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Andoniev et al.

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[54] **EVAPORATIVE COOLING OF METALLURGICAL FURNACES**

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[51] **Int. Cl.** **F28f 27/02**

[58] **Field of Search** 266/32; 263/44; 165/146, 76, 165/101

[56] **References Cited**

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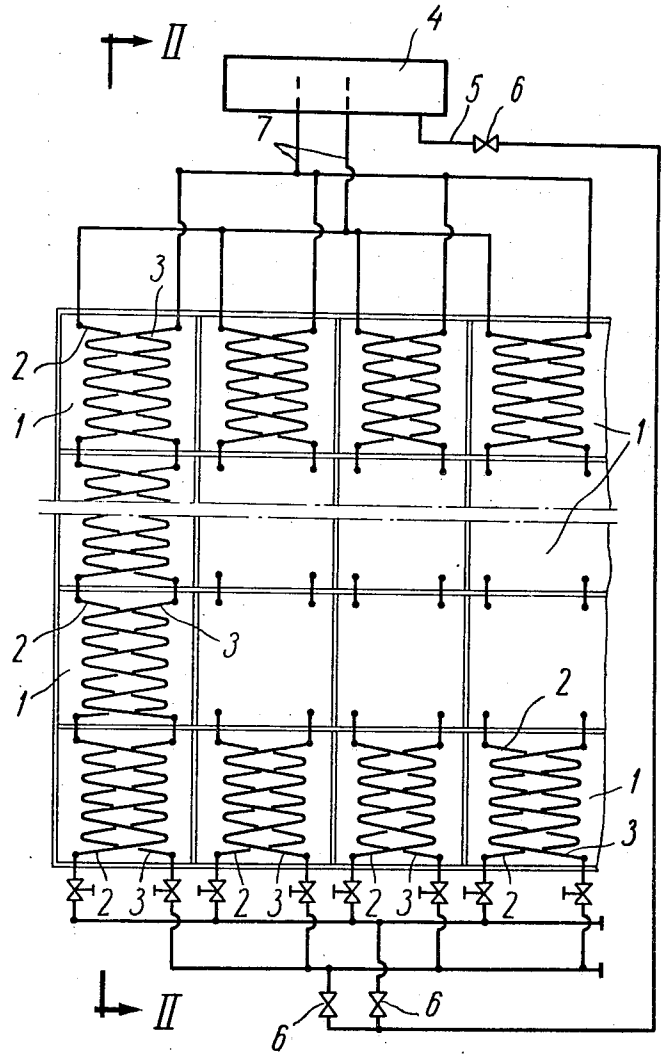
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[57] **ABSTRACT**

A device for evaporative cooling of metallurgical furnaces, wherein cooling members are interconnected and each member has at least two rows of coils for passing the coolant arranged in parallel relationship to the working surface of the cooling member and along the width of the cooling member.

4 Claims, 3 Drawing Figures



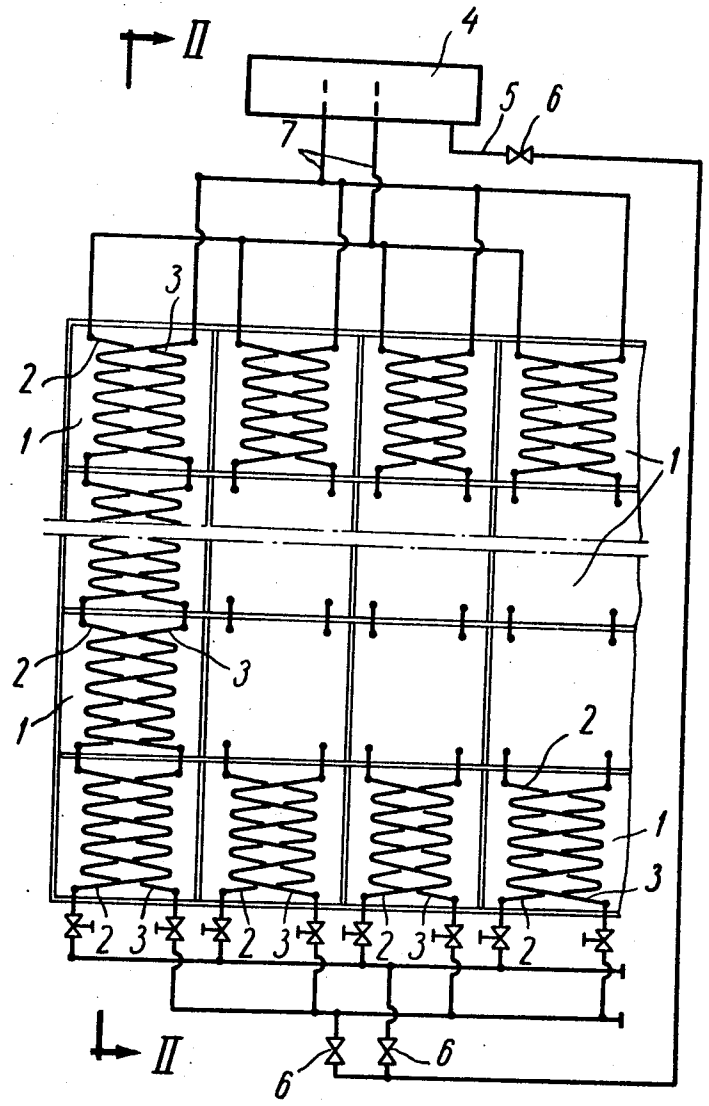


FIG. 1

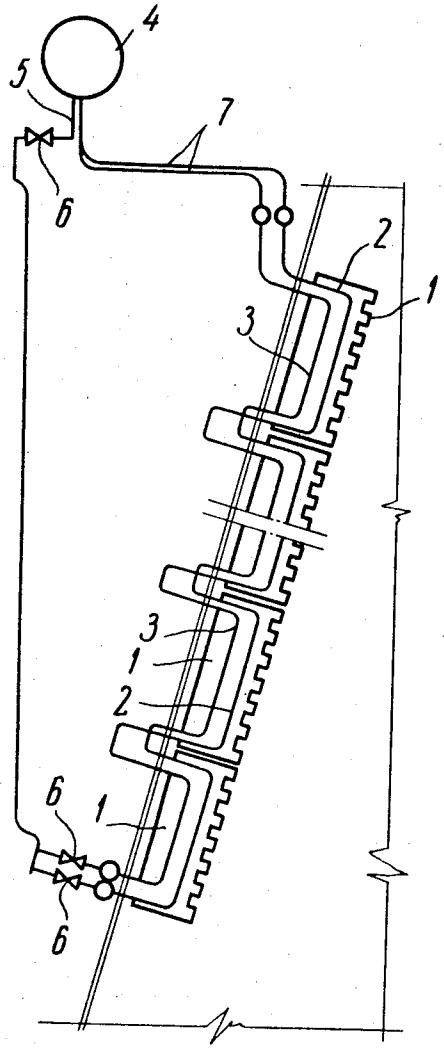


FIG. 2

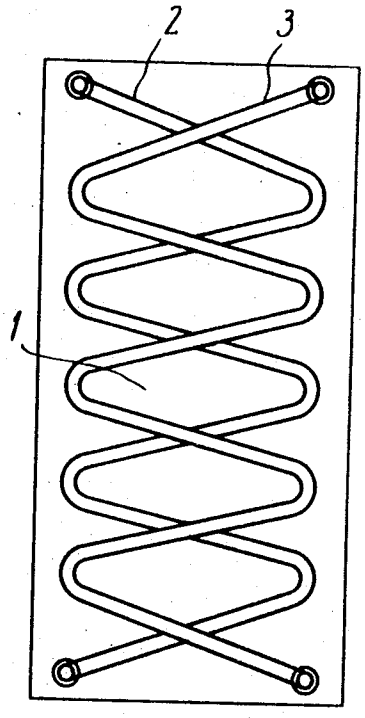


FIG. 3

EVAPORATIVE COOLING OF METALLURGICAL FURNACES

The present invention relates to metallurgy, and more particularly to devices for systems of evaporative cooling of metallurgical furnaces, preferably of blast furnaces.

Practice has shown the known systems of water cooling of metallurgical furnaces (see Author's Certificate of the Soviet Union, No. 87873) to be less effective than systems of evaporative cooling. In the known devices for systems of water cooling the cooling members are made as cast iron plates with built-in tubes for cooling water. The cooling members adapted for cooling the furnace casing or jacket are arranged in horizontal rows. In each plate the tubes are arranged to form two loops disposed at one level. Such plates cannot be used as members of a device for systems of evaporative cooling and prove to be short-lived.

Known in the art are cooling members in the form of vertically-arranged plates. In such plates the tubes are disposed so as to form coils with loops extending in the direction of the longitudinal axis of the plates.

In the course of operation of such members steam locks are likely to be formed in the upper bends of the coil loops, thus hindering the passage of the coolant.

To preclude the formation of steam locks, members of the device for evaporative cooling have been, arranged vertically and designed to accommodate straight tubes for the coolant which are disposed along the plates, the coolant in the tubes moving in an ascending flow.

In the tubes of such members no steam locks are formed. However, each such member required to have a great number of openings for the supply and discharge of the coolant. This fact adversely affects the tightness and strength of the jacket of the metallurgical furnace involved. Moreover, the longitudinal axes of the tubes lie in one plane and the tubes are equally spaced from the working surface of the members. Therefore in the case of wear of the surface of the cooling member all the tubes prove to fail simultaneously. Even if only one tube proves to be faulty, the uniformity of the furnace cooling becomes disturbed and this results in a rapid wear of the cooling member.

It is an object of the present invention to eliminate said disadvantages and to provide a device whose cooling members will be more effective as to their cooling ability. This device will also feature longer service life and be capable of ensuring tightness and strength of the furnace jacket.

Other objects of the invention include the provision of a more effective arrangement of tubes in the cooling members so as to make it possible to disconnect a burned-through portion without stopping the cooling, as well as to facilitate the detection and location of the worn member and to decrease the number of assembling jobs.

Said objects are attained in a device for a system of evaporative cooling of metallurgical furnaces, preferably of blast furnaces, which includes vertically arranged cooling members with tubes for the coolant to move in an ascending flow, wherein, according to the invention, the tubes of the cooling members are in the form of coils and arranged in at least two rows so that their longitudinal axes lie in planes parallel to the working surface of the cooling member, the loops of the coils being disposed along the width of the member transversely to the longitudinal axis thereof.

It is preferred, that in each cooling member the loops of the coil of one row be shifted relative to the loops of the coil of the next row.

It is desirable that the coils in the rows equally spaced from the working surface of the cooling members arranged vertically should be interconnected.

It also desirable that in the vertically arranged cooling members the coil of the preceding cooling member disposed nearer to the working surface should be connected with the coil of the successive cooling member which is disposed farther away from the working surface, and the coil of the preceding cooling member disposed farther away from the working surface be connected with the coil of the successive cooling member disposed nearer to the working surface.

Provided hereinbelow is a description of an exemplary embodiment of a device for evaporative cooling of blast furnaces, with reference to the accompanying drawings, wherein:

FIG. 1 shows a device for a system of evaporative cooling;

FIG. 2 shows the same device in section taken along line II—II of FIG. 1; and

FIG. 3 shows the arrangement of coils in one of the cooling members.

The device for a system of evaporative cooling of a blast furnace has cooling members 1 (FIG. 1, 2 and 3) arranged vertically along the furnace jacket.

Tubes for the supply of coolant make up two rows of coils 2 and 3, whose longitudinal axes lie in two planes parallel to the surface of the cooling member, the loops of the coils being mutually shifted and arranged along the width of the cooling member 1 transversely to the longitudinal axis thereof.

In the vertically arranged cooling members 1 the coil 2 of the preceding cooling member 1 disposed nearer to the working surface, is connected with the coil 3 of the successive cooling member 1 which is disposed farther away from the working surface, and the coil 3 of the preceding cooling member disposed farther away from the working surface is connected with the coil 2 of the successive cooling member which is disposed nearer to the working surfaces.

The device is provided with a capacity 4 (FIG. 1 and 2) for the coolant, that is, for water heated up to a temperature close to the boiling point.

A tube 5 with valves 6 is intended for directing the coolant from the capacity 4 into the coils 2 and 3 of the cooling members that are disposed in the lower portion of the furnace jacket, and a tube 7 serves for returning the coolant into the capacity 4.

The device operates as follows;

From the capacity 4 water heated to a temperature close to the boiling point is fed along the tube 5 into the coils 2 and 3 of the cooling members disposed below and ascends along the coils of the cooling members disposed above. While passing along the coils, water in the coils 2 approaches the working surface of the cooling members, and in the coils 3 it moves farther away from it. As the water ascends, steam-water mixture is formed which, through pipes 7, passes into the capacity 4.

Such connection of the coils 2 and 3 in the successively arranged cooling members makes it possible, upon reception of a signal indicative of the burn-through of a bank of interconnected coils, to effect a more rapid and accurate location of the burn-through. In this procedure first only those cooling members are checked, in which the coils involved in the burnthrough bank, are disposed nearer to the working surface.

In another embodiment of the device in the vertically arranged cooling members 1 the coil 2 of the preceding cooling member disposed nearer to the working surface may be connected also with the similarly disposed coil 2 of the successive cooling member, and the coil 3 of the preceding cooling member, with the coil 3 of the successive cooling member. Such connection of the coils makes it possible to disconnect the bank of the coils 2 arranged nearer to the working surface in case they become faulty, and continue the cooling of the furnace jacket by means of the coils 3 which are disposed farther away from the working surface of the cooling members, but which are arranged also along their width and, hence, are capable of ensuring effective cooling. Practically the service life of the cooling members is considerably increased. In the system of evaporative cooling means are envisaged for adjusting the feed of the coolant to each cooling member (not shown).

The above-described arrangement of the coils increases the effectiveness of cooling, and the provision of only two coils in each cooling element ensures tightness and strength of the furnace jacket. The device disclosed herein may find application in shaft furnaces and in metallurgical furnaces of other types.

We claim:

1. A device for evaporative cooling of metallurgical furnaces, preferably of blast furnaces, comprising cooling members with pipes for passing the coolant interconnected in series and facing the furnace with its working surface, said pipes being made as coils arranged in at least two rows in each cooling member so that their longitudinal axes lie in planes parallel to the working surface of the cooling member, the loops of the coils being arranged along the width of the cooling member transversely to the longitudinal axis thereof.

2. A device as claimed in claim 1, wherein in each said cooling member the loops of the coil disposed in one row are mutually shifted relative to the loops of the coil of the other row.

3. A device as claimed in claim 1, wherein the coils of the cooling members in the rows equally spaced from their working surface are interconnected.

4. A device as claimed in claim 1, wherein the coil of the preceding cooling member which is disposed nearer to its working surface is connected to the coil of the successive cooling member which is disposed farther away from its working surface, and the coil of the preceding cooling member which is disposed farther away from its working surface is connected with the coil of the successive cooling member which is disposed nearer to its working surface.

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