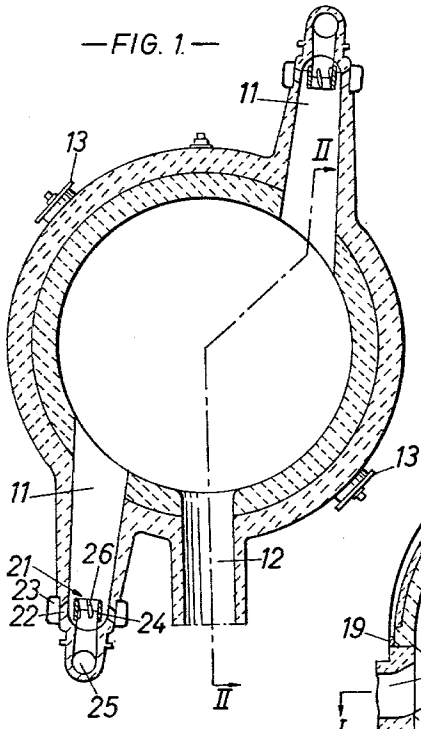
March 16, 1965 D. PETIT 3,173,666

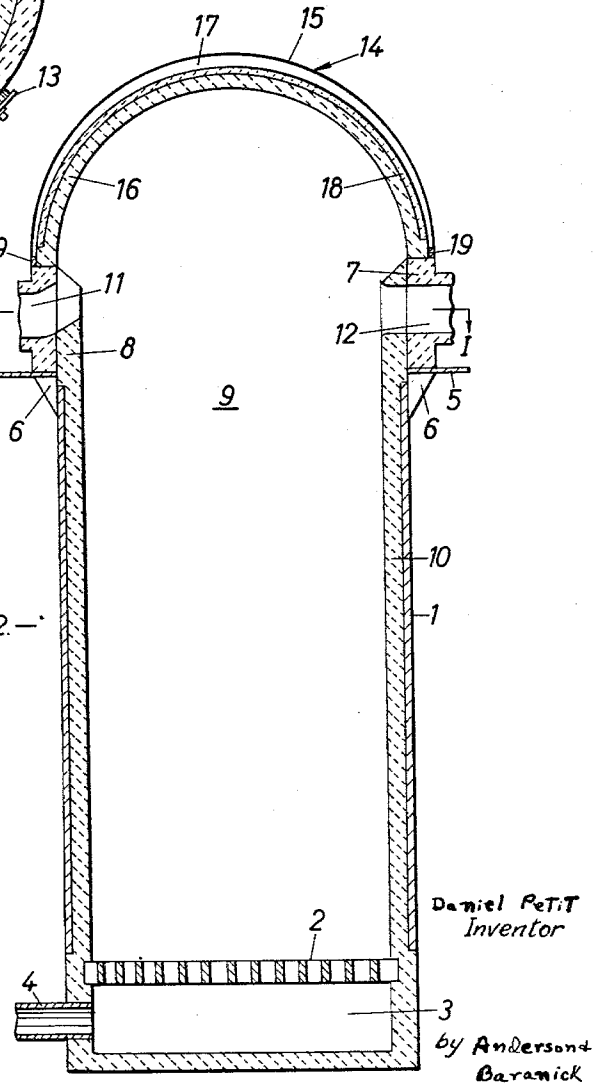
COWPER GAS-HEATING OVENS

Filed March 18, 1963

—FIG. 1.—



—FIG. 2.—



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United States Patent Office 3,173,666 Patented Mar. 16, 1965

3,173,666

COWPER GAS-HEATING OVENS

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Filed Mar. 18, 1963, Ser. No. 265,664
Claims priority, application Great Britain, Mar. 22, 1962, 11,107/62
16 Claims. (Cl. 263—19)

The invention relates to a Cowper gas-heating oven, and more specifically to the arrangement of burners on such an oven.

Cowper gas-heating ovens are used for heating a gas, generally air, before the gas is conveyed as a blast to the tuyères of a blast furnace.

Cowper ovens have been proposed which do not have combustion shafts, but which comprises a stack composed of chequer bricks through which combustion gases are passed during a heating-up phase, and through which air for the blast furnace is passed during a blast-heating phase. Two or more such ovens can be used alternately in each of these two phases, so that preheated air blast for a blast furnace is continuously provided.

It has been proposed to introduce heating gas to a Cowper oven from the top of a dome thereof, or laterally of the dome by means of burners, but it has been found that the combustion of the heating gas is not confined to the dome, the combustion continuing in the upper parts of the chequer brick stacks, with the result that the distribution of the combustion gases in the stacks is not uniform.

It is an object of the present invention to provide a new arrangement of burners in a Cowper gas-heating oven.

It is another object of the invention to provide a Cowper gas-heating oven in which burners providing combustion gases for heating the oven during a heating-up phase thereof, are so arranged that combustion effected by the burners takes place outside a dome of the oven.

It is a further object of the invention to provide a Cowper oven in which the dome is so mounted as to be freely expandable without restraint from a shell of the oven.

It is yet another object of the invention to provide a Cowper oven in which the capacity of the dome to expand freely is promoted by the entire surface of the dome being free of openings.

These and other objects and advantages of the invention will be apparent from the following description given with reference to the accompanying drawings, which are given by way of example and in which:

FIG. 1 is a plan view, in section along the line I—I of FIG. 2, of a Cowper gas-heating oven; and

FIG. 2 is a sectional view, partly broken away, along the line II—II of FIG. 1.

The oven illustrated in the drawings comprises an upright cylindrical shell 1 having a refractory lining 10, preferably of alumina. A grid 2 which may be made from refractory material or cast iron is positioned in the shell at the lower end thereof, so as to separate a chamber 3 from the remainder of the interior of the oven. A pipe 4 communicates with the chamber 3 and serves as an inlet for air which is to be heated.

The grid 2 supports stacks 9, known per se and not shown in detail, of chequer brickwork. A ring 5 is connected to the upper end region of the shell 1 by fillets 6, the ring 5 serving for freely supporting a generally annular member 7 which surrounds an upper end region 8 of the shell lining 10. The annular member 7 is made from alumina or other high quality refractory material having a low expansion coefficient, and is penetrated by two combustion tunnels 11, an outlet 12 for heated air,

and openings (not shown) which are closed off by two manhole covers 13.

The annular member 7 directly and freely supports a dome 14 having a shell 15 with a lining 16 formed from refractory silica bricks preferably having a silica content of greater than 90%, or of silica-alumina bricks or of other high quality refractory material. Apart from at its rim, the lining 16 is spaced from the dome shell 15 by a gap 17 and has a layer 18 of insulating material, facing the shell 15. The gap 17 is sufficiently large to allow the lining 16 to expand without contacting the dome shell 15. The dome lining 16 and the dome shell 15 engage each other only at the rim of the dome, and a metal ring 19 provided at the junction of the dome lining 16 and the dome shell 15 at the rim provides a reinforcement for the said rim, since it will be understood that he rim of the dome directly engages the upper surface of the annular member 7. The metal ring 19 should have a certain degree of elasticity, since its extent of expansion would normally be less than that of the silica dome lining 16 for a given temperature rise.

It will be appreciated that since all of the openings in the upper part of the oven are provided in the annular member 7, and none in the dome 14, the dome lining 16 can freely expand and contract with temperature changes without any undesirable stresses being created therein, as would be the case if various openings, and connections thereto, were provided in the dome. To provide support for the annular member 7, even when in its state of maximum expansion, the supporting ring 5 on which the annular member 7 is seated, is extended beyond the general periphery of the annular member 7, the radial breadth of the supporting ring 5 being for example 30 to 50 centimeters, depending on the radial breadth of the annular member 7.

The combustion tunnels 11 in the annular member 7 carry burners 21 at their outer ends. Each burner 21 is supplied with gas for combustion, through gas ducts 22 which lead to the burner from an annular gas manifold 23 surrounding the burner. Air for supporting the combustion is supplied to a burner nozzle 24 from an air supply pipe 25. The burner nozzle 24 contains fins 26 which are inclined in such a manner that air emerging from the nozzle 24 has a whirling motion so that efficient mixing thereof, with the gas entering the tunnel 11 through the gas ducts 22, is ensured.

The burners discharge a whirling mixture of gas and air into the combustion tunnels 11, where combustion takes place and, due to the positioning of the burners at the outer ends of the relatively long tunnels 11, it is ensured that combustion is completed before the gases reach the chequer work stacks 9. Also, due to the positioning of the burners at the outer ends of the tunnels, they are protected from radiation of heat from the dome.

As will be seen from FIG. 1, the combustion tunnels 11 have cross-sections which increase with distance from the burners, this enabling an improved combustion and providing a reduction in the speed of the gases emerging from the tunnels. Moreover, the tunnels 11 are directed tangentially and slightly upwardly, towards the dome, this providing a better distribution of hot gases to the chequer work stacks 9.

In use of the oven, combustible gases and combustion air are supplied to the burners 21 and combustion takes place in the combustion tunnels 11. The hot gaseous products of combustion pass into the chequer work stacks 9, and are removed through an outlet pipe, similar to the pipe 4 of FIG. 1 but which is not shown, which communicates with the chamber 3. After a sufficient period, when the chequer work stacks 9 have been heated, the supply of gases and air to the burners 21 is interrupted and the outlet pipe closed. Thereafter, air which

is to be heated is passed into the oven through the pipe 4, moves upwardly through the stacks 9 and is heated thereby, and then passes out of the outlet 12 in the annular member 7.

Due to the above described arrangement of the burners, and the fact that the dome is free of any stress-inducing openings therethrough and is freely expandable, it is possible to attain temperatures in the region of 1600° C. in the dome, and to operate with pressures of two or three kilograms per square centimeter.

Modifications, omissions and additions may be made within the spirit and scope of the invention as defined in the following claims. For example, although two burners and combustion tunnels have been shown in the illustrated embodiment, only one burner, or more than two burners may be provided, each combustion tunnel extending through one and the same annular member.

I claim:

1. A Cowper gas-heating oven, comprising a hollow body of circular section, a dome, means supporting the dome so as to close-off the interior of said hollow body, a burner, means positioning said burner at the outside of said hollow body, said positioning means defining an elongated combustion passage leading from said burner to the interior of said hollow body, said combustion passage being outside of said hollow body and of a length sufficient to permit substantially complete combustion of a combustible gas therein.

2. An oven according to claim 1, wherein said combustion passage is of a cross-section which increases with distance from said burner towards said hollow body.

3. An oven according to claim 2, wherein said combustion passage is directed substantially tangentially to the interior of said hollow body.

4. An oven according to claim 3, wherein said combustion passage is directed with an upward inclination towards said dome.

5. An oven according to claim 1, and comprising a generally annular member coaxial with said body member, and a metal plate freely supporting said annular member in a predetermined position relative to said body member, said burner positioning means being part of said annular member.

6. An oven according to claim 5, wherein said annular member surrounds an upper region of said body member.

7. An oven according to claim 5, wherein said annular member is of refractory alumina.

8. An oven according to claim 5, wherein a hot air outlet opening is provided in said annular member, said opening leading to the interior of said body member.

9. An oven according to claim 8, wherein an access opening is provided in said annular member, said access opening leading to the interior of said body member.

10. An oven according to claim 5, wherein said annular member constitutes said dome supporting means and said dome is freely supported thereon.

11. An oven according to claim 1, wherein said dome comprises refractory material and is imperforate.

12. An oven according to claim 11, and comprising an outer shell forming part of said dome and connected to said refractory material at a rim region thereof, said shell co-operating with said refractory material to form a space therebetween for the expansion of said refractory material.

13. An oven according to claim 12, and comprising heat insulating material insulating said shell from said refractory material.

14. A oven according to claim 12, wherein said refractory material is silica refractory material.

15. An oven according to claim 12, and comprising a metallic ring at the rim region of said dome, said ring abutting on said annular member.

16. An oven according to claim 5, and comprising a plurality of burners and positioning means therefor, each of said positioning means being part of said annular member.

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