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CHAMBERED FURNACE WITH REMOVABLE COVER

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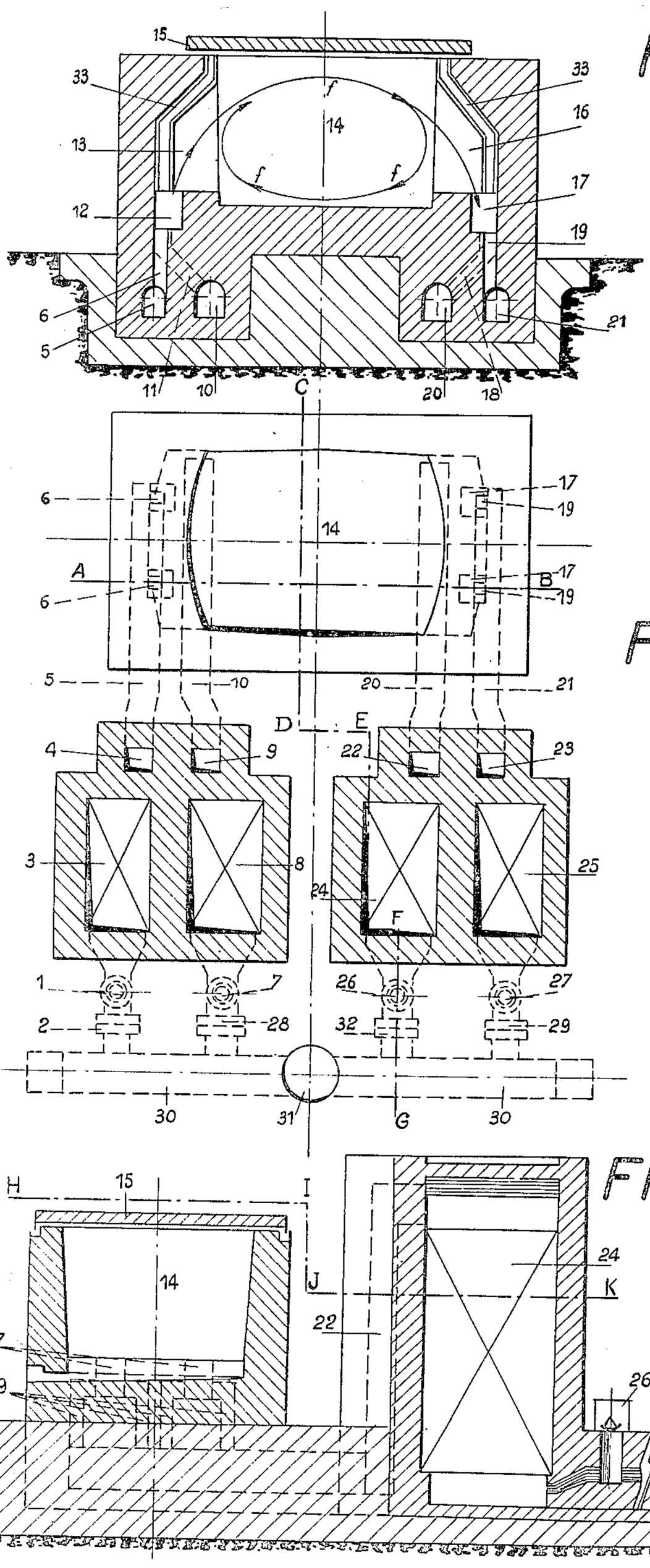

FIG. 1

FIG. 2

FIG. 3

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CHAMBERED FURNACE WITH REMOVABLE COVER

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4 Claims. (Cl. 263—15)

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In the present-day chambered furnaces, into which the products to be heated are fed through the top, the burners project their flames horizontally into the chamber through openings provided at the top of the side walls of the furnace, or vertically upwards through an opening provided in the hearth at the middle of the furnace.

The existing arrangements are suitable when it is required to heat the air or the air and the gas in continuous heat recuperators. They cannot be used in furnaces comprising an alternating system of recuperation, which operate with hot gas or air from regenerators which enable substantially higher heating temperatures to be obtained than with the continuous recuperation systems.

Continuous recuperators are delicate apparatus which are very liable to leak and which require costly servicing. Earthenware recuperators become disintegrated after the furnace has been lighted a few times and are not gas-tight, which impairs their efficiency. Furthermore, the heating temperature is limited, in particular the heating temperature of the gas, since owing to the danger involved by leakages, the gas is heated in metal recuperators which will not withstand high temperatures.

The arrangement which is adopted for the burners relatively to the furnace chamber in order to obtain a uniform temperature in the present-day constructions can only be used with air or air and gas heated in continuous recuperation systems.

The present invention has for its object to overcome this drawback by providing a perfect circulation of the flames and a uniform temperature in the furnace by means of the arrangement of the burners which are adapted to the preheating of the air or of the air and gas in regenerators.

The combustion of the air and gas takes place upwardly in a burner or burners which open vertically into the combustion chamber at one end of the furnace and approximately on a level with the hearth. The opposite side of the furnace is formed symmetrically with respect to the vertical plane of symmetry of the furnace chamber. The roof of the combustion chamber is so designed as to form a sloping surface of conical or cylindrical shape whereby the upwardly directed flames from the burner are constrained to spread out in fan formation over said sloping surface before entering the actual heating chamber of the furnace. The flame completely fills the chamber of the furnace; one part of said flame

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escapes through the burners of the opposite wall, which act as a flame outlet and in which there is a draught, and another part is returned towards the operative burners by the effect due to the natural flow produced by the differences of temperature.

At the next reversal, the path of the flames is reversed and the burners on the other side become operative, while the burners which were previously operative act as flame outlets.

These reversals of the flow of the flames, combined with the natural flow which is set up, enable absolute uniformity of temperature to be obtained.

An embodiment of the present invention is illustrated in Figs. 1, 2 and 3 of the accompanying drawing which shows an example of a furnace in which the air and gas are heated in regenerators.

Fig. 1 is a section along the line A—B of Fig. 2.

Fig. 2 is a diagrammatic elevational view in section along H—I—J—K of Fig. 3, with the cover 15 removed;

Fig. 3 is a section along C—D—E—F of Fig. 2.

The gas is supplied through the cock 1 (Fig. 2) to the base of the regenerator 3. The damper 2 is closed. The gas is heated by flowing upwards through the honey-comb of the regenerator 3 and then downwards through the pipe 4 which opens into the burner 12 (Fig. 1) of the furnace through the pipe 5 and the passage 6 (Figs. 1 and 2).

The air is supplied through the cock 7 (Fig. 2) to the base of the air regenerator 8. The damper 28 is closed. The air flows upwards through the honey-comb of the regenerator 8 and then downwards through the pipe 9 and reaches the burner 12 (Fig. 1) through the flue 10 (Fig. 2) and the passages 10 and 11 (Fig. 1).

The air and the gas from the regenerators 3 and 8 meet in the burner 12 (Fig. 1) and the flame produced by said burner is projected vertically into the combustion chamber 13 and impinges against the sloping cylindrical part 33 of the roof of said chamber; it is therefore constrained to spread over the surface of said roof in fan-shaped formation throughout the width of the furnace before entering the heating chamber 14. The path of said flame is illustrated by the arrows *f* and it is apparent that said path is tangential to the cover of the chambers. The flame thus fills the heating chamber 14 that is closed by the cover 15 and part of said flames leaves the furnace at the opposite end through the combustion chamber 16 and the burners 17 and the flues 18, 19, 20 and 21 (Figs.

1 and 2). They reach the top of the honey-comb of the regenerators 24 and 25 (Figs. 2 and 3) through the flues 22 and 33, pass downwards through the honey-comb and reach the chimney 31 through the manifold 30, the dampers 32 and 29 being open, and the cocks 26 and 27 closed.

The flames which are formed in the combustion chamber 13 (Fig. 1) and which have passed through the furnace, have given up heat; owing to the increase of their density produced thereby, they have a natural tendency to flow downwards towards the hearth. Only a portion escapes through the draught as hereinbefore described, and another portion follows the path of the arrows *f* and mixes with the flames which are issuing from the burner, thereby decreasing the temperature of said flames.

This flow is more violent as the differences of temperature between the top and the bottom of the furnace, the burner and the outlet, are more pronounced. It therefore has a natural tendency to equalize the temperature of the furnace.

After some time, when the honey-combs 3 and 8 (Fig. 2) have yielded part of their heat, a reversal is effected. The air and gas inlets 1 and 7 (Fig. 2) are closed, the dampers 2 and 28 are opened, the dampers 32 and 29 (Figs. 2 and 3) are closed, and the cocks 26 and 27 are opened.

Under these conditions, the opposite burner 17 (Figs. 1 and 2) becomes operative and the heating is effected with a symmetrical circulation of the flame relatively to the previous circulation. This, combined with the natural circulation due to the arrangement of the burners, enables an absolutely uniform temperature to be obtained in the furnace.

I claim:

1. A chamber furnace comprising a high closed heating chamber including a solid hearth and provided with an opening at its upper end for entering the products to be heated in a vertical position on to the hearth, a removable cover for the opening in the heating chamber, two terminal walls closing said chamber in its longitudinal direction and two combustion chambers opening into opposite sides of the combustion chamber and the upper cover wall of which opens along a gradually upwardly directed surface into the corresponding side of the heating chamber slightly underneath the cover thereof, a vertically directed burner opening into the lower surface of each combustion chamber, adapted to operate in alternation and to direct the flame produced thereby vertically into impact against the sloping cover wall of the corresponding combustion chamber for constraining said flame to expand fanwise throughout the breadth of said combustion chamber before entering the heating chamber in a direction substantially tangential to the cover of the latter for furthering the circulation of said flame through the same heating chamber and out through the opposite combustion chamber, part of the burnt gases produced by the burner flames remaining in the heating chamber for admixture with the mass of burnt gases produced by further incoming burner flames.

2. A chamber furnace comprising a high closed heating chamber including a solid hearth and provided with an opening at its upper end for entering the products to be heated in a vertical position on to the hearth, a removable cover for the opening in the heating chamber, two terminal walls closing said chamber in its longitudinal direction and two combustion chambers opening into opposite sides of the combustion chamber and the upper cover wall of which defined by sloping generating lines meeting at a predetermined point of the transversal plane of symmetry of the surface lying above the cover of the heating chamber between the heating chamber and the infinite, opens along a gradually upwardly directed surface into the corresponding side of the heating chamber slightly underneath the cover thereof, a vertically directed burner opening into the lower surface of each combustion chamber, adapted to operate in alternation and to direct the flame produced thereby vertically into impact against the sloping cover wall of the corresponding combustion chamber for constraining said flame to expand fanwise throughout the breadth of said combustion chamber before entering the heating chamber in a direction substantially tangential to the cover of the latter for furthering the circulation of said flame through the said heating chamber and out through the opposite combustion chamber, part of the burnt gases produced by the burner flames remaining in the heating chamber for admixture with the mass of burnt gases produced by further incoming burner flames.

3. A chamber furnace comprising a high closed heating chamber including a solid hearth and provided with an opening at its upper end for entering the products to be heated in a vertical position on to the hearth, a removable cover for the opening in the heating chamber, two terminal walls closing said chamber in its longitudinal direction and two combustion chambers opening into opposite sides of the combustion chamber and the upper cover wall of which assumes a substantially cylindrical shape and opens along a gradually upwardly directed surface into the corresponding side of the heating chamber slightly underneath the cover thereof, a vertically directed burner opening into the lower surface of each combustion chamber at a level which is not higher than the hearth of the furnace, said burners being adapted to operate in alternation and to direct the flame produced thereby vertically into impact against the sloping cover wall of the corresponding combustion chamber for constraining said flame to expand fanwise throughout the breadth of said combustion chamber before entering the heating chamber in a direction substantially tangential to the cover of the latter for furthering the circulation of said flame through the said heating chamber and out through the opposite combustion chamber, part of the burnt gases produced by the burner flames remaining in the heating chamber for admixture with the mass of burnt gases produced by further incoming burner flames.

4. A chamber furnace comprising a high closed heating chamber including a solid hearth and provided with an opening at its upper end for entering the products to be heated in a vertical position on to the hearth, a removable cover for the opening in the heating chamber, two terminal walls closing said chamber in its longitudinal direction and two combustion chambers opening into opposite sides of the combustion chamber and the upper cover wall of which opens along a gradually upwardly directed surface into the corresponding side of the heating chamber slightly underneath the cover thereof, a vertically directed burner opening into the lower surface of each combustion chamber, adapted to operate in alternation and to direct the flame produced thereby vertically into impact against the slop-

ing cover wall of the corresponding combustion chamber for constraining said flame to expand fanwise throughout the breadth of said combustion chamber before entering the heating chamber in a direction substantially tangential to the cover of the latter for furthering the circulation of said flame through the same heating chamber and out through the opposite combustion chamber, part of the burnt gases produced by the burner flames remaining in the heating chamber for admixture with the mass of burnt gases produced by further incoming burner flames, means for feeding selectively either combustion chamber burner with air and gas and regenerator systems each adapted to heat at least one of said

fluids, air and gas, feeding the corresponding burner through the waste gases produced by the flames passing out of the other burner.

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