have been applied.

Referring to the drawings, and particularly to FIGS. 1 and 2, the principles of the invention have been shown as applied to a retort type of furnace including a base 10 made from a refractory material and including an outer sheet 11 of sheet metal or the like. The base 10 is shown as being supported by standards 12 at spaced intervals about the base. In the embodiment disclosed, the furnace is cylindrical in form and includes a side wall 13 of the same or similar material from which base 10 is made, and said side wall is encased in a sheet metal shell 14.

An annular top wall 15 of refractory material may provide an enlarged central hole 16 extending there-through. A sheet metal retort 17 may be located within the furnace chamber defined by walls 13, and it may be supported on a frame 18 mounted on the base 10 of the furnace. The top wall 15 may include a circular groove 19 at its inner peripheral edge containing a sealing medium 20 therein. The retort 17 may include a flange 21 about its upper portion that includes a depending skirt 22 which cooperates with the sealing medium 20 to provide a seal between the retort and the top wall 15.

The retort 17 may have rack means 23 therein for supporting work to be heat treated, and it may be arranged for the free and even circulation of the atmosphere within retort 17 over all of the parts therein. There may be a removable cover 24 provided for the retort 17. It may comprise a wall 25 of refractory material and a sheet metal plate 26 attached thereto, the latter cooperating with sealing means 27 attached to the top of the retort 17.

A motor 28 may be mounted on cover 24, and its output shaft 29 may extend through cover 24 to the interior of retort 17 where it has fixed to its end a circulating fan 30 having deflecting vanes 31 associated with it. A ring 32 may be fixed to motor 28 to facilitate removing it, cover 24 and fan 30 when it is desired to load or unload the rack means 23.

In order to provide a controlled atmosphere within the retort 17, a pipe 33 may extend from the bottom of retort 17 through the bottom wall 10 to a water-cooled fitting 34. The fitting 34 may be provided with an inlet line 35 for supplying the retort with a desired gas, such as nitrogen, etc., and an exhaust line 36 may also be provided for evacuating the retort 17.

Referring to FIG. 2, heating burners 37, 38 may be arranged at spaced intervals about the periphery of the side wall 13 and they may extend through wall 13 into the space adjacent retort 17, in a tangential fashion so as to give a swirling action to the hot gases that are directed into the furnace. A stack 39 may extend vertically along the wall 13 and may include inlet ports 40 and 41 leading from the interior of the furnace.

Referring again to FIG. 1, a wall 42 may be located within the furnace and spaced radially inwardly of the wall 13 so as to provide an annular plenum chamber 43 between it and wall 13. The wall 42 extends in sealed relation from the bottom wall 10 to the top wall 15. The wall 42 preferably is made from a porous refractory material such as K26 insulating bricks manufactured by Babcock and Wilcox. It has been found that such bricks that are 4½ inches thick have a permeability for air of 3,000 cubic feet per hour at a static pressure of about 16 inches of water. The same bricks, 9 inches thick, have a permeability for air of 1,000 cubic feet per hour at a static pressure of about 10.6 inches of water.

A manifold 44 surrounding the furnace may be sup-

plied with air under pressure from a line 45. Ports 46 may connect the manifold 44 to the plenum 43 between walls 13 and 42.

From the foregoing it is evident that when the heat is turned off by turning off the burners 37 and 38, and opening the line 45 to admit pressurized cooling air to plenum chamber 43, the air is diffused through the wall 42 into the space surrounding the retort 17, thence exhausting out stack 39. Since the cool air enters the space adjacent retort 17 by passing from the relatively cool location outside of wall 42 to the hot interior thereof, there is little, if any, danger of detrimental shock to the refractory of wall 42, while still evenly cooling the retort 17 throughout its peripheral extent.

Referring to FIG. 3, the cover 24 is replaced by a cover 47 having a stack 48 leading therefrom. In the open furnace of FIG. 3, stack 39 is not needed, the hot and cooling gases passing out of the furnace through stack 48.

Although the various features of the improved furnace and cooling means therefor have been described in detail to fully disclose one embodiment of the invention, it will be evident that changes may be made in such details and certain features may be used without others without departing from the principles of the invention.

What is claimed is:

1. In a furnace having insulating refractory bottom, side and top walls, a retort within said furnace; another insulating refractory wall between said side wall and retort, and forming a plenum chamber between said side wall and other refractory wall; burner means extending through the side and other wall; a stack connected to the space between said other wall and retort; and means for supplying air under pressure to said plenum between said side wall and other wall, whereby said pressurized air diffuses through said other wall and passes out said stack thereby to cool said retort.

2. In a furnace having insulating refractory bottom, side and top walls, a retort within said furnace; another insulating refractory wall between said side wall and retort, and forming a plenum chamber between said side wall and other refractory wall; burner means extending through the side and other wall; a stack connected to the space between said other wall and retort; means for supplying air under pressure to said plenum, whereby said pressurized air diffuses through said other wall and passes out said stack thereby to cool said plenum; and means for supplying a controlled atmosphere to said retort.

3. In a furnace having insulating refractory bottom, side and top walls, a retort within said furnace; another insulating refractory wall between said side wall and retort, and forming a plenum chamber between said side wall and other refractory wall; burner means extending through the side and other wall; a stack connected to the space between said other wall and retort; means for supplying air under pressure to said plenum, whereby said pressurized air diffuses through said other wall and passes out said stack thereby to cool said retort; means for supplying a controlled atmosphere to said retort; and means for circulating the atmosphere within said retort.

4. In a furnace having insulating refractory bottom and side wall means, an insulating refractory annular top wall providing an enlarged central hole therethrough; a retort, closed at the bottom and open at the top, extending from said bottom wall up through the opening formed by said annular top wall; a seal between said retort and annular top wall; a removable cover for the open end of said retort; another insulating refractory wall between said side wall and retort, and forming a plenum chamber between said side wall and other refractory wall; burner

means extending through the side and other wall; a stack connected to the space between said other wall and retort; and means for supplying air under pressure to said plenum, whereby said pressurized air diffuses through said other wall and passes out said stack thereby to cool said retort.

5. In a furnace having insulating refractory bottom and side wall means, an insulating refractory annular top wall providing an enlarged central hole therethrough; a retort, closed at the bottom and open at the top, extending from said bottom wall up through the opening formed by said annular top wall; a seal between said retort and annular top wall; a removable cover for the open end of said retort; a motorized fan means mounted on said cover; another insulating refractory wall between said side wall and retort, and forming a plenum chamber between said side wall and other refractory wall; burner means extending through the side and other wall; a stack connected to the space between said other wall and retort; and means for supplying air under pressure to said plenum, whereby said pressurized air diffuses through said other wall and passes out said stack thereby to cool said retort.

6. In a furnace having insulating refractory bottom and side wall means, an insulating refractory annular top wall providing an enlarged central hole therethrough; a retort, closed at the bottom and open at the top, extending from said bottom wall up through the opening formed by said annular top wall; a seal between said retort and annular top wall; a removable cover for the open end of said retort; another insulating refractory wall between said side wall and retort, and forming a plenum chamber between said side wall and other refractory wall; burner means extending through the side and other wall; a stack connected to the space between said other wall and retort; means for supplying air under pressure to said plenum, whereby said pressurized air diffuses through said other wall and passes out said stack thereby to cool said retort; and means for supplying a controlled atmosphere to said retort.

7. In a furnace having insulating refractory bottom and side wall means, an insulating refractory annular top wall providing an enlarged central hole therethrough; a retort, closed at the bottom and open at the top, extending from said bottom wall up through the opening formed by said annular top wall; a seal between said retort and annular top wall; a removable cover for the open end of said retort; another insulating refractory wall between said side wall and retort, and forming a plenum chamber between said side wall and other refractory wall; burner means extending through the side and other wall; a stack connected to the space between said other wall and retort; means for supplying air under pressure to said plenum, whereby said pressurized air diffuses through said other wall and passes out said stack thereby to cool said retort; means for supplying a controlled atmosphere to said retort; and means for circulating the atmosphere within said retort.

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