

[54] **MOUNTING MEANS FOR A REFRACTORY SHIELD**

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[58] **Field of Search** **432/237, 238; 110/1 A,
110/99 R, 99 B**

[56] **References Cited**
UNITED STATES PATENTS

2,660,050	11/1953	Hosbein et al.	110/1 A
2,994,288	8/1961	Keller	110/99
3,045,994	7/1962	Longenecker	432/237

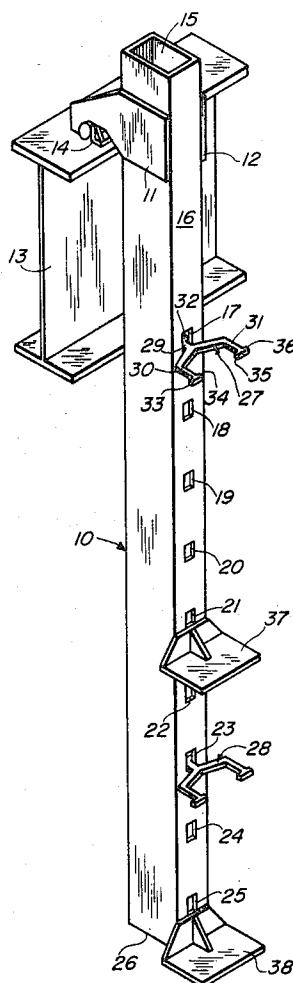
3,328,014 6/1967 Longenecker 432/238

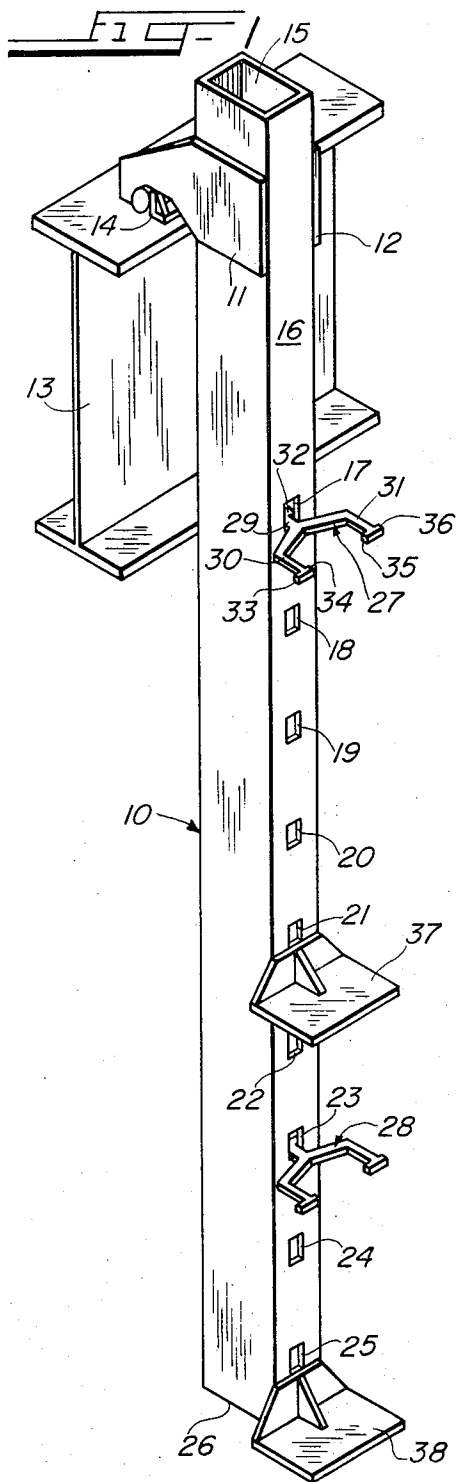
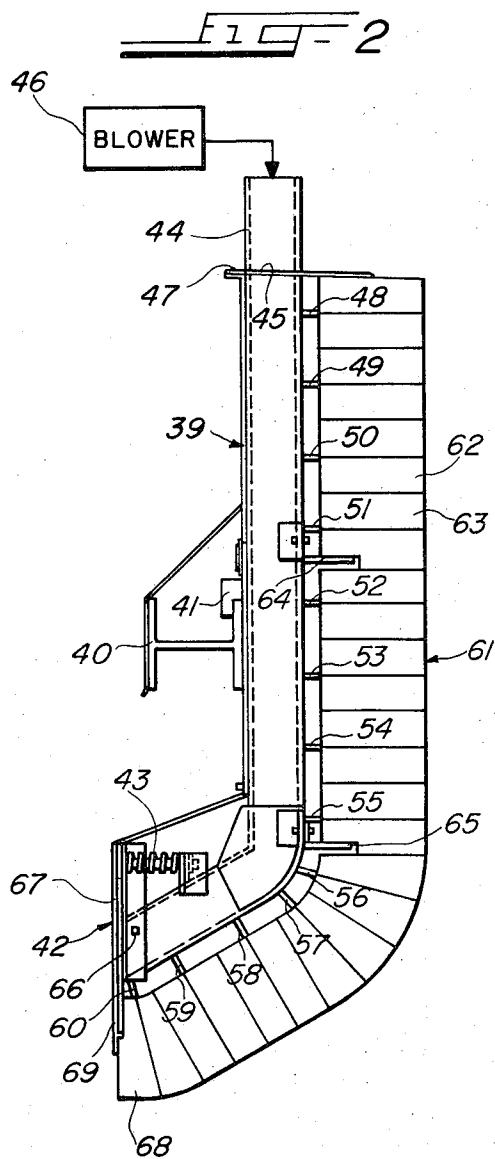
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[57] **ABSTRACT**

Mounting means for a suspended refractory shield such as a furnace wall or roof in a high temperature furnace comprises a support beam providing structural support for the refractory shield, a hollow, structural hanger tube depending from the support beam, metal hanger means engaging the hanger tube through oblong openings provided therein, and a cooling fluid supply means communicating with the hanger tube through the open end thereof. In use, a cooling fluid is passed through the oblong openings and cools the metal hanger means.

12 Claims, 2 Drawing Figures





MOUNTING MEANS FOR A REFRACTORY SHIELD

BACKGROUND OF THE INVENTION

This invention relates to improvements in high temperature industrial furnaces. More particularly, this invention relates to mounting means for a refractory shield in a high temperature industrial furnace.

High temperature industrial furnaces normally are lined with a refractory material. Occasionally a flat roof is desired, or relatively long open slots must be provided in furnace walls for feeding a charge into the furnace. In such cases it is necessary to suspend and tie back the refractory material to a structural frame. In extremely high temperature furnaces, such as glass manufacturing furnaces, it is frequently desirable to direct cooling air at the suspension or tie back means and to "wash" the cold side of the refractory material with a cooling fluid. In both instances the average temperature of the suspension or tie back means and of the refractory is reduced and the service life is prolonged.

This is recognized by the prior art. U.S. Pat. No. 3,045,994 to Longenecker proposes to cool the furnace wall, i.e., the refractory shield, as well as the metal hangers therefor by passing an air stream upwardly along the furnace wall and provides lateral apertures in hanger castings to facilitate such air flow. Such an approach, while providing some cooling to the metal hangers, is not satisfactory because the air stream is already quite warm after prior contact with the lower portion of the hot furnace wall and also because the air stream moves at a relatively slow rate. U.S. Pat. No. 3,139,846 to Longenecker teaches that direct impingement of a concentrated blast of cooling air onto a refractory furnace wall is undesirable, inasmuch as such impingement causes the development of holes in the furnace wall.

It is an object of the present invention to provide mounting means for a refractory shield such as a furnace wall or roof whereby metal hangers and the furnace wall and/or roof are effectively cooled by exposure to an air stream.

A further object of this invention is to provide a method for cooling metal hangers and hanger supports in a high-temperature furnace.

Still other objects of the present invention will present themselves to the skilled artisan upon reference to the ensuing specification, the drawing, and the claims.

SUMMARY OF THE INVENTION

This invention contemplates mounting means for a suspended refractory shield in a high-temperature furnace which comprises a support beam providing structural support for the refractory shield, a hollow, tubular hanger tube depending from the support beam, substantially Y-shaped metal hanger means engaging the hanger tube and adapted to engage and hold a refractory brick which is a part of the refractory shield, and a cooling fluid supply means communicating with the open end of the hanger tube.

The hanger tube is provided with mounting means attaching to the support beam, and has at least one open end and a face with a plurality of longitudinally-arranged oblong openings in said face. Preferably this face is generally flat. The metal hanger means has a body portion and a pair of arm portions which extend

from one end of the body portion, and engages the hanger tube through the oblong openings therein. Opposed side lugs are provided for this purpose on the hanger means adjacent to the free end of the body portion and abut the inner surface of the hanger tube. In addition, opposed side lugs are provided adjacent to the free ends of the arm portions for engaging and holding the refractory brick.

The cooling fluid supply means operatively communicates with the hanger tube through the open end thereof and serves to provide and pass cooling fluid through the oblong openings in the hanger tube. For this purpose the oblong opening is of a cross-sectional area which is greater than the cross-sectional area of the received body portion.

The method of the present invention includes supplying a cooling fluid under positive pressure into the hollow, hanger tube and passing the cooling fluid through the oblong openings in the hanger casting so as to cool a metal hanger received through these openings and to cool the face of the refractory shield as well.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing,

FIG. 1 is a perspective view showing a hanger tube embodying the present invention and a pair of metal hangers received therein, and

FIG. 2 is a side elevational view showing a high temperature furnace back wall embodying the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, hanger tube 10 is a hollow metal tube having a generally rectangular cross-section. Mounting lugs 11 and 12 are attached to each side of hanger tube 10 and secure hanger tube 10 to suitable support beam 13 so that hanger tube 10 hangs freely therefrom by engaging stop block 14 welded onto support beam 13.

Open end 15 of hanger tube 10 is adapted for communication with a suitable cooling fluid supply means. Face 16 extends longitudinally down one side of hanger casting 10 and is provided with a plurality of longitudinally-arranged rectangular openings 17 to 25. Lower end 26 of hanger tube 10 preferably is closed so as to maximize cooling fluid flow through openings 17 to 25. As will be discussed hereinbelow in greater detail, the lower portion of a hanger tube can also curve as in FIG. 2 when used to support a furnace wall or an arcuate roof portion.

Substantially Y-shaped metal hangers 27 and 28 are received through openings 17 and 23, respectively, and serve to engage and hold refractory bricks which are a part of the refractory shield. Hanger 27 is typical and comprises body portion 29 and arm portions 30 and 31. Opposed side lugs such as lug 32 are provided adjacent to the free end of body portion 29 and engage the inner surface of hanger tube 10. Opposed side lugs 33 and 34 are provided adjacent to the free end of arm portion 30 and similar opposed side lugs 35 and 36 are provided adjacent to the free end of arm portion 31 for engaging and holding refractory bricks. Optional, substantially horizontal shelves 37 and 38 and be mounted on hanger tube 10 in a spaced relationship relative to each other so as to aid in distributing the weight of refractory bricks engaged by hangers 27 and 28. In the event

hanger tube 10 is situated in a generally horizontal position, for example as part of a flat suspended refractory roof construction, shelves 37 and 38 become superfluous and can be dispensed with. However, such shelves can be utilized for constructing an arcuate portion of a furnace roof. Rectangular openings 17 and 25 are of a cross-sectional area which is greater than the cross-sectional area of the body portion 29 of a typical hanger so that the passage of cooling fluid through an opening is not blocked even when a hanger is in place. Openings 17 to 25 need not be rectangular but can have any desired oblong configuration, for example an elliptical configuration.

In FIG. 2, hanger tube 39 is similar to aforescribed hanger tube 10 and is suspended freely from structural members above. Beam 40 is engaged by mounting lug 41 and is a kicker beam for resisting rotational movement of the refractory wall. The lower portion of hanger tube 39 is curved and terminates in rocker backing plate 42 which is pivotally mounted on hanger tube 39 by means of through-bolt 66 and which pivots against compression spring 43 as refractory bricks hung from tube 39 expand and abut thereagainst. Such a spring-loaded arrangement for rocker backing plate 42 permits hanger tube 39 to accommodate thermal expansion of the refractory bricks without pinching the bricks between fixed structural members as temperature in the furnace is increased to operational level. The rocker backing plate assembly comprises a generally flat plate 67 which is pivotally mounted across the end of hanger tube 39 by means of bolt 66 so that portions of plate 67 extend beyond hanger tube 39, and plate 67 which pivots on an axis normal to the longitudinal axis of hanger tube 39. Compression spring 43 is mounted on hanger tube 39 and abuts first extending portion 67 of plate 42. Second extending portion 69 of plate 42, situated on opposite side of the pivot axis, is adapted to abut refractory brick 68. As the refractory bricks hung from hanger tube 39 expand due to temperature rise in the furnace, first extending portion 67 is urged against compression spring 43. The rocker backing plate assembly set forth hereinabove is not limited to use with a substantially vertical hanger tube, but can be utilized as well with a substantially horizontal hanger tube, if desired.

Air duct 44 communicates with open end 45 of hanger tube 39 and with air blower 46 which serves as a cooling fluid supply means. Adjustable vent means 47, e.g., a slidably mounted flat plate with a single aperture or plurality of apertures having same or varied cross-sectional areas, can be provided in air duct 44 or at the juncture of duct 44 and hanger tube 39 for regulating rate of flow of cooling fluid such as air to hanger tube 39. Hangers 48 to 60 are received in appropriate oblong openings in hanger tube 39 and together retain furnace wall 61 which is made up of a plurality of refractory bricks such as bricks 62, 63 and 68. Horizontal shelves 64 and 65, bolted onto hanger tube 39, each carry a stack of refractory bricks which, in turn, are held by the respective hangers.

During furnace operation, a cooling fluid such as air is fed into hanger tube 39 under positive pressure via duct 44 by means of blower 46. The rate of flow is regulated by vent means 47, and the air exits through the oblong openings in hanger tube 39, cools hangers 48 to 60, and diffuses the cooling air against the cold face of the adjacent refractory brick wall.

While in the foregoing specification this invention has been described in relation to certain preferred embodiments thereof, and many details have been set forth for purpose of illustration, it will be apparent to those skilled in the art that the invention is susceptible to additional embodiments and that certain of the details described herein can be varied considerably without departing from the basic principles of the invention.

I claim:

1. A mounting means for a suspended refractory shield for a high-temperature furnace which comprises

a support beam providing structural support for the refractory shield;

a hollow hanger tube provided with mounting means attaching to said support beam and depending from said support beam, and having at least one open end and one face with a plurality of longitudinally-arranged oblong openings in said face;

metal hanger means for supporting said refractory shield, said hanger means having a body portion and at one end opposed side lugs, said side lugs being adapted to be received within one of said oblong openings and abutting the inner surface of said hanger tube adjacent said opening and holding means at the other end of said body portion adapted to engage and hold refractory brick forming a part of the refractory shield;

a cooling fluid supply means operatively communicating with said hanger tube through an open end of said hanger tube;

said oblong opening receiving the body portion of said hanger means having a cross-sectional area which is greater than the cross-sectional area of the received body portion, the cooling fluid introduced at one end of said hollow hanger tube flowing the length of said tube passing outwardly at said oblong openings thereby cooling said metal hanger means.

2. The mounting means in accordance with claim 1 wherein said oblong openings are rectangular in configuration.

3. The mounting means in accordance with claim 1 wherein said hanger tube depends from said support beam substantially vertically, wherein a substantially horizontal shelf means is mounted on said flat face and is adapted to receive a stack of refractory bricks, and wherein said free ends of said arm portions are adapted to engage and hold a refractory brick in said stack of refractory bricks.

4. The mounting means in accordance with claim 1 wherein an adjustable vent means is provided near the open end of said hanger tube for regulating flow of cooling fluid into said hanger tube.

5. The mounting means in accordance with claim 1 wherein the hanger tube face having said openings is generally flat.

6. A hanger tube for retaining refractory brick in a high-temperature furnace comprising a hollow tube member having at least one open end adapted for communication with a cooling fluid supply means, one face provided with a plurality of longitudinally-arranged oblong openings which are adapted to receive and retain metal hangers for refractory bricks, the cooling fluid supplied at one end of said hollow hanger tube flowing the length of the tube exiting at said oblong

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openings thereby cooling the metal hangers, and a mounting lug on said hollow tube member for attaching the hanger tube to a support beam.

7. The hanger tube in accordance with claim 6 wherein an adjustable vent means is provided at the open end of said tube member for regulating flow of cooling fluid into said tube member.

8. The hanger tube in accordance with claim 6 further provided with a substantially horizontal shelf means mounted on the face of said hanger tube and adapted to receive a stack of refractory bricks.

9. The hanger tube in accordance with claim 6 wherein a spring-loaded rocker backing plate means is provided at one end of said hanger tube and comprises

a generally flat plate pivotally mounted across one end of said hanger tube so as to pivot on an axis substantially normal to the longitudinal axis of said hanger tube and having first and second plate portions extending beyond said hanger tube on opposite sides of the pivot axis, and

a compression spring means mounted on said hanger tube and abutting the first extending plate portion of said plate;

the second extending plate portion being adapted to abut a refractory brick hung from said hanger tube expand due to an increase in temperature.

10. The hanger tube in accordance with claim 6 wherein the face having said openings is generally flat.

11. A method of cooling metal hangers for a refrac-

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tory shield of a high-temperature furnace of the type having a support beam providing structural support for the refractory shield; a hollow hanger tube provided with mounting means attaching to said support beam and depending from said support beam, and having at least one open end and one face with a plurality of longitudinally-arranged oblong openings in said face; metal hanger means for supporting said refractory shield, said hanger means having a body portion and at one end opposed side lugs, said side lugs being adapted to be received within one of said oblong openings and abutting the inner surface of said hanger tube adjacent said opening and holding means at the other end of said body portion adapted to engage and hold refractory brick forming a part of the refractory shield; a cooling fluid supply means operatively communicating with said hanger tube through an open end of said hanger tube; said oblong opening receiving the body portion of said hanger means having a cross-sectional area which is greater than the cross-sectional area of the received body portion comprising:

supplying a cooling fluid through an open end of said hanger tube under positive pressure;

passing the cooling fluid the length of the hanger tube, the cooling fluid flowing outwardly through said oblong openings thereby cooling the metal hangers received within the oblong openings.

12. The method in accordance with claim 11 wherein the cooling fluid is air.

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