

[54] MELTING FURNACE

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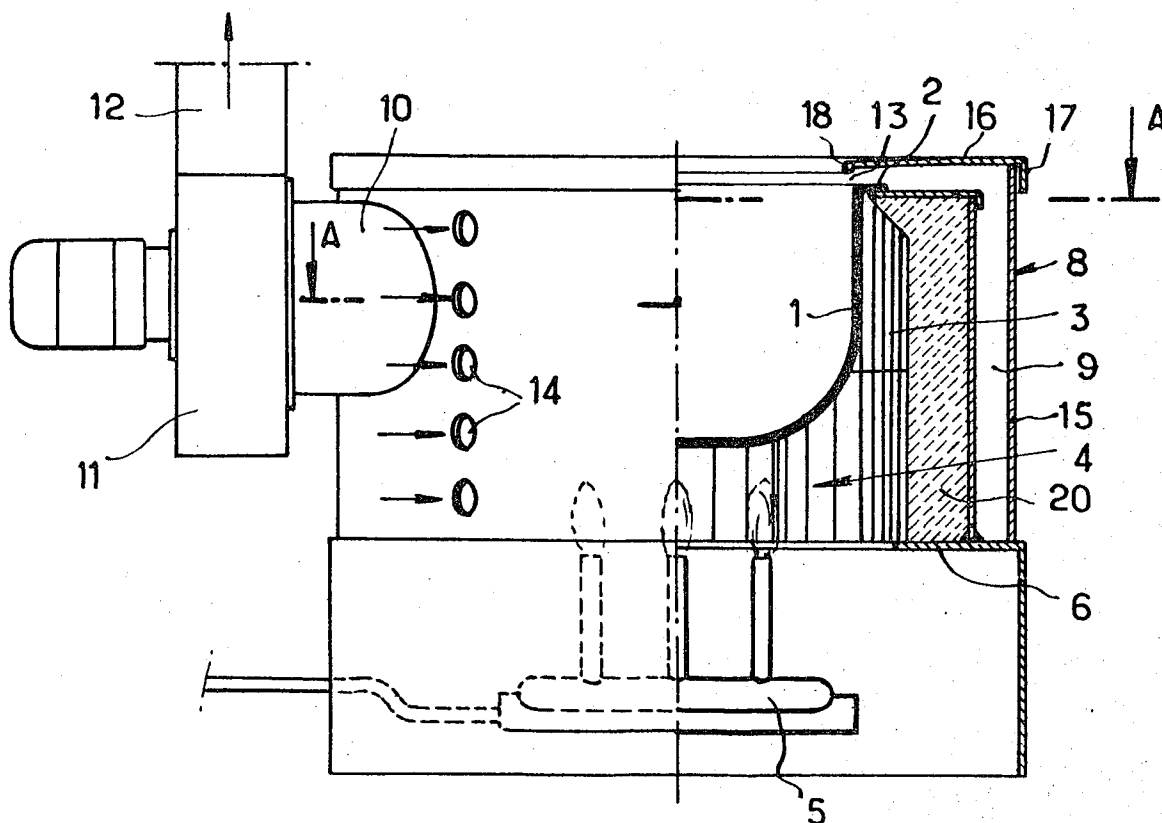
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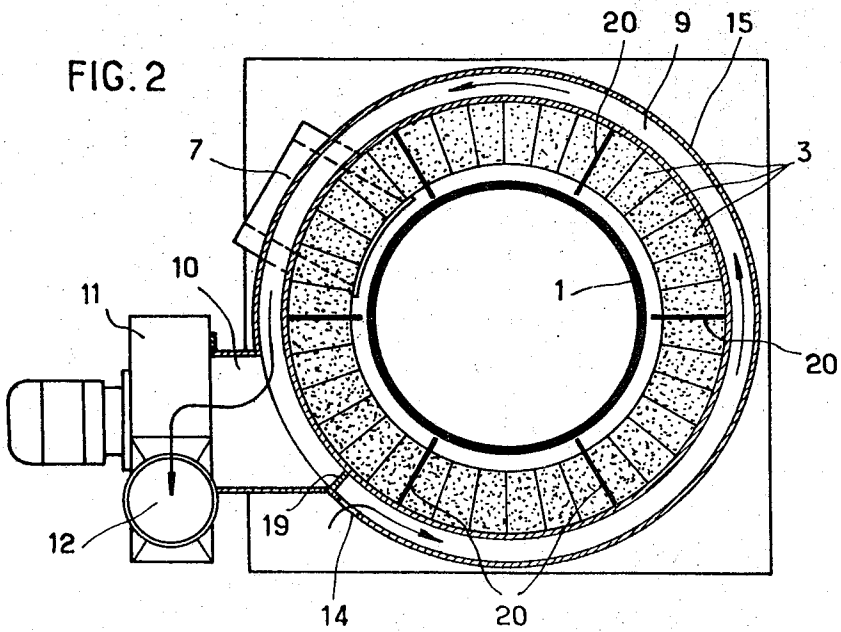
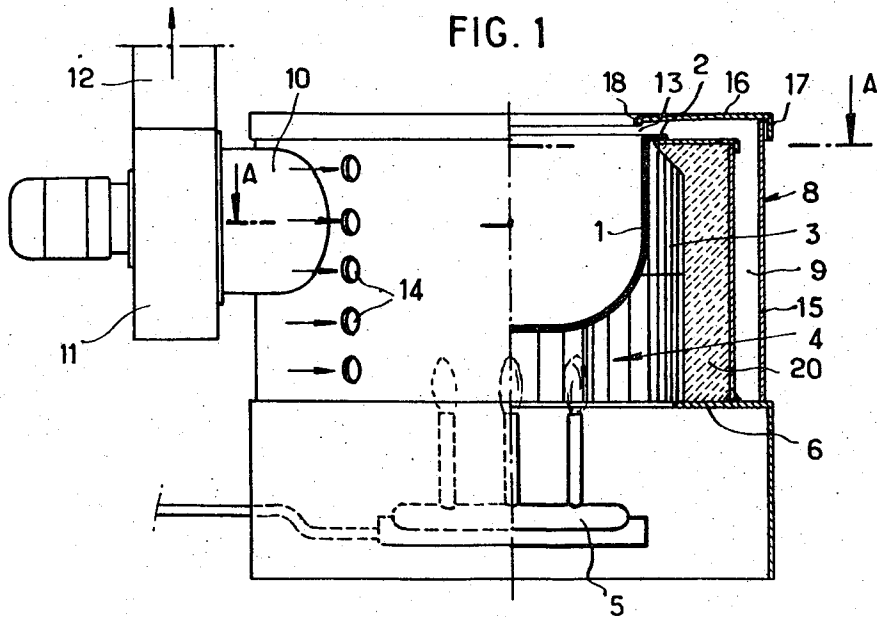
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[57] ABSTRACT

A melting furnace constituted by a crucible supported at its periphery by a gas-tight refractory structure forming a combustion chamber having a furnace fitted at the bottom and a duct for evacuating burnt gases disposed at one of its sides.

3 Claims, 2 Drawing Figures





MELTING FURNACE

The present invention concerns a melting furnace constituted by a crucible supported at its periphery by a gas-tight refractory structure forming a combustion chamber having a burner fitted at the bottom and a duct for evacuating burnt gases disposed at one of its sides.

When it is required to shield the materials to be heated against contact with the flames or with the gases of combustion, use is generally made of crucible furnaces. Thus, such furnaces are used for melting white metals so as to prevent them from being oxidized.

However, crucible furnaces suffer from numerous disadvantages. The structure forming the combustion chamber is usually not cooled efficiently, and the intense heating-up of the refractory material forming the chamber leads to its becoming worn. Very often cracks can be seen in its walls and it has to be replaced. The furnace cannot therefore be used during the repair operations, and production is reduced. Furthermore, the considerable heat dissipated from the supporting structure causes considerable trouble to the workmen operating around the furnace and makes their task very uncomfortable.

On the other hand a considerable volume of gas is released when the furnace charge melts. Since these gases are exhausted into the workshop and so causes pollution, it is necessary to provide hoods above the furnaces and this increases the capital cost of the installation.

An object of the present invention is to overcome these disadvantages and to provide a melting furnace, the walls of the supporting structure of which are cooled to an extent such that the useful life of the refractory material is increased and the temperature of the area surrounding the furnace is reduced. Another object of the invention is to suppress pollution by removing the gases released from the molten material as soon as they form, without the need for fitting a hood.

These objects are achieved by the melting furnace of this invention which is characterized by a double wall which defines a chamber extending at least around and above the refractory supporting structure, the chamber being connected with a duct fitted with an extraction fan and having two air inlets, one being annular and extending around the periphery of the crucible and the other extending through the side wall of the chamber.

By means of this arrangement the walls of the supporting structure are cooled since they are surrounded by a chamber in which fresh air circulates after having entered through the lateral inlet. The side wall of the chamber, likewise cooled by the stream of fresh air, provides the supporting structure with thermal insulation and therefore limits the rise in temperature of the surrounding area. Furthermore, since the chamber has an air inlet extending around the periphery of the crucible, the gases formed within the crucible are drawn into this inlet and directed to the exhaust duct by the fan.

The cooling of the walls of the supporting structure and the exhausting of the polluting gases are thus achieved simultaneously by a simple means consisting only of a fan and of a chamber having two air inlets, this means also offering the advantage of being less costly on account of the absence of a hood.

The chamber advantageously includes a lateral outer wall which rests on a protruding part of the base of the

supporting structure and an annular cover which has an outer downwardly extending lip which caps the lateral wall, and an inner downwardly extending lip which terminates near the periphery of the crucible.

Since the chamber rests on a protruding portion of the base of the supporting structure, it can be rapidly assembled in view of the fact that it can be placed in position without the need for providing a supplementary structure for supporting it.

The inner lip of the cover which limits the size of the air inlet disposed at the periphery of the crucible, enables the opening to be disposed in a uniform manner around the crucible, and directs the opening towards the interior of the crucible.

All the gases liberated from the crucible charge are thus drawn out by the fan.

The outer lip of the cover on the other hand enables the cover to be rapidly fitted onto the lateral outer wall of the chamber and ensures that a good seal is established between these two parts.

In a preferred embodiment the air inlet extending through the side wall of the chamber is situated near the exhaust duct from which it is separated by a partition which closes the lateral chamber.

Since the air inlet extending through the side wall of the chamber is separated from the exhaust duct by the partition, the air drawn into the chamber is forced to travel circumferentially right through the chamber before being exhausted by means of the fan. Thus, during its travel, the air is gradually heated up as a result of absorbing the heat given off by the refractory supporting structure which is thus kept cool by the air.

One embodiment of the present invention is illustrated by way of example in the accompanying drawing in which:

FIG. 1 is a side elevation, partly in section, of the melting furnace of the invention, and

FIG. 2 is a section through the furnace on the line A—A of FIG. 1.

Referring to the drawing, it will be seen that the melting furnace is constituted by a crucible 1 supported at its periphery 2 by a gas-tight refractory structure 3. This supporting structure encloses the combustion space 4, a burner 5 being disposed at the bottom 6 of the structure and a duct 7 for exhausting the burnt gases being located at the side thereof.

It will also be seen that the furnace has a double wall 8 which defines a chamber 9 which extends around and above the refractory supporting structure 3. This chamber is provided with a duct 10 which is equipped with a fan 11 and is connected to an exhaust line 12; the chamber 9 also has an annular air inlet 13 extending around the periphery 2 of the crucible, and a lateral air inlet 14.

The double wall 8 of the chamber 9 has a lateral outer wall 15. The chamber 9 has a cover 16 which is preferably made of metal.

The lateral wall 15 of the chamber surrounds the lateral surface of the supporting structure 3 and rests on a protruding portion of the base 6 of the supporting structure.

The cover 16 has an outer downwardly extending lip 17 which caps the upper portion of the wall 15 and an inner downwardly extending lip 18 terminating near the periphery 2 of the crucible.

The partition 19 which closes off the chamber 9 separates the lateral air inlet 14 from the duct 10.

The crucible 1 is of conventional design. Its wall which is made of a suitable refractory material is of cylindrical form on the outside and is rounded towards the base.

The refractory supporting structure 3 is of cylindrical form and surrounds the outer side wall of the crucible. The supporting structure however extends downwardly to a point much lower than the base of the crucible and it defines a cavity below the latter.

The supporting structure is made up of refractory bricks, and the assembly of bricks is reinforced by metallic elements 20 which extend from the base 6 of the structure to the periphery 2 of the crucible. These elements which are uniformly distributed around the structure are embedded in the refractory composition and also perform the function of supporting the crucible on their upper protruding portions.

As can be seen in the drawing, the entire furnace rests on a construction, the upper surface of which is square.

The burner 5, disposed at the bottom of the structure 3, is fed through a pipe contained in this construction. This burner is selected to suit the fuel used which may be either liquid or gaseous.

After having heated the assembly consisting of the crucible and the supporting structure, the gases of combustion are directed towards the exhaust duct 7 and may then be filtered.

The annular air inlet 13 takes the form of a narrow gap. The lateral air inlet 14 on the other hand is constituted by a row of circular apertures arranged at equal distances apart along a generatrix of the lateral wall 15 of the chamber 9. It will be understood that the apertures forming this inlet can be of any other shape.

The partition 19 that closes off the chamber 9 is generally of metal. It extends along generatrices of the lateral wall 15 and the lateral wall of the supporting structure so interconnecting these walls, and is disposed near the apertures forming the lateral air inlet 14. The fan 11, secured to the upper portion of the lateral wall 15 is thus shut off from the apertures forming the lateral inlet.

The fan is of a conventional type and is so rated that the amount of air that it draws in ensures that the furnace is efficiently cooled and that the gases given off by the crucible charge are completely exhausted.

The fan is started up while the charge is being melted. It sets up a partial vacuum in the annular chamber into which air passes through the lateral inlet 14 and the annular inlet 13.

The air passing through the lateral inlet 14 is forced to travel right through the entire chamber in order to reach the fan, and is displaced tangentially to the walls of the chamber. Since these walls are hot the air becomes heated upon contact with them and so keeps them cool. Since the apertures constituting the lateral inlet are disposed at equal distances apart along a generatrix of the lateral wall of the chamber, the air-stream extends over the entire volume of the chamber in a uni-

form manner. The lower portion of the chamber is clearly the hottest since it is nearest the source of heat. The air introduced into this portion is therefore additionally heated.

The air passing through the annular inlet contains a large amount of the gases liberated in the crucible.

The partial vacuum within the chamber 9 is such that the gases liberated at all points on the upper surface of the charge are all drawn through the inlet 13 into the chamber.

It should be mentioned that these gases are mixed with the circulated cooling air introduced into the upper portion of the chamber. However, these gases which are hot interfere very little with the cooling of the upper portion of the chamber which is not so hot as the lower portion and which therefore requires less cooling.

The air leaving the annular chamber 9 may of course be filtered upon issuing from the fan 11 and before being passed into the atmosphere.

It will thus be seen that the melting furnace of the invention can be readily cooled and that the gases from the crucible are exhausted at the same rate as they are formed with the aid of the annular chamber provided around the refractory structure supporting the crucible. Thus the use of a hood is no longer necessary and the temperature obtaining in the area around the furnace is reduced.

I claim:

1. An improvement for a melting furnace of the type that includes a crucible, a gas-tight refractory structure surrounding the periphery of the crucible, and means for heating the crucible, the improvement comprising a wall spaced apart from the outer surface of the refractory structure, the wall surrounding the refractory structure along the sides and top thereof to form a chamber extending at least around and above the refractory structure, outlet means in the wall through which gas in the chamber can be withdrawn, first and second inlet means in the wall communicating with the outlet means, the first inlet means comprising a space between the upper periphery of the crucible and the wall through which gas emanating from the crucible can flow, the second inlet means comprising an opening in the wall through which gas can enter the chamber.

2. The improvement in claim 1, wherein the chamber includes (a) a lateral outer wall resting on a base, and (b) an annular cover which has an outer downwardly extending lip which caps the lateral wall and an inner downwardly extending lip which terminates near the periphery of the crucible.

3. The improvement in claim 2, wherein the second inlet means is disposed near the exhaust means, and the chamber includes partition means therein between the outlet means and the second inlet means for blocking the flow of gas between them along the closest distance therebetween.

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