Sept. 24, 1974 O. MESSERSCHMIDT 3,838,017

REGENERATION FOR COKE OVENS

Filed Sept. 19, 1972

2 Sheets-Sheet 1

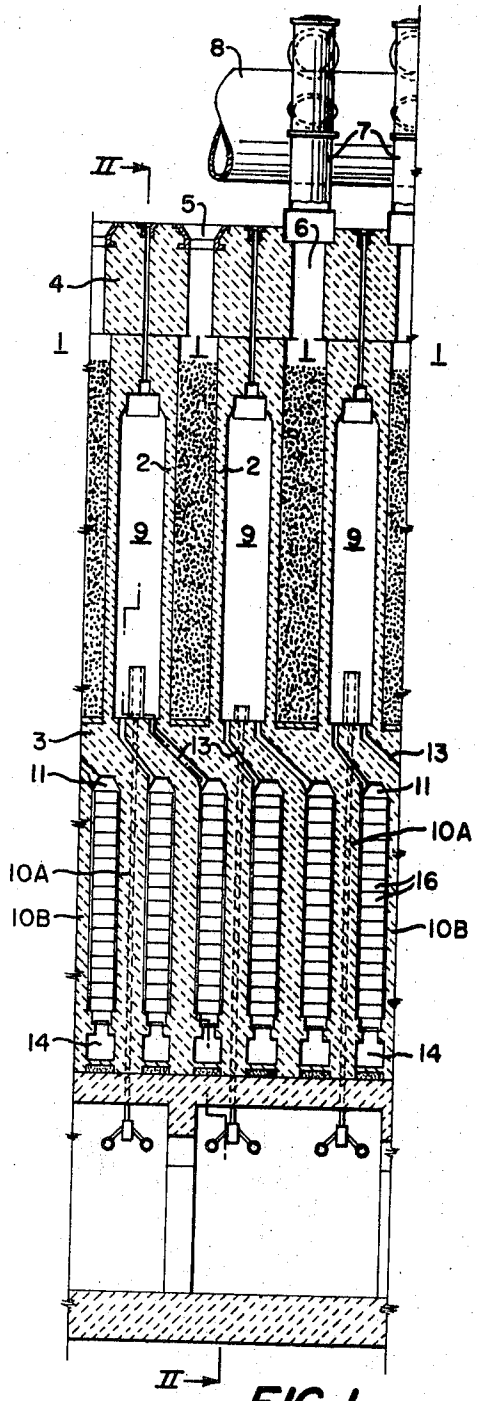

FIG. 1

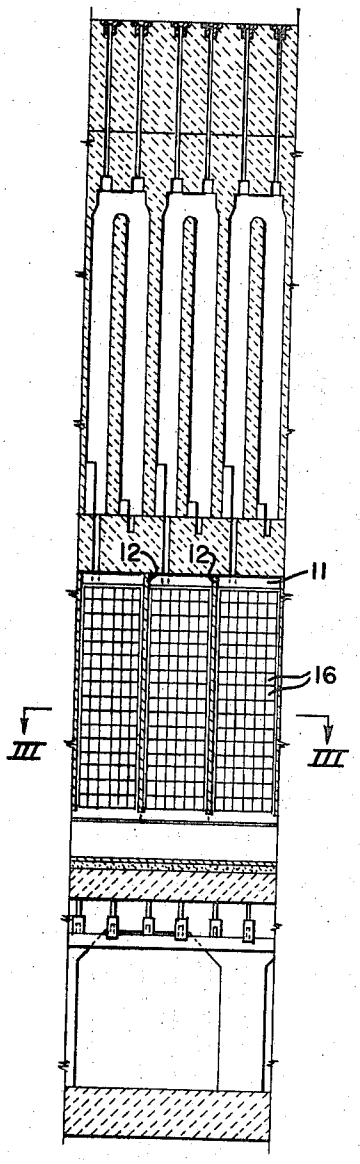

FIG. 2

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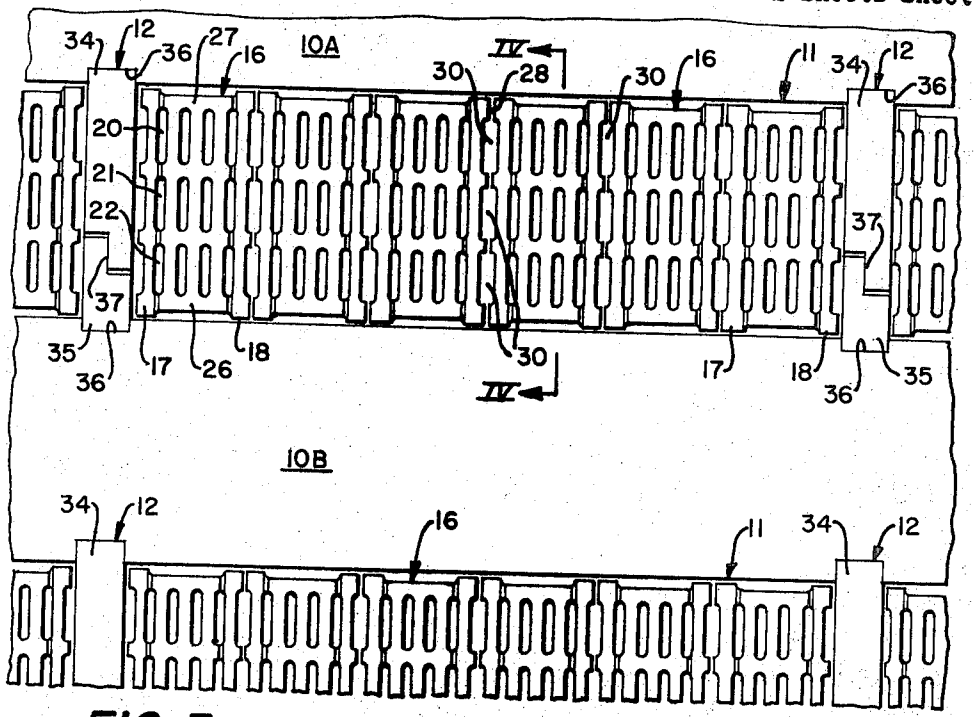

FIG. 3

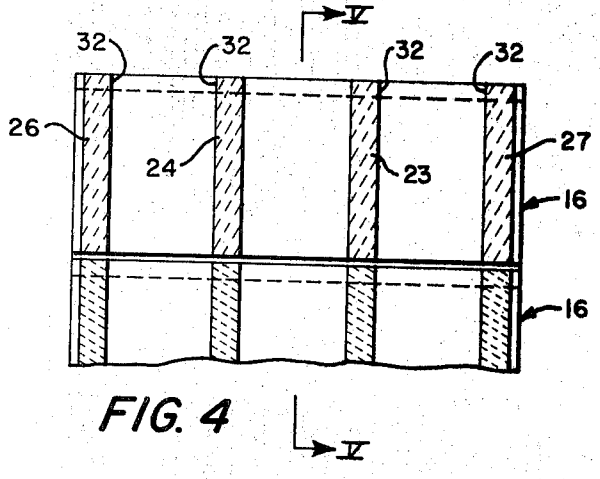

FIG. 4

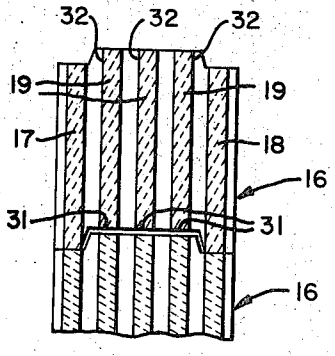

FIG. 5

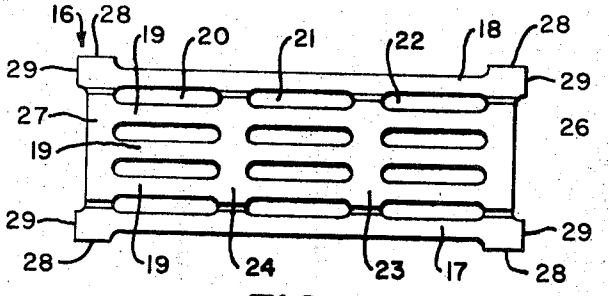

FIG. 6

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REGENERATOR FOR COKE OVENS

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Int. Cl. C10b 1/06, 5/12
U.S. Cl. 202—141 5 Claims

ABSTRACT OF THE DISCLOSURE

A vertical regenerator for a horizontal coke oven chamber. Columns of superimposed checkerbricks are arranged so that each brick extends longitudinally between spaced parallel walls of the regenerator. Along the longitudinal length of each checkerbrick, there extends a projection which passes into a complementary formed recess in a vertically adjacent brick.

BACKGROUND OF THE INVENTION

The present invention relates to horizontal coke ovens with a vertical discharge type of transverse regenerator having checkerwork consisting of checkerbricks placed one on top of the other. Transverse regenerators extend parallel to the oven chambers and also parallel to the series of heating flues which extend across the width of the chambers forming the battery of coke ovens. These regenerators are connected to one or several adjacent heating flues.

In order to provide a maximum heat transfer surface between the brick material of the regenerator and the gases which pass therethrough, it is logical to form vertically-arranged continuous flow spaces in the checkerbricks. The checkerbricks may include longitudinal ribs divided by crosswalls to form cross-sectional squares along the length of the checkerbricks. The thickness of the ribs and crosswalls may be selected to correspond with the width of the flow spaces in the checkerbricks.

Such checkerbricks were placed one on top of the other with their longitudinal ribs extending parallel to the longitudinal walls of the regenerator. The height of the longitudinal walls was selected so as to project beyond the crosswalls and thereby form a horizontal hollow channel which connects all of the continuous flow spaces in the checkerbricks between the overlying parts of the longitudinal walls. This produces a concern that a blocking of the continuous flow spaces could occur at a location where a greater number of bricks is provided as a result of falling mortar or brick fragments. In the event certain of the individual flow spaces were eliminated, in effect, then the efficiency of the regenerators could still be basically retained since a continuous flow of gases through adjacent spaces was made possible by the horizontally-arranged hollow channels. It has been discovered that the exposed upper edges of the crosswalls below the horizontal channels presented surfaces on which deposits of dust accumulate. Such dust deposits occur, for example, due to blast furnace gases which are frequently used for heating coke ovens. The dust contained in such gases not only produces deposits on the exposed surfaces in the regenerator that may even block the horizontal channels at the top thereof, but also forming cohesive layers of such dust over a period of time. As these cohesive layers of dust progressively increase in size, they extend into the continuous flow spaces that eventually produces an extensive obstruction of these flow spaces in the regenerator.

The large thermal expansions of the regenerator and the movement occurring in the masonry which borders the regenerators produce forces on the checkerbricks which are arranged in a straight column-like formation that impairs the entire structure. Moreover, the free passage of gases through the continuous flow spaces can no longer be assured and, as a result, gas pressure losses in the regenerator reach unacceptable values.

Vertically-arranged regenerators are frequently divided into individual cells by crosswalls. Each cell is associated with one or more heating flues in the overlying heating walls. In this manner, the largest possible quantity of heat can be accumulated from the waste gases flowing into the chamber on the one hand and a uniform vertical outward flow is made possible from the individual cells on the other hand. Moreover, the distribution of the preheated combustion agents can be maintained as usual at the base of the regenerator cells where there is maintained sliding bricks or lattice gates. The results are manifested by a pre-established distribution of combustion agents at the heating flues. In the final analysis, this serves the purpose of guaranteeing a uniform distribution of the combustion agents to uniformly heat the oven chambers over their entire length.

An important consideration must be given to the structure forming the vertical intermediate walls dividing the regenerator into cells. Specifically, this structure must be independent of the longitudinal walls in the regenerator in view of the expansion phenomena of the oven masonry. In many cases, therefore, the bricks forming the intermediate walls are not connected with each other or with the bricks in the walls of the regenerator. The regenerator walls are constructed, for example, from bricks which fit into each other. Another aspect to be considered relates to the pressure equalization of gases passing through the regenerators at the intermediate walls. It is desirable to dimension the regenerator bricks themselves in such a way as to prevent a horizontal flow of gases in a longitudinal direction of the regenerator, which is perpendicular to the intermediate walls.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide checkerwork for a vertical discharge regenerator of a horizontal coke oven employing checkerbricks designed in a manner so that there are no exposed horizontal faces and in a manner for exact alignment of superimposed bricks to assure continuous flow spaces for heat exchange gases.

It is another object of the present invention to provide crosswalls for dividing a coke oven regenerator into individual chambers wherein the crosswalls are formed by loosely positioned bricks which project into depressions in the longitudinal walls of the regenerator.

According to one form of the present invention, there is provided for a horizontal coke oven, a vertical discharge regenerator formed by checkerbricks having internal spaces divided into groups, one behind the other, and each group defining continuous flow spaces. These flow spaces are further characterized as vertically-extending passageways having a length and width defined by continuous crosswalls and longitudinal ribs, the latter being arranged parallel to the longitudinal walls of the bricks. The invention further provides in such checkerbricks, that the relative height of the crosswalls and the longitudinal ribs in relation to the height of the outer longitudinal walls is such as to define depressions at the upper side of the bricks and projections at the underside of the bricks. The bricks are arranged as courses of interfitting bricks, each course spanning the distance between the outer walls of the regenerator with courses arranged side-by-side along the width of the regenerator.

The depressions formed in the upper side of the bricks may be, according to an alternative arrangement, formed at the underside of the bricks. The projections are then

formed at the upper side of the checkerbricks. According to this alternative arrangement, the superimposed courses of checkerbricks are protected from mutual displacement in the transverse direction of the bricks since the outer longitudinal walls pass over the inner longitudinal ribs either above or below the latter where they are tightly placed on each other. This prevents escapement of gases in the longitudinal direction of the regenerator since the bricks occupy the entire width of the regenator. Thus, it is important to note that the intermediate walls which divide the regenerator into cells are relieved of the usual tight-fitting requirements and may be arranged in an independent manner. The danger of dust deposits is avoided since exposed horizontal faces are eliminated from the checkerwork. Due to the solid interfitting relation between the checkerbricks by the depressed and projecting faces, the checkerwork overcomes the effects of stresses and expansion which occur in the masonry of the regenerator walls due to temperature changes and changes in the brick material.

These features and advantages of the present invention will be more fully understood when the following description is read in light of the accompanying drawings, in which:

FIG. 1 is a fragmentary vertical transverse section through a row of coke ovens and regenerators;

FIG. 2 is a fragmentary vertical section taken along line II—II of FIG. 1;

FIG. 3 is a sectional view taken along line III—III of FIG. 2;

FIG. 4 is a sectional view taken along line IV—IV of FIG. 3;

FIG. 5 is a sectional view taken along line V—V of FIG. 4; and

FIG. 6 is an enlarged plan view of a checkerbrick shown in FIG. 3.

Referring to FIGS. 1 and 2 of the drawings, a series or rows of laterally-spaced coke ovens are shown in which each horizontal coke oven chamber **1** has side walls **2**, a floor **3** and a roof **4**. The roof is provided with vertical passages **5** for filling the ovens with coal that is to be coked, and with other passages **6** through which the gases formed during coking leave the ovens to enter small ducts **7** that are connected with large ducts **8** extending along the tops of the ovens. The spaces between the ovens form heating flues **9**.

Below the floor of the ovens and flues there is a series of side-by-side regenerators **11**, each of which includes longitudinal walls **10A** and **10B**. The space between these walls is divided by vertical crosswalls **12** into separate cells which is best shown in FIGS. 2 and 3. The upper ends of the cells are connected by inclined passages **13** with the bottom of the flues. At the bottom of each regenerator there is a horizontal duct **14** admitting to the cells the air that is to be heated and to remove from the cells the combustion gases when the regenerators are reversed.

Each of the regenerator cells is filled with columns of superimposed checkerbricks **16** for alternately absorbing heat and imparting heat to incoming gases to preheat them. The columns of bricks are supported side-by-side such that each checkerbrick extends longitudinally between the walls **10A** and **10B** where the bricks abut the vertical surfaces of these walls.

As clearly shown in FIGS. 4, 5 and 6, each checkerbrick has three groups of flow spaces **20**, **21** and **22** arranged one behind the other longitudinally of the bricks. The checkerbrick has longitudinal walls **17** and **18** and outer crosswalls **26** and **27**. Within the outer walls there is provided three inner longitudinal walls **19** and inner crosswalls **23** and **24**. Side projections **28** extend from the outer surface of the longitudinal walls **17** and **18**. Other projecting surfaces **29** extend from the crosswalls **26** and **27** at the four corners of each brick.

As best shown in FIG. 3, the position of the bricks in the regenerator cell forms additional flow spaces **30** by the cooperation between the projections **28** on the bricks.

According to the features of the present invention, the design of the individual bricks attains the goal of assuring continuous flow spaces through the bricks and throughout the entire height of the regenerator cell and eliminating horizontal surfaces where dust deposits may be collected.

This is accomplished by providing the inner walls **23** and **24**, outer crosswalls **26** and **27** and the inner longitudinal walls **19** with extensions **32** at the upper sides of the bricks and identically-shaped depressions **31** at the underside of the bricks. An arrangement of superimposed course of bricks is such that the upper projections are engaged in the lower depressions, as clearly shown in FIGS. 4 and 5. In vertical cross section, FIG. 5, the depressions essentially form troughs defined by a plane bottom and relatively steep ascending side walls.

In the longitudinal direction of the regenerator, an almost gas-tight seal is produced between the checkerbricks by the depressions **31** and projections **32** which are arranged in a superimposed relation such that the longitudinal walls **17** and **18** are placed firmly on top of one another. In this manner, a substantially gas-tight enclosure is provided by the outer longitudinal walls of the bricks at adjacent regenerator cells. This gives rise to the possibility of omitting the crosswalls **12**. As illustrated in FIG. 3, the crosswalls are actually formed from plates **34** and **35** which extend into recesses **36** formed in the longitudinal walls **10A** and **10 B** of the regenerator. A Z-shaped joint **37** is formed where the plates **34** and **35** engage each other. As shown in the drawings, the plates **34** and **35** are of different lengths such that the joint **37** is adjacent the wall **10B** in the course of bricks shown in FIG. 3. The joint **37** is staggered from course-to-course of bricks such that throughout the even-numbered brick courses, the joint is adjacent the wall **10B** and throughout the odd-numbered brick courses, the joint is closely adjacent the wall **10A**.

Although the invention has been shown and described in connection with certain specific embodiments, it will be readily apparent to those skilled in the art that various changes in form and arrangement of parts may be made to suit requirements without departing from the spirit and scope of the invention.

I claim as my invention:

1. In combination with a horizontal coke oven chamber, a vertical regenerator comprising:

spaced regenerator walls extending along the length of said coke oven chamber,

a column of superimposed checkerbricks with each checkerbrick arranged longitudinally to extend between and in abutment with said spaced regenerator walls,

a plurality of side-by-side continuous flow spaces extending through said column of superimposed checkerbricks and defined by a plurality of superimposed abutting checkerbrick walls aligned vertically between each superimposed checkerbrick,

a recess formed in one horizontally-extending end of each checkerbrick and extending from one regenerator wall to the other regenerator wall along the entire longitudinal length of the checkerbrick, and

a projection formed on the other horizontally-extending end of each checkerbrick and extending along the entire longitudinal length of the checkerbricks, the projection of one checkerbrick extending into the recess of a vertically adjacent checkerbrick, said checkerbricks defining outer longitudinal walls that are independent of said recess and said projection.

2. The combination according to claim **1** further comprising a plurality of spaced-apart crosswalls formed by courses of loosely set bricks arranged to extend between said spaced regenerator walls, said crosswalls dividing said regenerator into cells, each cell comprising a plurality

of said columns of superimposed checkerbricks arranged side-by-side between said crosswalls.

3. The combination according to claim 2 wherein said regenerator walls have recesses for loosely receiving said crosswalls.

4. The combination according to claim 1 wherein said checkerbricks each comprise spaced-apart parallel arranged crosswalls, outer longitudinal walls and inner longitudinal walls defining groups of said plurality of continuous flow spaces, each of said groups being arranged one behind the other along the longitudinal length of the checkerbricks.

5. The combination according to claim 4 further comprising spaced parallel wall extensions formed by said outer longitudinal walls projecting from one end of said checkerbricks beyond said crosswalls and inner longitudinal walls, and spaced parallel wall recesses defined by said crosswalls and inner longitudinal walls projecting

from the opposite side of said checkerbricks beyond said outer longitudinal walls.

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U.S. Cl. X.R.

52—602, 603