No. 818,033. PATENTED APR. 17, 1906.

H. KOPPERS.

GAS FURNACE OR COKE OVEN.

APPLICATION FILED FEB. 7, 1905.

3 SHEETS—SHEET 1.

Fig. 2

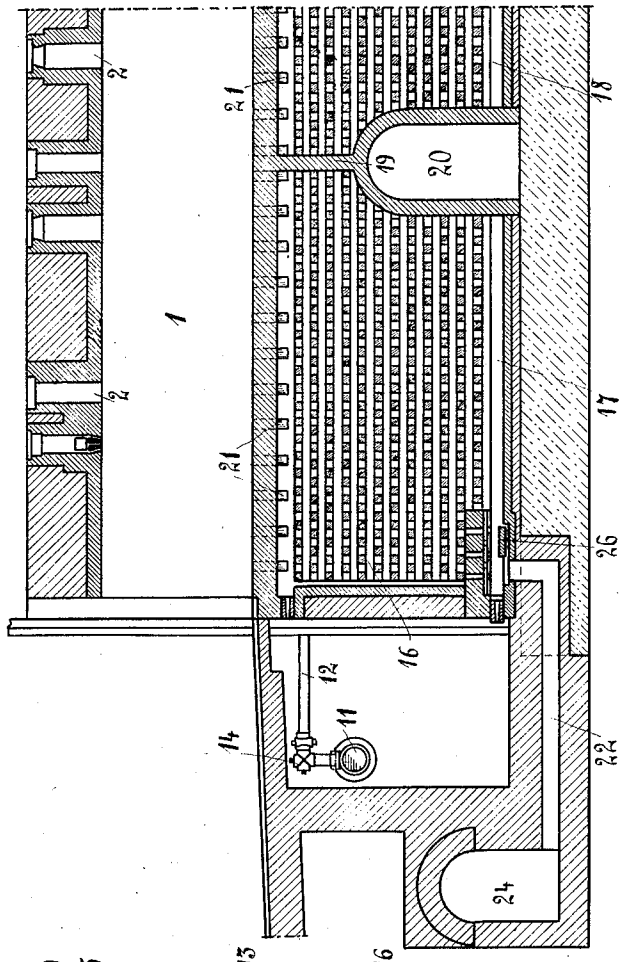
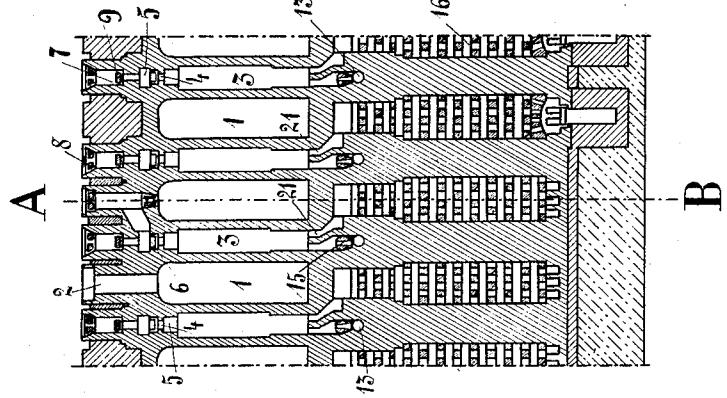


Fig. 1



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3 SHEETS—SHEET 2.

Fig. 4

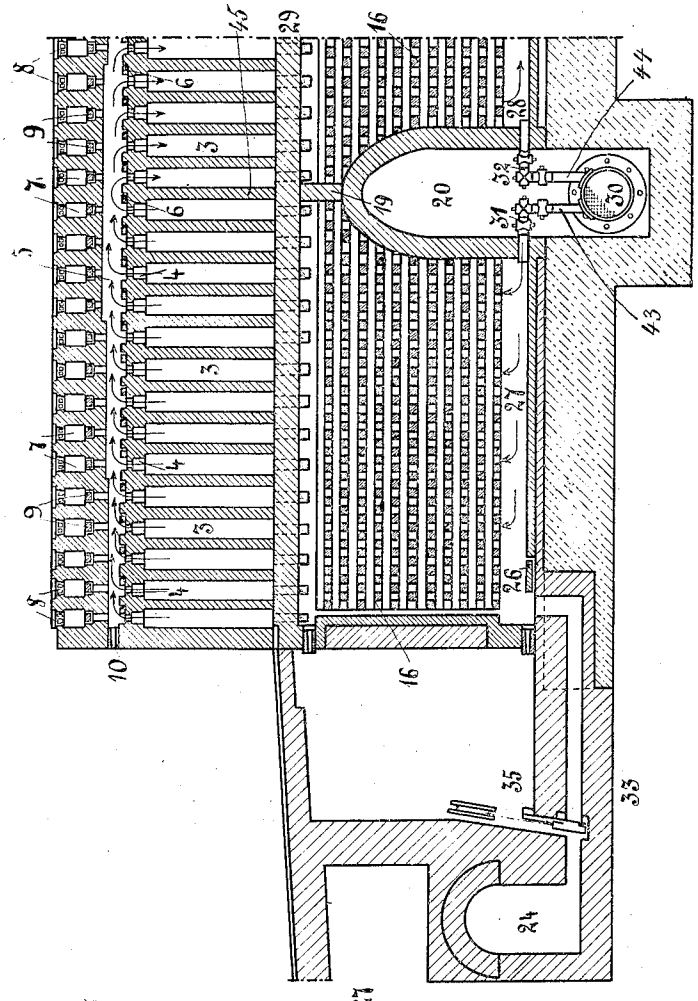
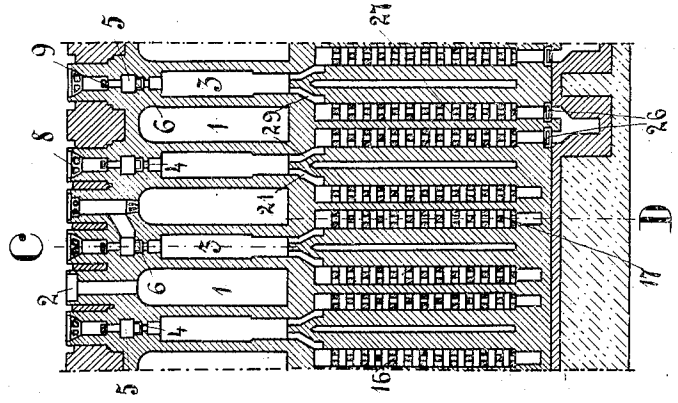


Fig. 3



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3 SHEETS—SHEET 3.

Fig. 5

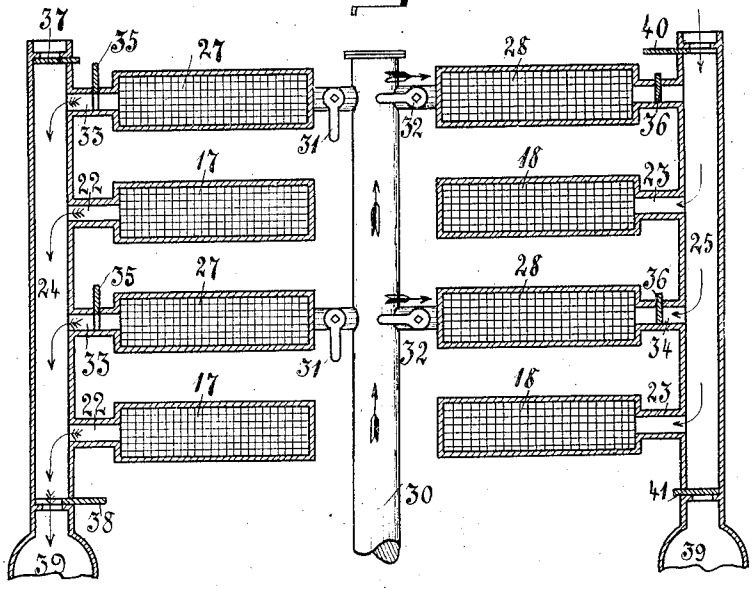
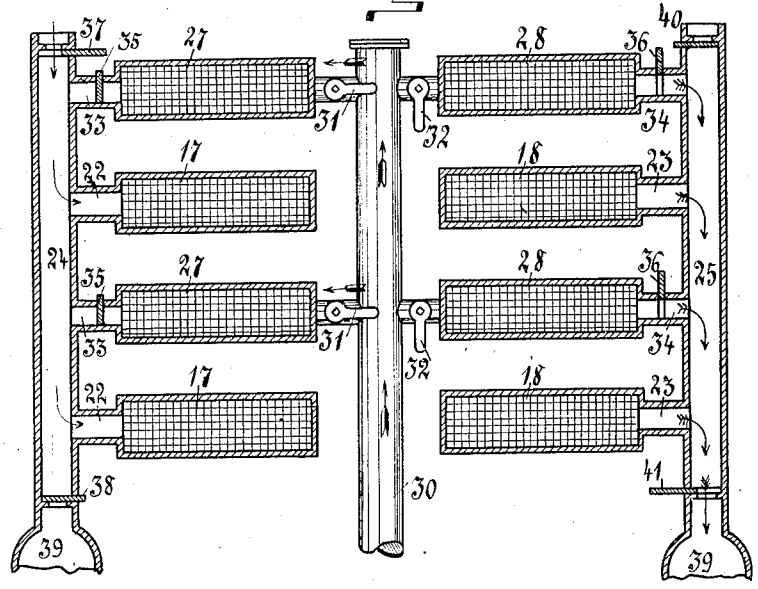


Fig. 6



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UNITED STATES PATENT OFFICE.

HEINRICH KOPPERS, OF ESSEN-ON-THE-RUHR, GERMANY.

GAS-FURNACE OR COKE-OVEN.

No. 818,033. Specification of Letters Patent. Patented April 17, 1906.

Application filed February 7, 1905. Serial No. 244,553.

To all whom it may concern:

Be it known that I, HEINRICH KOPPERS, a citizen of the German Empire, and a resident of Essen-on-the-Ruhr, Germany, have invented certain new and useful Improvements in or Relating to Gas-Furnaces or Coke-Ovens, of which the following is a specification.

My invention relates to an improved coke-oven, and more particularly to improved means for heating the same in a uniform and economic manner. For this purpose the oven is divided into two sections having separate regenerators. These regenerators are traversed alternately by burnt gases and fresh gases, so as to utilize the heat imparted to the regenerators by the former for preheating the latter.

In the accompanying drawings, Figure 1 is a vertical section through a part of my improved coke-oven constructed to preheat air only; Fig. 2, a vertical section on line A B, Fig. 1; Fig. 3, a vertical section through a modification of the oven constructed to preheat air and gas; Fig. 4, a vertical section on line C D, Fig. 3; and Figs. 5 and 6 are diagrammatic views of the regenerator and connections, showing the parts in different positions.

The numerals 1 indicate a series of parallel coking-chambers having the usual openings 2 for the introduction of the material to be coked. Intermediate the coking-chambers there are arranged two sets of parallel heating-chambers 3, separated by a partition 45 and communicating at their top by openings 4 with horizontal channels 5, that increase in area from the ends toward the center. Communication between chambers 3 and channels 5 is controlled by dampers 6. Above and in vertical alinement with the heating-chambers 3 there are provided openings 7, normally closed by plugs 8 and 9. These plugs may be readily removed whenever an inspection of the heating-chambers is necessary. Openings 10 (shown in Fig. 4) serve to permit an observation of the channels 5 and control the admission of air when starting combustion.

The coking-oven (illustrated in Figs. 1 and 2) is provided near each side with a gas-main 11, which communicates by branches 12, having valves 14, with gas-ducts 13. The latter open through nozzles 15 into the heating-chambers 3. Below the coking-chambers 1 are arranged parallel to heating-chambers 3 two sets of regenerators 17 and 18, formed by open brickwork 16, the regenerators being separated by a partition 19 and arched passage 20. The regenerators 17 and 18 communicate, through ducts 21, with their respective heating-chambers. Further, regenerators 17 are connected by ducts 22 to an air-passage 24, while regenerators 18 are connected by ducts 23 to air-passage 25, Fig. 5, communication between the regenerators and the ducts being controlled by dampers 26.

Figs. 3 to 6 illustrate a coke-oven in which gas, as well as air, is preheated. Intermediate the air-regenerators 17 and 18 there are interposed gas-regenerators 27 and 28, respectively, opening through apertures 29 into the heating-chambers 3. The arched passage 20 contains the gas-main 30, communicating through branches 43 44, having cocks 31 32, with the gas-regenerators 27 28, respectively. At their outer ends the gas-regenerators are connected, through ducts 33 34, with the main passages 24 25, communication being controlled by dampers 35 36, respectively. One end of main passage 24, controlled by damper 37, may be connected with the open air, while its other end, controlled by damper 38, is adapted to communicate with a flue 39. Passage 25 is provided with corresponding dampers 40 and 41.

As in both of the constructions illustrated in the drawings the air is heated in the same manner, the process may be described in connection with the oven illustrated in Figs. 3 to 6. The gas heated in regenerators 27 enters through apertures 29 into heating-chambers 3, where it burns, together with the air delivered from regenerator 17, through openings 21. In order to admit fresh air to the several regenerators 17, damper 37 is opened and damper 38 closed, so that air may pass through passage 24 and ducts 22 to said regenerators. The burning and burnt gases ascend in the heating-chambers 3 and flow through damper-controlled openings 4 into the horizontal channels 5. From these channels the gases pass by openings 21 into the regenerators 18. The gases will deliver their heat to the open brickwork 16 of the regenerators and will then escape into passage 25. As damper 40 is closed, the gases will flow through open damper 41 into flue 39. After the lapse of a certain time—say half an hour—the gas-supply pipes of that oven-section within which the combustion has taken place are closed and those of the other

section are opened. Dampers 38 and 40 are opened, while dampers 37 41 are closed. Combustion now takes place in the reverse direction, the air being preheated while flowing through the open brickwork of air-regenerators 18. In case gas as well as air is to be preheated the air is preheated in manner above described, the air entering through open damper 40, ducts 23, and regenerators 18 into heating-chambers 3. The gas passes from gas-main 30 through open valves 32 into the gas-regenerators 28, which are disconnected from passage 25 by closing dampers 36, Fig. 5. The heated gas now enters through ducts 29 into chambers 3 to meet the heated air emerging from ducts 21, so that combustion will take place. The burning and burnt gases will pass through regenerators 17 and 27 to heat the same and will escape through ducts 22 and open dampers 35 into passage 24. As damper 37 is closed while damper 28 is opened, the gases will finally be discharged through flue 39. If the direction of the gases is to be reversed, gas-valves 32 are closed and dampers 36 are opened. As the draft in the flue has not yet been changed, the gas contained in regenerators 28 is sucked into the oven to be burnt with the separately-entering air. The dampers 37 38 40 41 are now moved into the position shown in Fig. 6, and then the gas-valves 31 are opened. In this way any loss of gas is avoided. The gases will now flow in the opposite direction, as indicated by arrows in Fig. 4.

The regenerators above described have the advantage that the passing gases are evenly distributed. As the regenerators are placed directly in the way of the heating-gases, the latter are also evenly distributed in the heating-chambers, so that the formation of any whirls and stagnation is avoided.

What I claim is—

1. In a coke-oven, a series of heating-chambers, and coking-chambers intermediate the heating-chambers, combined with a series of regenerators below and parallel to the heating-chambers and communicating directly therewith, substantially as specified.

2. A coke-oven provided with coking-chambers, heating-chambers intermediate the coking-chambers, and a series of alternating gas-regenerators and air-regenerators arranged below and communicating with the heating-chambers, substantially as specified

3. A coke-oven provided with parallel coking-chambers, a series of heating-chambers intermediate each pair of coking-chambers, and alternating gas-regenerators and air-regenerators arranged below and communicating with the heating-chambers, substantially as specified.

4. A coke-oven provided with parallel coking-chambers, heating-chambers intermediate the coking-chambers, two sets of alternating gas-regenerators and air-regenerators arranged below and communicating with the heating-chambers, a gas-pipe, means for controlling communication between the gas-regenerators and the gas-pipe, an air-passage for each set of air-regenerators, and means for controlling communication between each air-passage and the air-regenerators, substantially as specified.

5. A coke-oven provided with coking-chambers, two sets of heating-chambers intermediate the coking-chambers, two sets of regenerators communicating with the heating-chambers and arranged below the coking-chambers, and a partition between the regenerators, substantially as specified.

6. A coke-oven provided with coking-chambers having parallel heating-walls, heating-chambers between said walls, regenerators communicating with the heating-chambers, a partition and an arched passage between the regenerators and arranged transversely to the heating-walls, passages communicating with the regenerators, dampers between the passages and regenerators, a flue, means for connecting the passages either to the flue or to the open air, a gas-main inclosed in the arched passage, and valve-controlled means for admitting gas to the regenerators, substantially as specified.

7. A coke-oven provided with coking-chambers having parallel heating-walls, heating-chambers between said walls and having top openings, horizontal channels that increase in area from the ends toward the center and communicate through said openings with the heating-chambers, and dampers controlling said openings, substantially as specified.

Signed by me at Essen this 19th day of January, 1905.

HEINRICH KOPPERS.

Witnesses:

HARRY L. MEFFORD,

E. PFUDEL.